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FINAL
HUMAN HEALTH RISK ASSESSMENT FOR THE SMURFIT-STONE/FRENCHTOWN MILL OPERABLE UNIT 3 SITE LOCATED IN MISSOULA COUNTY, MONTANA

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LIST OF ACRONYMS AND ABBREVIATIONS

95UCL	95% Upper Confidence Limit
ABS_d	Dermal Absorption Fraction
ABS_{GI}	Fraction absorbed in gastrointestinal tract
ADAF	Age-Dependent Adjustment Factor
Ah	Aromatic Hydrocarbon
AOC	Administrative Order on Consent
AT	Averaging Time
ATSDR	Agency for Toxic Substances and Disease Registry
BCF	Bioconcentration Factor
Bgs	Below Ground Surface
BOD	Biological Oxygen Demand
BW	Body Weight
C	Concentration
C_{air}	Concentration in Air
C_c	Concentration in Fish Carcass
C_f	Concentration in Fish Fillet
C_{soil}	Concentration in Soil
C_{wb}	Concentration in Whole Body Fish
CalEPA	California Environmental Protection Agency
CDD	Chlorinated Dibenzo-*p*-Dioxins
CDF	Chlorinated Dibenzo-*p*-Furans
CF_{soil}	Conversion Factor for Soil
CFR	Clark Fork River
COPC	Contaminant of Potential Concern
Cr(VI)	Hexavalent Chromium
Cr(III)	Trivalent Chromium
CSKT	Confederated Salish and Kootenai Tribes
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
DAD	Dermal Absorbed Dose
DA_{event}	Absorbed dose per event
DAF	Dermal Adherence Factor
DI	Daily Intake
DI_L	Daily Intake, averaged over a lifetime
DL	Sample-specific Detection Limit
DRI	Daily Recommended Intake
EC	Exposure Concentration
ED	Exposure Duration
EF	Exposure Frequency
EPC	Exposure Point Concentration
EPD	Effective Predictive Domain
ET	Exposure Time
EU	Exposure Unit
EV	Event Frequency

FRN	Frenchtown
FSP	Field Sampling Plan
HDPT	High Density Pulp Tank
HEAST	Health Effects Assessment Summary Table
HHRA	Human Health Risk Assessment
HI	Hazard Index
HIF	Human Intake Factor
HIF_{ing}	Human Intake Factor for Ingestion
HIF_{derm}	Human Intake Factor for Dermal
HQ	Hazard Quotient
IR	Intake Rate
IRIS	Integrated Risk Information System
Kow	Octanol/water partition coefficient
LOAEL	Lowest Observed Adverse Effect Level
MCLG	Maximum Contaminant Level Goal
MDEQ	Montana Department of Environmental Quality
MDL	Method Detection Limit
MPDES	Montana Pollution Discharge Elimination System
MRL	Minimal Risk Level
MW	Molecular Weight
ND	Non-Detect
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
NPP	North Polishing Pond
NTP	National Toxicology Program
OCC	Old Corrugated Container
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzo-*p*-dioxin
PCDF	Polychlorinated Dibenzo-*p*-furan
PEF	Particulate Emission Factor
PPRTV	Provisional Peer Reviewed Toxicity Value
p-RfC	Provisional Reference Concentration
p-RfD	Provisional Reference Dose
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RBA	Relative Bioavailability
REL	Reference Exposure Level
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RIWP	Remedial Investigation Work Plan
RfC	Reference Concentration
RfD	Reference Dose
RfD_{ABS}	Absorbed Reference Dose
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level

SA	Surface Area
SAB	Science Advisory Board
SB	Spoils Basin
SF	Slope Factor
SF_{ABS}	Absorbed Slope Factor
SI	Site Investigation
SL	Screening Level
STR	Saint Regis
STSC	Superfund Technical Support Center
SVOC	Semi-volatile Organic Compound
SWB	Solid Waste Basin
TCDD	2,3,7,8-Tetrachlorodibenzo-*p*-dioxin
TDS	Total Dissolved Solids
TEF	Toxicity Equivalence Factor
TEQ	Toxicity Equivalent
$TEQ_{(D/F)}$	Toxicity Equivalent for Dioxins and Furans
$TEQ_{(D/F/PCB)}$	Toxicity Equivalent for Dioxins, Furans and Coplanar Polychlorinated Biphenyls
$TEQ_{(PCB)}$	Toxicity Equivalent for Polychlorinated Biphenyls
TSB	Transformer Storage Building
TSS	Total Suspended Solids
TWA	Time Weighted Average
TWF	Time Weighting Factor
UR	Unit Risk
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
W_c	Weight of Fish Carcass
W_f	Weight of Fish Fillet
WOE	Weight of Evidence
kg/day	Kilogram per day
kg/kg-day	Kilogram per kilogram per day
L/day	Liter per day
m^3/day	Cubic meter per day
m^3/kg	Cubic meter per kilogram
mg/day	Milligram per day
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
mg/m^3	Milligram per cubic meter
$\mu g/m^3$	Microgram per cubic meter

EXECUTIVE SUMMARY

ES-1 INTRODUCTION

This document is a baseline human health risk assessment (HHRA) for the Smurfit-Stone/Frenchtown Mill Site Operable Unit 3 (OU3) ("Site). The purpose of this document is to characterize the potential risks to humans, both now and in the future, from site-related contaminants that are present at the Site, assuming that no steps are taken to remediate the environment or to reduce human contact with contaminated environmental media.

ES-2 SITE DESCRIPTION

The Site is located in Missoula County, Montana within the Clark Fork River (CFR) drainage. The historic pulp mill operated at the Site from 1957 to 2010. Most areas of the Site have been idle since industrial activities ceased in 2010. OU3 includes the current open space that was formerly used as the wastewater treatment system (settling ponds, aeration basins, polishing ponds, solid waste basins, holding ponds, spoils basins, and infiltration basins) and parts of the CFR where hazardous substances from Site activities may have come to be located.

Mill operations (predominantly the pulping and bleaching processes) used or produced various hazardous chemicals on Site, including volatile and semi-volatile organic compounds (VOCs and SVOCs), and bleaching chemicals. The use of chlorine for the bleaching of pulp produces chlorinated organic compounds, including dioxins and furans. The historical use of OU3 for treatment and storage of wastewater and solid wastes represents the primary source of contamination of OU3 soils. Historical Mill operations consisting of boiler emissions may have also resulted in direct deposition of contaminants in OU3 surface soils. Fate and transport mechanisms may have resulted in contamination moving from soils to groundwater, or surface water and sediments of on-site creeks, ponds and the CFR. As described in further detail in NewFields (2020), the Mill also operated under a Montana Pollutant Discharge Elimination System (MPDES) permit that applied to the discharging of treated effluent to the CFR via permitted outfalls and infiltration to underlying groundwater. Previous site investigations have identified contaminants of potential concern (COPCs) at the Site to include dioxins/furans, heavy metals, polychlorinated biphenyls (PCBs), SVOCs, and VOCs. Exposures to these types of COPCs may cause a range of non-cancer and cancer effects in humans, so humans who reside in, work at, and/or visit the OU3 Site now or in the future could be at risk of adverse health effects if excessive exposure to contaminated environmental media were to occur.

ES-3 EXPOSURE ASSESSMENT

Exposure is the process by which humans come into contact with chemicals in the environment. In general, humans can be exposed to chemicals in a variety of environmental media (e.g., soil, water), and these exposures can occur through several pathways (e.g., ingestion, dermal contact, inhalation).

This HHRA evaluates the potential for unrestricted future use of OU3. As such, the following receptors and exposure pathways were selected for evaluation:

Receptor	Exposure Pathway
Hypothetical Future Resident	Incidental ingestion of and dermal contact to surface soil Ingestion of groundwater as drinking water
Hypothetical Future Commercial/Industrial Worker	Incidental ingestion of and dermal contact to surface soil Ingestion of groundwater as drinking water
Hypothetical Future Construction Worker	Incidental ingestion of and dermal contact to surface and subsurface soil Inhalation of soil particulates
Recreational Visitors	
Hiker	Incidental ingestion of and dermal contact to surface soil
Camper	Incidental ingestion of and dermal contact to surface soil Ingestion of surface water (as drinking water) Incidental ingestion of and dermal contact to surface water and sediment while swimming
Recreational Fisher	Incidental ingestion of and dermal contact to surface soil Incidental ingestion of and dermal contact to surface water and sediment while fishing Ingestion of fish

Receptor	Exposure Pathway
Tribal Fisher	Incidental ingestion of and dermal contact to surface soil Incidental ingestion of and dermal contact to surface water and sediment while fishing Ingestion of fish

COPCs are contaminants which exist in the environment at concentration levels that might be of potential health concern to humans and which are or might be derived, at least in part, from site-related sources. COPCs for OU3 media were selected using a conservative procedure that is expected to retain some contaminants that are actually of little or no concern, but which ensures that no contaminants of authentic concern will be overlooked. The COPCs identified for evaluation are summarized below:

COPC	Soil	Groundwater	Surface Water	Sediment	Fish
Dioxins/furans evaluated as toxicity equivalent ($TEQ_{D/F}$)	X	X			X
Coplanar polychlorinated biphenyls (PCBs) evaluated as toxicity equivalent (TEQ_{PCB})					X
Dioxins, furans and coplanar PCBs evaluated as toxicity equivalent ($TEQ_{D/F/PCB}$)					X
Total PCBs					X
Aroclor-1260		X			
Aluminum	X	X			
Antimony	X	X			
Arsenic	X	X	X	X	
Barium	X	X			
Beryllium		X			
Cadmium	X	X			
Chromium	X	X	X	X	
Cobalt	X	X			
Copper		X			
Iron	X	X			
Manganese	X	X			
Mercury	X				

Nickel		X			
Thallium	X	X			
Vanadium	X	X			
1,4-dichlorobenzene		X			
Benzene		X			
Chlorobenzene		X			

Human exposures to COPCs in environmental media at the Site were quantified using standard equations developed by the USEPA for use at Superfund sites. Exposure parameters that define the magnitude and frequency of exposure were selected from USEPA defaults or by application of professional judgment. Because there is normally a wide range of exposure levels that may occur in a population of exposed humans, parameters were selected to provide an estimate of exposures that are "average" or are near the upper end of the range. These two exposure estimates are referred to as Central Tendency Exposure (CTE) and Reasonable Maximum Exposure (RME), respectively. Exposure parameters selected for each exposure scenario are summarized in Section 3.5 (see Tables 3-23 to 3-29).

Exposure concentrations were estimated for defined exposure areas. An exposure area (also referred to as an exposure unit or exposure point) is an area where a receptor may be exposed to one or more environmental media. In general, receptors are assumed to move about at random within an exposure area. For this assessment, OU3 was evaluated based on randomized 20-acre grid exposure areas in the upland area and based on randomized 100-acre grid exposure areas in the floodplain (see Figures 3-4 and 3-5). Groundwater wells were evaluated individually. Surface water and sediment were evaluated by water body whereby the area in the CFR defined as the OU3 study area was evaluated as one exposure area. Since the true arithmetic mean concentration cannot be calculated with certainty from a limited number of measurements, the USEPA recommends that the 95 percent (%) upper confidence limit (95UCL) of the arithmetic mean at each exposure area be used as the exposure point concentration (EPC) when calculating exposure and risk at that location. EPCs were estimated differently for soil and groundwater based on the data available. For soils, UCLs could not be calculated. Multiple soil sample types were collected from the various exposure grids including 5-point composites collected over a biased area of a 1- to 3-meter radius and 20-point composites comprised of random grab samples collected across an entire exposure grid. The larger the number of grab samples used to create the composite sample, the lower the variability around the mean estimate. Additionally, the larger the area within the exposure area that a composite sample is based, the more representative of the mean exposure across the exposure area. A 20-point composite comprised of 20 grab samples collected across the whole of the exposure area grid provides a representative estimate of the mean. Whereas, a mean concentration derived based on a localized 5-point composite is more uncertain, and the variability around the mean could be much greater. Therefore, soil EPCs

were estimated as grid-specific weighted concentrations by assigning higher confidence in the concentration based on the 20-point composite than the 5-point composite (see Section 3.5.4). Particulate concentrations in air were estimated from soil concentrations and an assumed particulate emission factor (PEF) to account for soil disturbances at construction sites (inhalation of soil particulates was only quantified for a hypothetical future construction worker).

Groundwater EPCs were generated for each individual well. Data from all sampling years considered in the risk assessment were used in deriving well-specific EPCs. A 95UCL was calculated where at least four detected values were available, per USEPA guidance (USEPA 2015b). If this data requirement was not met, the EPC was set equal to the maximum detected value. CFR surface water and sediment EPCs for arsenic and chromium were derived using ProUCL to generate 95UCLs. Surface water EPCs for arsenic and chromium in the on-site creeks were based on the maximum detected concentrations.

Fish EPCs were based on wet weight concentrations estimated as 95UCLs by species and tissue type (fillet or whole body).

An accurate assessment of human exposure to ingested contaminants requires knowledge of the amount of contaminant absorbed from the gastrointestinal tract into the body from site media compared to the amount of absorption that occurred in the toxicity studies used to derive the toxicity factors. This ratio (amount absorbed from site media compared to the amount absorbed in toxicity tests) is referred to as Relative Bioavailability (RBA).

The oral RBA value for dioxins in soil is assumed to be 100% in accordance with USEPA (USEPA 2010b). This is considered to be a conservative assumption, because reports summarized by USEPA (2010b) indicate that absorption of dioxins from soils through the gastrointestinal tract is usually less than 50%.

In general, metals in soils exist in the form of mineral particles that are not completely solubilized in gastrointestinal fluids when ingested, while toxicity studies often utilize readily soluble forms of the test contaminant. Thus, oral RBA values for metals in soils are often less than 1.0. For arsenic, sufficient data are available to establish that oral RBA values in soil are generally less than 60% (USEPA 2012b). Thus, for the purposes of this HHRA, a RBA of 60% was applied for arsenic in OU3 soils. RBA data are much more limited or absent for other metals (except lead which was not identified as a COPC in this assessment). RBA values for all other metal COPCs were conservatively assumed to be 100%.

ES-4 TOXICITY ASSESSMENT

The objective of a toxicity assessment is to identify what adverse health effects a contaminant may cause, and how the emergence of these adverse effects depends on exposure level.

The toxicity assessment process is usually divided into two parts: the first characterizes and quantifies the non-cancer effects of the contaminant, while the second addresses the cancer effects of the contaminant. This two-part approach is employed because there are typically major differences in the time-course of action and the shape of the dose-response curve for cancer and non-cancer effects. The relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population forms the basis for a quantitative dose-response relationship. Toxicity values are derived based on such dose-response relationships (see tables 4-1 to 4-2).

ES-5 RISK CHARACTERIZATION

The potential for non-cancer effects is evaluated by comparing the estimated exposure concentration for a receptor over a specified time period to a reference threshold that represents the exposure below which it is unlikely for even sensitive populations to experience adverse health effects. This ratio of exposure to toxicity is called a Hazard Quotient (HQ). The sum of HQ values cross different exposure pathways is referred to as the hazard Index (HI). If the HQ or HI for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If an HQ or HI exceeds one, there is some possibility that non-cancer effects may occur, although an HQ or HI above one does not indicate an effect will occur. However, the larger the value, the more likely it is that an adverse effect may occur. Because the assumption of dose additivity in the HI approach is most relevant to contaminants that induce an effect on the same target organ within a human body, target organ specific HI values were calculated in this HHRA for receptors and pathways where the total HI summed across COPCs >1E+00. The risk benchmark for non-cancer hazard based on target organ HIs was also HI >1E+00.

The excess risk of cancer from exposure to a chemical is described in terms of the probability that an exposed individual will develop cancer because of that exposure. Excess cancer risks are summed across all carcinogenic chemicals and all exposure pathways that contribute to exposure of an individual in a given population. The level of total cancer risk that is of concern is a matter of personal, community, and regulatory judgment. In general, the USEPA considers excess cancer risks that are below one in one million (1E-06) to be so small as to be negligible, and risks above one in ten thousand (1E-04) to be sufficiently large that some sort of remediation is desirable. Excess cancer risks that range between 1E-04 and 1E-06 are generally considered to be acceptable, although this is evaluated on a case by case basis. Furthermore, the MDEQ

allowable cancer risk level is 1E-05, which will be considered outside of this risk assessment as part of the risk management decisions associated with this Site.

Detailed calculations of exposure and risk from each COPC for each exposure scenario are presented in Appendix D and are summarized in Section 5.3. In brief, unacceptable risks (HI > 1E+00, cancer risk ≥ 1E-04) are predicted for hypothetical future residents and commercial/industrial workers who may be exposed to OU3 soils and groundwater. Non-cancer hazards and cancer risks for these receptors are primarily driven by consumption of OU3 groundwater as drinking water. The primary risk drivers in groundwater are arsenic and manganese, and to a lesser extent cobalt, iron, and chromium. Acceptable non-cancer hazards (HI ≤ 1E+00) to hypothetical future residents based on direct exposures to OU3 soils are predicted in most areas of OU3. However, unacceptable non-cancer hazards for a hypothetical future child resident are predicted in 27 of the exposure grids. HIs in these grids are driven by exposure via the incidental ingestion of surface soil. Target organ specific HIs only exceed 1E+00 in five of these exposure grids (grids 55, 58, 67, 68 and 74). The risk driver in grid 55 is manganese that contributes to potential nervous system effects. $TEQ_{D/F}$ is the risk driver in the other grids contributing to potential reproductive system effects. In grid 74, arsenic and thallium are also risk drivers that contribute to potential dermal effects. Unacceptable cancer risks are also predicted for the hypothetical future RME resident based on incidental ingestion of OU3 surface soils in upland exposure area grids 26, 42, 47, 48, 49, 50, 53, 54, 55, 56, 58, 59, 65, 67, 68, 71, 72, 74 and in floodplain exposure area grids 86, 88, 90, 91, 93, 94, 95, and 98. Unacceptable cancer risks for the hypothetical future CTE resident are only predicted in grid 48 (cancer risk = 1E-04). These predicted cancer risks from soil exposures to hypothetical future residents are primarily driven by assumed early lifetime exposures to chromium (evaluated as hexavalent chromium [Cr(VI)] accounting for a mutagenic mode of action). Acceptable non-cancer hazards and cancer risks are predicted for the hypothetical future commercial/industrial worker and construction worker populations based on direct contact exposures to OU3 soils.

Estimated non-cancer hazards and cancer risks to a current and/or hypothetical future hiker within OU3 are predicted to be acceptable (HI ≤ 1E+00, cancer risk < 1E-04) based on direct contact exposures with OU3 surface soils. Acceptable risks were predicted for direct contact exposures by current and/or hypothetical future campers to most OU3 soils, with the exception of surface soils in grid 74. The cancer risk predicted from exposures to OU3 soils in Grid 74 is 1E-04 for the RME scenario. This cancer risk is based on total risk from $TEQ_{D/F}$, arsenic, and chromium. However, the individual contaminant predicted cancer risks are all below 1E-04. Cancer risks predicted for campers from exposures to OU3 soils in all other grids are below 1E-04. Acceptable risks are predicted based on exposures by campers to surface waters and sediments in on-site creeks or in the CFR.

Unacceptable non-cancer hazards and cancer risks are predicted for both recreational and tribal fishers (HI > 1E+00, cancer risk ≥ 1E-04). These are attributed to consumption of fish collected from the CFR; acceptable non-cancer hazards and cancer risks are predicted for both recreational and tribal fishers based on exposures to floodplain soils and CFR surface water and sediment. Evaluation of exposures to dioxins/furans and PCBs in rainbow trout and northern pike revealed that levels of TEQ and total PCBs within the tissues of game fish in the CFR from within the OU3 study area may contribute to risks above a level of concern for fishers who consume these fish as a significant portion of their diet. Comparison of the risk estimates for TEQ suggest that coplanar PCBs are contributing most of the risk to TEQ. Cancer risks based on total PCBs are also ≥1E-04 for a RME tribal fisher consuming northern pike as fillets or whole body. Predicted non-cancer hazards and cancer risks to local fishers are likely lower than those estimated in this assessment based on potential cooking losses of dioxins/furans and PCBs. Evaluation of general cooking loss for dioxins and PCBs demonstrated that the predicted non-cancer hazards and cancer risks are reduced by comparison to the risk estimates based on no assumed cooking loss. However, unacceptable risks are still predicted based on the consumption of fish collected from the CFR even when accounting for cooking loss.

ES-6 UNCERTAINTY ASSESSMENT

Quantitative evaluation of the risks to humans from environmental contamination is frequently limited by uncertainty regarding a number of key data items, including concentration levels in the environment, the true level of human contact with contaminated media, and the true dose-response curves for non-cancer and cancer effects in humans. This uncertainty is usually addressed by making assumptions or estimates for uncertain parameters based on whatever limited data are available. Because of these assumptions and estimates, the results of risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment. However, the assumptions applied in this assessment are intended to be health-protective to account for this uncertainty. The cumulative effect of these assumptions can result in an evaluation with an overall conservativeness greater than the individual components. Thus, it is important to note that the risks presented in this assessment are more likely to be overestimated rather than underestimated.

A significant source of uncertainty for this risk assessment is the form of chromium present in Site media. Chromium was only evaluated as total chromium in Site samples. There is no information available to understand the ratio of Cr(VI) to trivalent chromium (Cr(III)) in Site media. In the absence of data based on oxidation state, the health protective approach used in this evaluation estimated risks based on the more toxic form, Cr(VI). Because there is no indication that historical Mill operations used or generated Cr(VI), evaluating chromium risks as being attributed to 100% exposure to Cr(VI) suggests that the estimated risks are overestimated.

Unacceptable risks associated with the recreational scenarios evaluated in this assessment are predicted for fishers consuming fish collected from the CFR within the OU3 study area. Risk estimates derived for the purposes of this assessment were based on conservative exposure assumptions including assuming that 100% of a fisher's diet was comprised of locally caught fish. This type of assumption likely overestimates actual risks associated with fish consumption, but nonetheless it is considered health protective consistent with USEPA Superfund guidance.

1.0 INTRODUCTION

1.1 Purpose

This document is a human health risk assessment (HHRA) for the Smurfit-Stone/Frenchtown Mill Operable Unit 3 (OU3) Site located in Montana. The purpose of this document is to evaluate potential risks to humans, both now and in the future, from Site-related chemicals that are present at the OU3 Site, assuming that no steps are taken to remediate the environment or to reduce human contact with contaminated environmental media.

The results of this assessment are intended to help inform risk managers and the public about current and potential future health risks to humans that may occur as a result of exposure to Site-related contaminants, and to help determine if there is a need for action to protect public health at the OU3 Site. Although the Site is not listed on the National Priorities List (NPL), a Remedial Investigation (RI) is being conducted by the Potentially Responsible Parties (PRPs)[1] in accordance with the Administrative Order on Consent (AOC) entered into with the United States Environmental Protection Agency (USEPA) in November 2015 (USEPA 2015a). The RI serves as the mechanism for collecting data to characterize Site conditions for the purposes of developing and evaluating remedial alternatives. The RI characterizes the nature and extent of contamination at a Site and estimates risks to human health and the environment posed by contaminants at the Site. The latter objective is achieved by conducting a baseline risk assessment during the RI process to characterize risks posed to human health or the environment by current environmental conditions at the Site. To meet this requirement and consistent with the Site-specific AOC, the USEPA has developed this HHRA to quantitatively describe the potential human health risks at the OU3 Site in the absence of remediation. The risk information generated by this evaluation based on USEPA's current understanding of the Site will be used in the Remedial Investigation/Feasibility Study (RI/FS) at the Site. This baseline risk assessment represents only one part of the human health evaluation being conducted under the RI/FS.

The methods used to evaluate risks in this assessment are consistent with current guidelines for human health risk assessment provided by the USEPA for use at Superfund sites (USEPA 1989; 1991a; 1991b; 1991c; 1992; 2002a,b; 2004; 2009; 2014a, 2014b). The evaluation presented herein is based on the current understanding of the Site given the information and data available at the time of development. This HHRA represents a dynamic document that may need to be revised and/or updated to address new information.

[1] International Paper Company, WestRock CP, LLC, and M2Green LLC as defined in the Administrative Order on Consent (AOC).

1.2 Organization

In addition to this introduction, this report is organized into the following sections:

Section 2 This section provides a description of the Site and a review of Site investigations that have been conducted to collect and characterize the environmental contamination at the Site.

Section 3 This section identifies human exposure scenarios of potential concern at the OU3 Site and describes the approach for identifying chemicals of potential concern (COPCs) for each exposure medium.

Section 4 This section includes the toxicity assessment and identifies potential non-cancer and cancer effects and toxicity values for the COPCs identified at the OU3 Site.

Section 5 This section summarizes estimated exposure and risk to humans from COPCs at the OU3 Site.

Section 6 This section summarizes the uncertainty analysis.

Section 7 This section summarizes the main conclusions based on the risk characterization.

Section 8 This section provides full citations for USEPA guidance documents, Site-related documents, and scientific publications referenced in this report.

All tables, figures, and appendices cited in the text are provided at the end of the report.

2.0 SITE CHARACTERIZATION

A detailed description of the Smurfit-Stone/Frenchtown Mill Site and its history is provided in the Remedial Investigation Work Plan (RIWP) report for the Site (NewFields 2015). Site information is also provided on USEPA's Superfund Page for the Site[2]. Pertinent information derived from these sources is summarized in brief in the following subsections.

2.1 Site Overview

The Smurfit-Stone/Frenchtown Mill Site is in Missoula County, Montana and is located 11 miles northwest of Missoula, Montana (Figure 2-1). The entire Site consists of three operable units and encompasses approximately 3,150 acres. The Site is located in the Clark Fork River (CFR) drainage. The CFR flows westward through the valley and north along the Site's western property boundary. The small tributaries O'Keefe Creek and Lavalle Creek flow through the southern end of the Site and drain into the CFR. A pulp mill operated at the Site from 1957 to 2010. Most areas of the Site have been idle since industrial activities at the Mill ceased in 2010. A detailed description of the Site and historical operation of the pulp mill is provided in the RIWP (NewFields 2015) and briefly summarized below.

The core industrial footprint of the Mill Site covers about 260 acres and includes the former mill, recycling plant, wood chipping area, and hog fuel area as well as various equipment storage areas. Over 900 acres of the Site consist of a series of unlined ponds used to store treated and untreated wastewater effluent from the Mill, as well as primary sludge recovered from untreated wastewater. Some ponds initially used to store wastewater were drained and used for the landfilling of solid wastes generated from the Mill. Most of the pulp was used to produce un-bleached linerboard, but about 6 percent of the total pulp produced from 1960-1999 was used to create white linerboard or sold as bleached pulp. The on-site production of chlorine, for the pulp bleaching process results in the formation of chlorinated dibenzo-*p*-dioxins (CDDs) and dibenzo-*p*-furans (CDFs) (USEPA 1990). During the production of pulp and paper, high usage of water and energy resulted in large amounts of wastewater, solid waste (e.g., treatment sludges, boiler ash, wood processing residuals, lime kiln grits, inert materials, and general refuse) and air emissions. The paper making process at the Site was designed to recover and recycle chemicals utilized in the washing and digesting processes. Stack emissions from recovery boilers, power boilers, and lime kilns were controlled and monitored, and releases to the atmosphere were subject to permit standards. The Mill included a wastewater treatment system that included a primary clarifier and settling ponds (primary treatment), sludge dewatering plant, aeration basins

[2] Smurfit-Stone Mill Frenchtown, Missoula, MT webpage: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0802850

(secondary treatment), polishing ponds, a color removal plant (tertiary treatment), and a series of unlined holding ponds used to store treated effluent prior to discharge. When holding ponds were at capacity, treated wastewater was moved to infiltration basins and infiltrated to groundwater. Treated wastewaters discharged to the CFR was subject to Montana Pollution Discharge Elimination System (MPDES) permit standards (i.e., flow and ambient river temperature criteria). There are two main levees and several berms that were constructed using on-Site materials[3]. The CFR levee located west of the treated water holding ponds provides flood protection, and the inner levee provides a physical barrier between wastewater solids and treated water holding ponds.

The USEPA conducted an initial site investigation (SI) in 2011 to support evaluation of the Site for possible inclusion in the NPL (USEPA 2012a). This investigation was focused on the former wastewater treatment and storage area, O'Keefe Creek, and the CFR. The Smurfit-Stone/Frenchtown Mill Site was proposed to be added to the NPL on December 12, 2013. As noted above, the Site has not been added to the NPL. For assessment and management purposes, the USEPA, the Montana Department of Environmental Quality (MDEQ), and the PRPs agreed to divide the Site into three operable units (OUs) based on historic use and the nature of the potential environmental concerns, as follows (Figure 2-2):

> **OU1** encompasses about 1,200 acres of the Site. This area has been and continues to be used largely for agricultural purposes, including grasslands for cattle grazing and cropland irrigated for alfafa and grain crops.
>
> **OU2** encompasses approximately 255 acres of the Site and includes the former industrial area. This area includes the former buildings and process areas for the Mill.
>
> **OU3** encompasses approximately 1,700 acres of the Site and includes areas of the Site where solid and aqueous wastes were treated and stored. This area includes the former wastewater treatment system (settling ponds, aeration basins, polishing ponds, solid waste basins, holding ponds, spoils basins, and infiltration basins), the holding ponds areas within the 100-year floodplain, and parts of the CFR where hazardous substances from site activities may have come to be located.

Human health risks within OU1 were previously evaluated in 2017 (USEPA 2017). Human health risks within OU2 are being evaluated in a separate report. This assessment focuses on OU3 (i.e., the study area). OU3 includes the land outside of the 100-year floodplain where the

[3] This HHRA does not evaluate effects from hypothetical future flooding events. Berm stability has been evaluated in multiple investigations (NewFields 2018a, 2018b, 2019).

former wastewater treatment system was contained. This area will be referred to herein as the "upland" area. OU3 also includes the land within the 100-year floodplain up to and including the CFR. As defined in NewFields (2015), OU3 includes locations in the CFR where hazardous substances from Site activities have come to be located, if any. The full nature and extent to which hazardous substances from Site activities have come to be located in the CFR adjacent to and downstream of the Site has not been fully established and is outside of the scope of this risk assessment, but will be considered within the RI. For the purposes of this assessment, sampling conducted to date within the CFR adjacent to the Site and downstream of the Site is considered to represent potential areas where Site-related contamination may have deposited, and is hereafter defined as within the "study area" evaluated within this HHRA (Figure 2-3).

Within the AOC, OU3 is defined to include site-wide groundwater (USEPA 2015a). Groundwater beneath the Site is present in three primary hydrostatigraphic units (NewFields 2020):

- Unit 1 – water table aquifer below the Site, generally present to a depth of approximately 35 feet below ground surface (ft bgs). Most onsite monitoring wells are completed within Unit 1.
- Unit 2 – semi-confining layer generally present from 35 to 130 ft bgs. No monitoring or water supply wells have been completed in Unit 2, as this unit transmits relatively minor quantities of water compared to Units 1 and 3.
- Unit 3 – regional water supply aquifer generally present from 130 to 160 ft bgs. Several monitoring wells and all the industrial and domestic water supply wells on the Site are completed in Unit 3.

Since the USEPA is evaluating human health risks separately for each individual OU, each HHRA includes evaluation of groundwater collected from wells within the boundary for the OU being assessed. For the purposes of this assessment, groundwater data collected from wells within the OU3 land boundary were evaluated in this report. Groundwater data collected from wells within the land boundaries of the other OUs were evaluated in the respective HHRA reports.

2.2 Former Wastewater Treatment and Storage

Figure 2-4 (adapted from NewFields 2015) presents a schematic of the general wastewater treatment flow process that was followed during the last 13 years of operation (1997-2010). The wastewater treatment system was designed to allow for flexibility to route treated water to multiple areas when needed. As shown in Figure 2-4, the Mill maintained four permitted outfalls to the CFR. Treated wastewater discharged to the CFR through outfalls 1 through 3 was subject to permit conditions including ambient river temperature and flow. Outfall 4 was used for

discharging non-contact cooling water. The outlet at the North Polishing Pond (NPP) was the point of compliance for the wastewater treatment system.

2.3 Solid Waste Basins

The Mill utilized spoils basins (SBs) and solid waste basins (SWBs) in OU3 (Figure 2-4), as follows:

- SB19 & SB20 received dredged pond material (spoils) removed from the aeration basins and settling ponds (P5 and P8).
- SWBA received general refuse (paper, plastic, metal, wood, glass, and food).
- SWB6 received hog fuel ash and lime kiln grits.
- SWBCa and SWBCb received hog fuel, lime grits, and ragger wire.
- SWBF received asbestos containing materials.
- SWBG received Class III inert materials (wood, gravel, log yard wastes, bricks).

All solid waste basins listed above were closed and capped in 1993 except for SWBG which has an open and active permit to receive Class III inert materials. After 1993, all Class II solid wastes generated by the Mill were transported offsite for disposal.

2.4 Land Use

The OU3 Site is mostly open space consisting of upland and floodplain meadows, ponds, and wetlands. O'Keefe Creek enters the boundary of the Smurfit-Stone/Frenchtown Mill Site along the southern edge of OU2 as shown in Figure 2-2. O'Keefe Creek runs through portions of OU3 to the confluence with Lavalle Creek prior to discharging to the CFR. Lavalle Creek runs up through OU1 land on the southern end of the Site prior to the confluence with O'Keefe Creek. The CFR is used recreationally in the summer months (mainly between Memorial Day to Labor Day) for a variety of activities, including camping, hiking, and fishing. The CFR is a culturally significant fishery of the Confederated Salish and Kootenai Tribes (CSKT) of the Flathead Nation.

There are no current residential or commercial properties within OU3. Building within the floodplain is not preferred, but with proper design and conditions, residential development is allowable within the 100-year floodplain (Missoula County 2017). The PRPs have indicated that there is a restrictive covenant currently placed on the property that restricts future development to industrial/commercial activities. The agencies have not approved the use of such a restrictive covenant as an element of the final remedial action, nor does the restrictive covenant limit the agencies' analysis of risk or reasonably anticipated future use. Previous discussions have indicated the potential to develop areas within the 100-year floodplain of the CFR into natural

riparian woodlands or wet meadows with recreational features including trails, river access, golf course, and/or parks (NewFields 2015).

2.5 Basis for Potential Human Health Concern

Mill operations (predominantly the pulping and bleaching processes) used or produced various hazardous chemicals on site, including volatile and semi-volatile organic compounds (VOCs and SVOCs), and bleaching chemicals. The use of chlorine for the bleaching of pulp produces chlorinated organic compounds, including dioxins and furans. Treatment and storage of solid and aqueous wastes within OU3 may have resulted in contamination of surface soils and subsequent contamination of subsurface soils and groundwater, as well as possible contamination of sediments and surface water within the CFR and its tributaries that flow through the Site via fate and transport mechanisms discussed in further detail below. Previous site investigations have identified COPCs at the Site to include dioxins/furans[4], heavy metals, polychlorinated biphenyls (PCBs)[5], SVOCs, and VOCs. Exposures to these types of COPCs may cause a range of non-cancer and cancer effects in humans. Humans who reside in, work at, and/or visit the OU3 Site now or in the future could be at risk of adverse health effects if excessive exposure to contaminated environmental media were to occur.

2.6 Summary of Site Investigations

Numerous environmental studies and compliance monitoring events have been conducted at the Site in support of ongoing RI activities. In 2011, the USEPA conducted a site investigation (SI) to support evaluation of the Site for proposed NPL listing (USEPA 2012a)[6]. Following the 2011 SI, the PRPs for the Site commissioned the collection of environmental samples in April 2014 from areas that were not investigated by the USEPA in 2011. These data were evaluated within the RIWP (NewFields 2015) which also outlined sampling planned in 2015. Follow-up sampling was conducted in a series of sampling events in accordance with the USEPA approved RIWP and associated Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). Between 2014 and 2020, the following environmental investigations were conducted[7]:

[4] See USEPA Factsheet on dioxins/furans at the Site (USEPA 2021a).
[5] See USEPA Factsheet on PCBs at the Site (USEPA 2021b).
[6] As noted in Appendix A, data collected in 2011 were not considered in the HHRA due to deviations from the Quality Assurance Project Plan that occurred during sampling and analysis of those samples. Instead, USEPA used those data to inform the RI sampling.
[7] RIWP reports are available on the Smurfit-Stone Mill Frenchtown, Missoula, MT webpage: https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.docdata&id=0802850

Sampling Date	Sample Type[8]	Reference
April 2014	Soil and groundwater sampling	RIWP (NewFields 2015)
November/December 2015	Soil, groundwater, sediment and surface water sampling	RIWP (NewFields 2015, 2016a)
May/June 2016	Groundwater sampling	RIWP Addendum 1 (NewFields 2016b)
August 2016	Soil sampling for PCBs at the HDPT foundation and TSB foundation areas	RIWP Addendum 2 (NewFields 2016c)
January and March 2017	Groundwater sampling	RIWP Addendum 3 (NewFields 2017a)
June, July, December 2017 and January 2018	Groundwater sampling	RIWP Addendum 4 (NewFields 2017b)
October 2017	Soil sampling	RIWP Addendum 7 (NewFields 2017c)
July 2018	Fish sampling	USEPA (2018a)
August 2018	Sediment, surface water, and biotic tissue sampling	RIWP Addendum 9 (NewFields 2018b)
June 2019	Fish sampling	USEPA (2019)
June 2019 and September/October 2019	Groundwater sampling	RIWP Addendum 8 (NewFields 2018a)
June and September 2020	Groundwater sampling	RIWP Addendum 10 (NewFields 2020)

[8] Soil samples collected from the Site represent bulk soils.

3.0 EXPOSURE ASSESSMENT

Exposure is the process by which humans come in to contact with chemicals in the environment. In general, humans can be exposed to chemicals in a variety of environmental media (e.g., soil, sediment, water, air, food), and these exposures can occur through several routes (e.g., ingestion, dermal contact, inhalation).

3.1 Site Conceptual Model

Figure 3-1 presents a Conceptual Site Model (CSM) for OU3 that summarizes USEPA's current understanding of how chemicals that have been released to the environment within OU3 might result in exposure of human receptors. This CSM is based on the most current understanding of expected land use now and in the future. The main features of this CSM are discussed below.

3.1.1 Primary Sources of Contamination

As noted above and as described in further detail in the RIWP, historic Mill operations included the creation of pulp, wood chipping, recycling of old corrugated container (OCC), burning of solid fuels in boilers, and paper making (NewFields 2015). Pulp and paper manufacturing involve a series of steps, each producing one or more characteristic wastes. NewFields (2020) provides a detailed description of the pulp making process at the Mill and the associated waste streams generated during operation. In brief, the chemical pulping process used at the Mill (the "Kraft process") used a sodium-based alkaline solution (white liquor), consisting of sodium hydroxide and sodium sulfide, to digest wood chips and produce pulp. Smaller amounts of sulfuric acid and aluminum sulfate were also used during the process. No metals besides aluminum were used in the paper making process, although pulp is made from raw materials (i.e., wood), and the concentrations of metals in the trees used to produce the pulp is unknown.

After producing the raw pulp, it was processed to remove impurities by chemically treating the pulp mixture to recover residual white liquor for reuse and remove heavy metals. Waste products such as excess sodium hydroxide and sodium sulfite were also removed. As noted above, a chlorine bleaching process was used to create white linerboard for about 6% of the pulp produced between 1960 and 1999 (NewFields 2020). The combination of chlorine and carbon can result in the formation of dioxins and furans under particular temperature and pressure conditions.

The historical use of OU3 for treatment and storage of wastewater and solid wastes represents the primary source of contamination of OU3 soils. Historical Mill operations consisting of boiler emissions may have also resulted in direct deposition of contaminants in OU3 surface soils.

Emissions from the recovery boilers, multi-fuel and power boilers, the lime kilns, and ambient air systems were controlled and monitored consistent with the Mill's Title V air quality operating permit issued by MDEQ (NewFields 2020; Permit OP 2589). The Title V permit covered the sources of air emissions at the historic Mill including the: Pulp, Chip Dock and Recycled Fiber Department, the Power, Recovery, and Recausticizing Department, the Paper Mill Department, the Environmental and Technical Department, and the Engineering and Maintenance Department.

As described in further detail in NewFields (2020), the Mill also operated under a MPDES permit that applied to the discharging of treated effluent to the CFR via permitted outfalls and infiltration to underlying groundwater. MPDES permits included limits based on biological oxygen demand (BOD), total suspended solids (TSS), total dissolved solids (TDS), and nutrient reduction (nitrogen and phosphorus). Limits on toxic pollutants were based on Section 307(a) of the Montana Water Quality Act pursuant to established water quality standards. During mill operations, wastewater in the ponds infiltrated into Unit 1. The accumulation of wastewater in the ponds resulted in seasonal groundwater mounding in Unit 1 that was most pronounced in the winter and early spring. Groundwater mounding in Unit 1 likely contributed to downward vertical hydraulic gradients from Unit 1 to Unit 3.

PCBs are not generally produced in the practice of wastewater chlorination in the paper industry (USEPA 1977). Generally speaking, potential sources of PCBs in the pulp and paper industry may include the use of printing inks containing PCBs, the recycling of carbonless copy paper (if manufactured from 1957 to 1971), use of PCB transformers and capacitors, and possible use of PCB-filled hydraulic or heat transfer systems, PCB-containing lubricants, paints, etc. (USEPA 1977). Specific to the Site, there is no available information to suggest significant use of process chemicals or inks containing PCBs. Site investigations have determined that PCBs were present in localized areas of OU2 associated with transformer storage (Transformer Storage Building [TSB]) and in the vicinity of the former High-Density Pulp Tank (HDPT). A removal action was taken in these areas in 2016 (NewFields 2018c).

3.1.2 Transport in the Environment

Solid wastes generated during mill operations or recovered from the aqueous waste stream were either burned for energy recovery (e.g. primary wastewater treatment plant solids) or were stored in solid waste disposal areas. Treated wastewater was stored in ponds designed to allow infiltration into soil and groundwater. Water that did not infiltrate was ultimately discharged into the CFR. Additionally, contaminants generated and/or released from historical Mill operations may migrate in the environment by several processes:

- Fine-grained soil particulates from contaminated soil and/or solid waste disposal areas may be released into air as a consequence either of wind erosion and/or human disturbances. The waste materials in the settling ponds were saturated due to precipitation and historic inundation which limited dust generation. Additionally, transport of contaminants emitted to the air from boiler emissions can result in direct deposition of chemicals in OU3 surface soils[9].

- Runoff (from rain or snowmelt) from surface soils and/or solid waste disposal areas may result in contamination of both surface water and sediments in the CFR and its tributaries (O'Keefe and Lavalle Creeks).

- Contaminants in soil may be dissolved by water (rain or snowmelt) and infiltrate into subsurface soils and downward into groundwater.

3.1.3 Populations of Primary Concern

Humans who are most likely to be exposed to Site-related contamination include the following:

Hypothetical Future Residents. There are no current residences at the OU3 Site. To be conservative and consistent with USEPA Superfund guidance, hypothetical future residential land use within OU3 is evaluated. The residential population is defined as individuals (children aged 0 to 6 years and adults) that inhabit residences within OU3.

Hypothetical Future Commercial/Industrial Workers. There are no current commercial/industrial buildings within OU3. Anticipated future land use within the OU3 upland area includes commercial/industrial activities. Consistent with the evaluation of potential hypothetical future residential land use within OU3, hypothetical future commercial/industrial land use within OU3 is also evaluated. The commercial/industrial worker population is defined as full-time employees (adults) working on-Site.

Hypothetical Future Construction Workers. In support of hypothetical future residential and/or commercial/industrial development within OU3, associated construction activities may occur. The construction worker population is defined as an adult who may be exposed during construction activities including soil excavation.

[9] USEPA published a Smurfit Stone Mill Site Air Deposition Fact Sheet (USEPA 2021c) that describes how USEPA has investigated impacts of aerial deposition and addresses potential environmental concerns. https://semspub.epa.gov/work/08/100010222.pdf

Recreational Visitors. As noted above, the OU3 Site is mostly open space consisting of upland and floodplain meadows, ponds, and wetlands. Aside from the access road in OU3, there are no well-defined hiking trails. However, the CFR is popular for recreation and a variety of different types of recreational visitors may encounter Site-related contamination while recreating in the study area. For this evaluation, it is assumed that hiking or camping may occur anywhere in OU3. It is also assumed that the CFR is used for wading, floating, boating and fishing. The lack of fish and stagnate nature of the on-Site ponds, and the presence of only smaller fish that are not typically targeted for human consumption within the smaller on-Site creeks (O'Keefe and Lavalle Creeks) limits similar activities in these water bodies. For the purposes of this assessment, three scenarios have been selected to serve as representative activities for a recreational visitor at the Site:

- Hiker: The hiker is selected to represent a typical soil exposure at the Site. The hiker population is assumed to include older children/adolescents (aged 6 to 16 years) or adults who pass across the Site while hiking in the area.

- Camper: The camper is selected to represent a receptor who may come into contact with multiple contaminated media (soil, surface water, sediment) while camping within the Site boundary. This population is assumed to include young children (0-6 years), older children/adolescents (aged 6 to 16 years), and adults.

- Recreational Fisher: The recreational fisher population represents children (0-6 years), older children (aged 6 to 16 years), and adults who may collect and consume fish from the CFR included within the OU3 study area.

Tribal Fishers. Pursuant to the Hellgate Treaty of 1855, the CSKT are a natural resources trustee of the CFR fishery and reserved themselves the right to fish within the CFR. Thus, the OU3 CSM includes tribal fishers as an additional population of concern. The tribal fisher population is defined as children (0-6 years), older children (aged 6 to 16 years), and adults that fish within the CFR.

USEPA recognizes that there may be other receptors who are exposed at the Site now or in the future that are not specifically captured within the populations described above. However, it is assumed that evaluation of the receptor populations described above is protective of other potential receptors who may be intermittently exposed to contaminated media at the OU3 site. For instance, it is assumed that exposures to hypothetical future commercial/industrial workers and construction workers will be higher than exposures to people working on maintenance of the levees and berms or trespassers.

3.2 Exposure Pathways of Chief Concern

Not all of the potential exposure pathways to these populations of receptors are likely to be of equal concern. First, in order to be of concern, an exposure pathway must be "complete". That is, there must be contact between a human receptor and a contaminated environmental medium. Exposure pathways that are not complete are indicated in Figure 3-1 by open boxes. For pathways that are complete, the relative importance of one to another is related to the amount of chemical taken into the body by each pathway. Exposure scenarios that are likely to result in the highest level of exposure are shown in Figure 3-1 by boxes containing a solid circle (●). Greatest attention is focused on quantification of exposure from these pathways in order to determine if the pathway contributes significant risk. Pathways that are complete, but which are judged to contribute only minor exposures in comparison to other pathways, are shown by boxes with an open circle (❍). Because of their minor contribution, these pathways are not evaluated quantitatively. Boxes with an "X" indicate exposure pathways that are likely to be complete, but for which data are insufficient to derive meaningful risk estimates.

The following sections present a more detailed description of these pathways and an analysis of their relative importance for human exposure.

3.2.1 Exposures to Soil

Exposures to Surface Soil

Incidental Ingestion of Soil

Even though few people intentionally ingest soil, anyone who has direct contact with contaminated surface soil may incidentally ingest small amounts that adhere to their hands during outdoor activities. Incidental ingestion of soil is often one of the most important routes of human exposure, so ingestion of surface soil is evaluated for all receptors. For this evaluation, surface soil is defined as the six-inch depth below ground surface (0-6" bgs).

Due to the nature of the work, construction workers may be exposed via direct contact to soils down to a depth of 10 feet. Construction workers who have direct contact with contaminated soils may get soils on their skin and incidentally ingest small amounts that adhere to their hands during construction activities. On this basis, incidental ingestion of surface and subsurface soils is considered a complete exposure pathway for hypothetical future construction workers.

Dermal Contact with Surface Soil

Humans who come into contact with contaminated soils may get some of the material on their skin. As such, dermal exposure to surface soil is considered a complete exposure pathway and is evaluated quantitatively for all receptors. For hypothetical future construction workers, it is assumed that dermal exposure to surface and subsurface soil is a complete exposure pathway and is evaluated quantitatively.

Inhalation of Airborne Soil Particulates

Whenever contaminated soils are exposed at the surface, fine-grained particles may become suspended in air by wind and/or human activity, and humans in the area could inhale those particles. In cases where the soil is disturbed only by wind or light human activity (e.g., walking/hiking), the amount of particulate material inhaled from air is generally quite small compared to the amount that is typically assumed for incidental ingestion. Therefore, inhalation of soil particulates generated by wind erosion or walking was considered a minor pathway for hypothetical future residents, commercial/industrial workers, and recreational visitors. Appendix B presents screening level calculations to support this designation.

When soil is disturbed by mechanical forces such as construction equipment, dust levels in air may be significant and intake of soil from inhalation of airborne dusts may become similar to or even higher than the ingestion pathway. Thus, inhalation of soil particulates generated through the use of construction equipment was evaluated quantitatively for hypothetical future construction workers.

Inhalation of Vapors Emitted from Surface Soils

Whenever contaminated soils are exposed at the surface, volatile chemicals may volatilize into the air and humans in the area could inhale those vapors. Soils in OU3 have not been analyzed for VOCs because no VOCs were detected in OU2 soils (where they were considered most likely to occur) (NewFields, 2016c). Volatilization of dioxins/furans in OU3 soils is generally not expected to be significant given the relatively low volatility of these chemicals and the absence of a continuous source. Also, the amount of vapor inhaled from air is generally quite small compared to the amount that is typically assumed for incidental ingestion. Therefore, inhalation of vapors emitted from surface soils was considered a minor pathway for all potential human receptors. Appendix B presents screening level calculations to support this designation.

3.2.2 Exposures to Groundwater

Groundwater is not currently used as a drinking water source in OU3. Therefore, current exposures to groundwater are not evaluated quantitatively. However, it is possible that groundwater within OU3 could be used within hypothetical future residences and/or commercial/industrial buildings. There are three primary pathways by which a hypothetical future resident or commercial worker may be exposed to groundwater as described below.

Ingestion of Drinking Water

Hypothetical future residents or commercial workers may ingest Site groundwater as drinking water.

Dermal Contact with Groundwater

If Site groundwater was used in residential homes in the future, dermal exposure by residents would primarily be the result of showering/bathing. If Site groundwater was used in commercial/industrial buildings in the future, dermal exposure by workers would primarily be the result of hand washing. Several VOCs were detected in groundwater from wells within the OU3 upland area. However, VOCs tend to volatilize from the skin (USEPA 2004). Metals and dioxins/furans have been detected in OU3 groundwater samples. USEPA guidance recommends against quantifying exposure and risk based on dermal contact with 2,3,7,8-TCDD in water because the molecular weight (MW) and octanol/water partition coefficient (Kow) are outside of the effective predictive domain (EPD) (USEPA 2004). Uptake of metals across the skin from contact with water is usually a minor exposure pathway due to the relatively low tendency of metals to cross the skin even when contact does occur. Furthermore, risk associated with dermal contact to metals in water is expected to be relatively small compared to the amount that is typically assumed for ingestion of drinking water. On this basis, dermal exposure to groundwater by hypothetical future residents and workers is considered a minor pathway in the CSM. Appendix B presents screening level calculations to support this designation. Thus, dermal exposure to contaminants in groundwater by hypothetical future residents and workers was considered a minor pathway and was not evaluated quantitatively in this assessment.

Inhalation of Vapors Released from Water

Volatile chemicals in water can be released to indoor air by two pathways: 1) vaporization to indoor air through standard indoor water uses, and 2) vapor intrusion in which vapors rise from the groundwater through the soil underlying a building foundation and get into the building through cracks in the foundation. Although these pathways may be complete at future residences

and/or commercial/industrial buildings within the OU3 Site, the chemicals detected at a high frequency in OU3 groundwater (dioxins/furans, metals) are not considered to be of sufficient volatility to expect significant exposures via these pathways. Therefore, these pathways were not evaluated quantitatively in this assessment.

3.2.3 Exposures to Sediment

Incidental Ingestion of Sediment

Tribal receptors and people recreating along/within the CFR included in the OU3 study area are unlikely to intentionally ingest sediment, but as described above for surface soil, anyone who has direct contact with contaminated sediments may incidentally ingest small amounts that adhere to their hands during recreational and tribal activities. Thus, incidental ingestion of CFR sediment is considered a complete exposure pathway for campers, recreational fishers, and tribal fishers.

Dermal Contact with Sediment

Campers, recreational fishers, and tribal fishers who come into contact with contaminated sediments may get some of the material on their skin during recreational activities. As such, dermal exposure to sediments is considered a complete exposure pathway for all recreational visitors and tribal fishers in the CFR.

3.2.4 Exposures to Surface Water

Ingestion of Surface Water as Drinking Water

Although it is assumed that people recreating in the OU3 study area generally bring potable drinking water and/or some form of a water filtration system, this assessment also considers exposure to people who may ingest drinking water drawn from the CFR or on-Site creeks without the benefit of filtration. Of the various types of receptors, it is assumed that campers would be most likely to do this. Thus, ingestion of surface water as drinking water was considered a complete exposure pathway for campers.

Incidental Ingestion of Surface Water

Campers, recreational fishers and tribal fishers may not intentionally ingest surface water, but may incidentally ingest small amounts while recreating. It is assumed that the camper represents the recreational visitor most likely to swim within the CFR. Therefore, it is assumed that a fisher (general and tribal) may incidentally ingest surface water while fishing and a camper may incidentally ingest surface water while swimming in the CFR.

Dermal Contact with Surface Water

Humans visiting the CFR for recreational or tribal purposes may have occasional dermal contact with surface water while fishing. Dermal contact with surface water is also a complete pathway for people swimming in the CFR. As noted above, it is assumed that the camper represents the recreational visitor most likely to swim within the CFR. Therefore, it is assumed that a fisher (general and tribal) may have occasional dermal contact with surface water while fishing and a camper will be exposed dermally while swimming in the CFR.

3.2.5 Exposures to Food Items

Ingestion of Homegrown Produce Items

Hypothetical future residential use within OU3 may include residential gardens used to grow vegetables or fruit in Site-impacted soils. Area residents who ingest home-grown produce may be exposed to certain contaminants that may be taken up by the vegetables or fruit. No data are available on the levels of contaminants that may be present in vegetation within OU3. Thus, this pathway cannot be evaluated quantitatively in this risk assessment without modeling uptake from soils into plants. Dioxins/furans and metals have been detected in OU3 soils. USEPA (1999) notes that most plants do not generally absorb dioxin. ATSDR (1998) notes that plants take up only very small amounts of CDDs by their roots and that most of the CDDs found on the parts of plants above the ground probably come from air and dust. Uptake of metals in plants varies for each metal and by metal form, and is strongly influenced by soil pH (USEPA 2013a). However, in general, the highest accumulation of metals in plants generally occurs in the roots whereby exposures to humans from most fruits and vegetables (except roots or green, leafy vegetables) are low (USEPA 2013a). In addition, exposure to dioxins and metals from ingestion of washed garden fruits or vegetables is likely to be a minor source of exposure compared with direct ingestion of soil. On this basis, ingestion of home grown produce by a hypothetical future resident was not evaluated quantitatively in this risk assessment. A qualitative evaluation of excluding this pathway from the risk characterization is discussed in the uncertainty assessment.

Ingestion of Fish from CFR

Fish that live in the CFR may take up contaminants from surface water, sediment, or food, leading to exposure of humans who eat locally-caught fish. The State of Montana currently has a consumption advisory in place to avoid eating all species collected from the CFR reach between from the Bitterroot River to the Flathead River (State of Montana 2021). Although this advisory is likely to limit the potential exposure by fishers to contaminants in the tissues of fish caught from locations in the CFR included in the study area, an advisory is not a regulation. As such, consumption of locally-caught fish is assumed to occur and this pathway is retained for quantitative evaluation in this assessment for both a recreational fisher and a tribal fisher. It is

assumed that both the recreational fisher and the tribal fisher primarily consume the fillets of fish collected from the CFR. However, information provided by the CSKT indicate that other parts of the fish (i.e., heads) are also used by tribal members in making soups. On this basis, ingestion of fish fillets is evaluated for both a recreational fisher and a tribal fisher, and ingestion of a whole fish is also evaluated for a tribal fisher.

3.2.6 Summary of Exposure Pathways for Quantitative Assessment

The receptor populations and exposure pathways evaluated quantitatively in this HHRA are summarized in the table below.

Receptor	Exposure Pathway
Hypothetical Future Resident	Incidental ingestion of and dermal contact to surface soil Ingestion of groundwater as drinking water
Hypothetical Future Commercial/Industrial Worker	Incidental ingestion of and dermal contact to surface soil Ingestion of groundwater as drinking water
Hypothetical Future Construction Worker	Incidental ingestion of and dermal contact to surface and subsurface soil Inhalation of soil particulates
Recreational Visitors	
Hiker	Incidental ingestion of and dermal contact to surface soil
Camper	Incidental ingestion of and dermal contact to surface soil Ingestion of surface water (as drinking water) Incidental ingestion of and dermal contact to surface water and sediment while swimming
Recreational Fisher	Incidental ingestion of and dermal contact to surface soil Incidental ingestion of and dermal contact to surface water and sediment while fishing Ingestion of fish
Tribal Fisher	Incidental ingestion of and dermal contact to surface soil Incidental ingestion of and dermal contact to surface water and sediment while fishing Ingestion of fish

3.3 Data Used in this Assessment

As noted in Section 2.6, a number of Site investigations have been conducted between 2014 and 2020 that have generated soil, groundwater, sediment, surface water and fish tissue data pertinent to evaluating human health risks within the OU3 Study Area. Not all available data are relevant for quantifying risks to potential human receptors; only those data relevant to evaluating the significant and complete exposure pathways identified in the CSM (Figure 3-1) were considered. All of the data used in this assessment have been validated, were collected in accordance with the Site-specific QAPP, and are considered appropriate for use in risk assessment. The data collected that are relevant to evaluating human health risks at the OU3 Site are summarized in Table 3-1 and include the following:

- Upland and floodplain surface soil (0-6 inches) collected in 2014, 2015, and 2017 from locations shown in Figures 3-4 and 3-5. Surface soil summary statistics are presented in Tables 3-2 and 3-3.
- Upland subsurface soil collected in 2014, 2015 and 2017 from locations shown in Figure 3-6. Only those samples collected down to 10 feet (the depth to which a construction worker may be exposed) were considered in this assessment. Subsurface soil summary statistics are presented in Table 3-4.
- Groundwater data collected between 2014 and 2020 from wells shown in Figure 3-2 (denoted by hydrostratigraphic unit). Groundwater summary statistics are presented in Table 3-5.
- Sediment and surface water data collected in 2015 and 2018 from the CFR at sampling locations adjacent to and downstream of the Site as shown in Figures 3-7 and 3-8. CFR bed sediment, flood fringe sediment, and surface water summary statistics are presented in Tables 3-6, 3-7, and 3-8 respectively.
- Sediment and surface water data collected in 2015 and 2018 from locations within O'Keefe and Lavalle Creeks within the current Site boundary as shown in Figures 3-7 and 3-9. O'Keefe sediment and surface water summary statistics are presented in Tables 3-9 and 3-10, respectively. Lavalle sediment and surface water summary statistics are presented in Tables 3-11 and 3-12, respectively.
- Rainbow trout and northern pike fillet and carcass tissues of fish caught in 2019 from reaches within the CFR adjacent to and downstream of the Site as shown in Figure 3-10 (Frenchtown [FRN] and St. Regis [STR] reaches). Summary statistics are presented in Table 3-13.

Consistent with the RI Work Plan Addendum 7, a randomized sampling grid design was used to collect 20-point composite surface soil samples in 2017 (NewFields 2017c). Older surface soil

data correspond to 5-point grab samples collected under a biased sampling strategy that targeted areas of most concern (NewFields 2015, 2016b). Subsurface soil samples were collected as vertical composites from varying depths down to 18 feet. Only those samples collected down to 10 feet (the depth to which a construction worker may be exposed) were considered in this assessment. Soil samples are based on the bulk fraction. As noted in Appendix A, data for rainbow trout and northern pike collected from the CFR in 2019 were used in this assessment to quantify human health risks associated with fish consumption. Rainbow trout and northern pike collected in 2018 are also considered in the uncertainty assessment (Section 6) consistent with USEPA (2020). More information on the sampling strategies that lead to the generation of the data used int this risk assessment is available in the individual RI Work Plan Addenda which are available on the Site webpage. Appendix A summarizes the data reduction procedures applied for the purposes of this specific assessment. All data used in this report are provided in Excel format in Appendix A for transparency and completeness. Other specific data considerations are outlined in brief below.

3.3.1 Calculation of Toxicity Equivalents

Because polychlorinated dibenzo-*p*-dioxin (PCDD) and furan (PCDF) congeners, and dioxin-like coplanar PCB congeners all act by the same mechanism as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), concentrations for the PCDD, PCDF, and coplanar PCB congeners were converted to a TCDD toxicity equivalent value (TEQ) by computing the sum across congeners of the product of congener-specific concentration and relative Toxicity Equivalence Factor (TEF) (USEPA 2013b):

$$TEQ = \Sigma (C_i \times TEF_i)$$

TEFs were based on USEPA (2010a) as shown in the following table.

Compound	TEF
Polychlorinated dibenzo-p-dioxins (PCDDs)	
2,3,7,8-TCDD	1
1,2,3,7,8-PeCDD	1
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
OCDD	0.0003

Compound	TEF
Polychlorinated dibenzofurans (PCDFs)	
2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDF	0.03
2,3,4,7,8-PeCDF	0.3
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
OCDF	0.0003
Polychlorinated biphenyls (PCBs)	
3,3',4,4'-TCB (77)	0.0001
3,4,4',5-TCB (81)	0.0003
3,3',4,4',5-PeCB (126)	0.1
3,3',4,4',5,5'-HxCB (169)	0.03
2,3,3',4,4'-PeCB (105)	0.00003
2,3,4,4',5-PeCB (114)	0.00003
2,3',4,4',5-PeCB (118)	0.00003
2',3,4,4',5-PeCB (123)	0.00003
2,3,3',4,4', 5 -HXCB (156)	0.00003
2,3,3',4,4',5'-HxCB (157)	0.00003
2,3',4,4',5,5'-HxCB (167)	0.00003
2,3,3',4,4',5,5'-HpCB (189)	0.00003

For this assessment, TEQ values in soil, groundwater, sediment and surface water were calculated based on data for the individual dioxin and furan congeners as described above ($TEQ_{D/F}$). The USEPA Scribe database for the Smurfit-Stone/Frenchtown Mill Site includes three alternative TEQ values that were computed based on evaluating non-detect (ND) concentrations as zero, at one-half the method detection limit (MDL) and at one-half the sample-specific detection limit (DL). Risk calculations included in this risk assessment were based on evaluating NDs at ½ DL. Evaluation of NDs at ½ DL when calculating TEQ is consistent with evaluations conducted at other USEPA sites in the region.

3.3.2 Polychlorinated Biphenyls

There are 209 distinct PCB congeners. PCBs generally occur as a mixture of congeners; the most common commercial mixtures are Aroclors. Abiotic samples collected within OU3 were analyzed for PCBs as Aroclor mixtures. This approach is useful because human health toxicity associated with exposures to most Aroclor mixtures has been evaluated, whereby toxicity values have been derived. The northern pike and rainbow trout fish tissue samples were analyzed for PCBs as the individual PCB congeners. This was done to provide information to risk managers that would be consistent with data used to generate the current fish advisory.

For fish tissues, total PCB concentrations were calculated as the sum across all PCB congeners for each sample. Similar to estimating TEQ concentrations, total PCB concentrations were calculated based on evaluating NDs at ½ DL (i.e., sample-specific detection limit), consistent with evaluations conducted at other USEPA sites in the region. Further, TEQ concentrations in fish tissues were calculated as $TEQ_{D/F}$ as well as toxicity equivalents for coplanar PCB congeners (TEQ_{PCB}) and as toxicity equivalents for dioxin, furan and coplanar PCB congeners ($TEQ_{D/F/PCB}$).

3.3.3 Fish Tissue Concentrations

Fish collected from the CFR were filleted in accordance with USEPA (2019) and fillet (skin and belly flap attached) and carcass (remainder) samples were submitted to the laboratory for analysis. For each tissue type, samples were composited (5 fish/composite where possible) and analyzed for dioxin, furan, and PCB congeners as summarized in USEPA (2020). The analysis focused on dioxins, furans, and PCBs based on a previous evaluation of risks from fish consumption (USEPA 2018b) and the current Montana Fish, Wildlife, and Parks (MFWP) fish advisory for the CFR (State of Montana 2021).

In addition to fillet concentrations, whole-body concentrations (C_{wb}) were estimated from the fillet and carcass samples as (Bevelhimer et al. 1997):

$$C_{wb} = \frac{\left(C_f \times W_f + C_c \times W_c\right)}{\left(W_f + W_c\right)}$$

where,

C_f	=	fillet concentration (µg/g)
W_f	=	fillet weight (g)
C_c	=	carcass concentration (µg/g)

W_c = carcass weight (g)

Wet-weight (e.g., as consumed) fish tissue concentrations were used in this assessment.

3.3.4 Inorganics in Groundwater

Groundwater samples were analyzed for both total recoverable and dissolved concentrations of inorganics. In general, filtered water data may underestimate actual exposure to humans if contaminants of concern are primarily associated with particulate matter and the pH of the human gastrointestinal environment is sufficiently low such that metals may dissociate from the bound particulate matter matrix. For risk assessment purposes, USEPA Region 8 evaluates exposures to groundwater assuming that the water is consumed without filtration. Thus, total recoverable metal concentrations were used to quantify risks in this assessment.

3.4 Selection of Chemicals of Potential Concern

COPCs are contaminants which exist in the environment at concentration levels that might be of potential health concern to humans and which are or might be derived, at least in part, from Site-related sources.

3.4.1 COPC Selection Process

The procedure used to identify COPCs for the evaluation of risks to human receptors from contaminated environmental media (soil and groundwater) is shown in Figure 3-3. It is important to note that this COPC selection procedure is intended to be conservative. That is, it is expected that some contaminants may be identified as COPCs that are actually of little or no concern to human health based on current USEPA guidelines, but that no contaminants of authentic concern will be overlooked.

In brief, the COPC selection procedure classifies each contaminant into one of three categories:

- COPC
- Not a COPC
- Source of Uncertainty

The process begins by determining if the contaminant has a risk-based screening level (SL) that can be used to evaluate potential risk. A risk-based SL is a concentration of a contaminant in a medium below which is believed to pose negligible health risk to a specified population of human receptors. For carcinogens, this is a concentration that corresponds to an added cancer

risk of 1E-06. For non-carcinogens, this is a concentration that corresponds to a Hazard Quotient (HQ) of 0.1.

If a risk-based SL is available, the next step is to evaluate the detection frequency. If a contaminant was detected in 5% or more of the Site samples, the maximum detected concentration for each contaminant in each medium is compared to the risk-based SL. If the maximum detected concentration exceeds the risk-based SL, the contaminant is identified as a COPC. If the maximum detected concentration does not exceed the risk-based SL, it may be concluded that the contaminant does not pose a significant risk to humans and may be excluded as a COPC.

If the contaminant was detected in fewer than 5% of the Site samples, or if the contaminant was not detected, then the detection limit is evaluated. If the detection limit is lower than the risk-based SL, then it is very unlikely that the contaminant will pose a significant risk to human health and may be excluded as a COPC. However, if the detection limit is above the risk-based SL, this is identified as a source of uncertainty because the detection limit was inadequate for detecting concentrations at the risk-based SL.

If a contaminant does not have a risk-based SL, this is identified as a source of uncertainty unless the contaminant is a beneficial nutrient and the expected average intake from Site media is similar to the range that is considered healthful.

In summary, a contaminant is identified as a COPC if the maximum detected concentration in the medium being evaluated (e.g., groundwater, soil, fish) exceeds an available risk-based SL.

To provide consistency in results reported across different areas of the OU3 site (i.e., upland and floodplain), all OU3 soil data evaluated for human health risks in this assessment were screened collectively. Thus, the maximum detected concentration across all OU3 soil samples was compared to the available RSL for each contaminant. Similarly, all OU3 groundwater data evaluated for human health risks in this assessment were screened collectively.

3.4.2 Source of Risk-Based Screening Level Values

Risk-based SLs used in this assessment were selected based on the human receptor identified in the CSM (Figure 3-1) who is expected to receive the highest exposure for each environmental medium. Risk-based SLs used in this assessment were derived from USEPA's Regional Screening Level (RSL) Tables (USEPA, 2021d)[10]. Soil and groundwater data were screened

[10] https://www.epa.gov/risk/regional-screening-levels-rsls (Tables last updated May 2021)

using the residential RSLs. USEPA's RSL Tables include generic SLs for a resident exposed to soil or drinking water calculated assuming default exposure parameters that represent Reasonable Maximum Exposure (RME) conditions for chronic exposures via the oral, dermal and inhalation pathways. Sediment, surface water and fish RSLs were calculated using the USEPA RSL Calculator assuming the exposure parameters for the recreational visitor exposure scenario expected to receive the highest exposure. For surface water, RSLs were calculated based on the camper scenario. For sediment, RSLs were calculated based on the tribal fisher scenario. Fish RSLs were also calculated based on exposure parameters assumed for the tribal fisher. Tables 3-14 and 3-15 present the exposure parameters assumed for each of these receptors. The SLs calculated based on these assumed exposures are shown in the COPC screening tables discussed below.

3.4.3 Evaluation of Beneficial Minerals

A number of metals are beneficial minerals, and a certain level of intake is required to maintain good health. This includes calcium, chromium (III), copper, iron, magnesium, manganese, molybdenum, potassium, selenium, sodium, and zinc. However, excess intake of these minerals may cause adverse effects. If a SL was available for such minerals in USEPA's RSL Tables, they were evaluated as described above. Because of their low toxicity (even at high doses), USEPA has not derived RSL values for some minerals, including calcium, magnesium, potassium, and sodium. These four essential nutrients were evaluated by calculating an effective SL as follows:

Effective SL (beneficial) = DRI / DI

Where:

DRI = Daily Recommended Intake (mg/day), derived from the Food and Nutrition Board (FNB 2013)

DI = Daily intake of Site medium (kg/day of soil; L/day of water)

3.4.4 COPC Screening Results

Tables 3-16 to 3-22 present the application of the COPC selection process to the OU3 soils, groundwater, sediment, surface water and fish data. The results are briefly summarized below.

Risk-based Screen

Maximum detected concentrations were higher than respective risk-based SLs (for contaminants detected in ≥5% of samples) in OU3 media for the following:

- $TEQ_{D/F}$, aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, iron, manganese, mercury, thallium, and vanadium in OU3 soils (Table 3-16).

- $TEQ_{D/F}$, Aroclor-1260, aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, manganese, nickel, thallium, vanadium, 1,4-dichlorobenzene, benzene, and chlorobenzene in groundwater (Table 3-17).

Arsenic and chromium in CFR and creek sediments (Tables 3-18 and 3-19).

- Arsenic and chromium in CFR and creek surface waters (Tables 3-20 and 3-21).

- $TEQ_{D/F}$, TEQ_{PCB}, $TEQ_{D/F/PCB}$, and total PCBs in fish (Table 3-22).

3.5 Quantification of Exposure

3.5.1 Basic Equations

Ingestion Exposures

The amount of contaminant which is ingested by receptors exposed to Site media may be quantified using the following general equation:

$$DI = C \cdot (IR / BW) \cdot (EF \cdot ED / AT) \cdot RBA$$

where:

DI = Daily intake of contaminant (mg per kg of body weight per day).

C = Concentration of the contaminant in the contaminated environmental medium (soil, groundwater, surface water, sediment, fish tissue) to which the person is exposed. The units are mg/kg for soil/sediment, µg/L for water, and mg/kg-ww for fish.

IR = Intake rate of the contaminated environmental medium. The units are kg/day for soil/sediment and fish, and L/day for water.

BW = Body weight of the exposed person (kg).

EF = Exposure frequency (days/year). This describes how often a person is likely to be exposed to the contaminated medium over the course of a typical year.

ED = Exposure duration (years). This describes how long a person is likely to be exposed to the contaminated medium during their lifetime.

AT = Averaging time (days). This term specifies the length of time over which the average dose is calculated. For a chemical which causes non-cancer effects, the averaging time is equal to the exposure duration. For a chemical that causes cancer effects, the averaging time is 70 years.

RBA = Relative bioavailability.

Note that the factors EF, ED, and AT combine to yield a factor between zero and one. Values near 1.0 indicate that exposure is nearly continuous over the specified averaging period, while values near zero indicate that exposure occurs only rarely.

For mathematical convenience, the general equation for calculating dose can be written as:

$$DI = C \cdot HIF_{ing} \cdot RBA$$

where:

HIF_{ing} = Human Intake Factor. This term describes the average amount of an environmental medium contacted by the exposed person each day. The value of HIF is typically given by:

$$HIF_{ing} = (IR / BW) \cdot (EF \cdot ED / AT)$$

The units of HIF_{ing} are kg/kg-day for soil and L/kg-day for water.

When the same individual may be exposed beginning as a child and extending into adulthood, exposure was calculated as the time-weighted average (TWA) lifetime exposure for evaluating cancer risks as recommended in USEPA Guidance (USEPA 1989).

Dermal Exposures

The amount of a contaminant which is absorbed across the skin is referred to as the dermally absorbed dose (DAD). Procedures for estimation of the DAD as outlined in USEPA (2004) are used in this assessment and described below. Exposure is quantified using an equation of the following general form:

$$DAD = DA_{event} \cdot EF \cdot ED \cdot EV \cdot SA / (BW \cdot AT)$$

where:

DAD = Dermal absorbed dose (mg of contaminant per kg of body weight per day).

DA_{event} = Absorbed dose per event (mg of chemical per square centimeter of skin surface area per event). This is media-specific and is further described below.

EF = Exposure frequency (days/year). This describes how often a person is likely to be exposed to the contaminated medium over the course of a typical year.

ED = Exposure duration (years). This describes how long a person is likely to be exposed to the contaminated medium during their lifetime.

EV = Event frequency (events/day). This describes the number of times per day a person comes in contact with a contaminant in soil.

SA = Surface area (cm^2). This describes the amount of skin exposed to the contaminated media.

BW = Body weight of the exposed person (kg).

AT = Averaging time (days). This term specifies the length of time over which the average dose is calculated.

For contaminants in soil, DA_{event} is estimated as follows:

$$DA_{event} = C_{soil} \cdot CF_{soil} \cdot DAF \cdot ABS_d$$

where:

C_{soil} = Chemical contaminant in soil (mg of contaminant per kg of soil).

CF_{soil} = Conversion factor for soil (10^{-6} kg/mg).

DAF = Dermal adherence factor (mg of soil per square centimeter of skin surface area per event). This describes the amount of soil that adheres to the skin per unit of surface area.

ABS_d = Dermal absorption fraction (unitless). This value is contaminant-specific and represents the contribution of absorption of a chemical across a person's skin from soil to the systemic dose.

For mathematical convenience, the general equation for calculating DAD for soil exposures can be written as:

$$DAD = C_{soil} \cdot ABS_d \cdot HIF_{derm}$$

where:

$$HIF_{derm} = (SA \cdot DAF \cdot EF \cdot ED \cdot EV \cdot CF_{soil}) / (BW \cdot AT)$$

The units of HIF_{derm} are kg/kg-day for soil.

Inhalation Exposures

Inhalation exposures are evaluated in accordance with the inhalation dosimetry methodology presented in USEPA (2009). In accordance with this guidance, the human intake equation does not include an inhalation rate (m^3/day) or body weight because the amount of the chemical that reaches the target site is not a simple function of these factors. Instead, the interaction of the inhaled contaminant with the respiratory tract is affected by factors such as species-specific relationships of exposure concentrations to deposited/delivered doses and physiochemical characteristics of the inhaled contaminant (USEPA 2009). Therefore, the inhaled exposure concentration (EC) for chronic exposures is calculated as:

$$EC = C_{air} \cdot (ET \cdot EF \cdot ED / AT)$$

where:

EC = Exposure Concentration ($\mu g/m^3$). This is the time-weighted concentration based on the characteristics of the exposure scenario being evaluated.

C_{air} = Concentration of the chemical in air ($\mu g/m^3$) to which the person is exposed.

ET = Exposure time (hours/day). This describes how long a person is likely to be exposed to the contaminated medium over the course of a day.

EF = Exposure frequency (days/year). This describes how often a person is likely to be exposed to the contaminated medium over the course of a year.

ED = Exposure duration (years). This describes how long a person is likely to be exposed to the contaminated medium during their lifetime.

AT = Averaging time (hours). This term specifies the length of time over which the time-weighted average concentration is calculated.

For mathematical convenience, the general equation for exposure concentration can be written as:

$$EC = C_{air} \cdot TWF$$

where:

TWF = Time-Weighting Factor (unitless). The value of TWF is given by:

$$TWF = (ET \cdot EF \cdot ED / AT)$$

As described above, when the same individual may be exposed beginning as a child and extending into adulthood, exposure was calculated as the TWA lifetime exposure for evaluating cancer risks.

3.5.2 Human Exposure Parameters

For every exposure pathway of potential concern, it is expected that there will be differences between different individuals in the level of exposure at a specific location due to differences in intake rates, body weights, exposure frequencies, and exposure durations. Thus, there is normally

a wide range of average daily intakes between different members of an exposed population. Because of this, all daily intake calculations must specify what part of the range of doses is being estimated. Typically, attention is focused on intakes that are "average" or are otherwise near the central portion of the range, and on intakes that are near the upper end of the range (e.g., the 95th percentile). These two exposure estimates are referred to as Central Tendency Exposure (CTE) and RME, respectively.

Because one or more exposure parameters (e.g., intake rates, body weight, and EF) may change as a function of age, exposure calculations are often performed separately for children and adults. For evaluation of non-cancer effects, the child (0-6 years) represents the most sensitive receptor based on a higher assumed exposure than adults. In this case, evaluation of risks for non-cancer effects for the child resident, child camper, child recreational fisher, and child tribal fisher is considered protective of risks for non-cancer effects for the adolescent or adult. As noted above, exposures for evaluating excess cancer risks over a lifetime are calculated as the TWA exposure.

Tables 3-23 to 3-29 list the CTE and RME exposure parameters and resultant HIF values used in this assessment for each receptor population. Some of the values are based on USEPA default guidelines, while other values were informed by Site information or professional judgment. The footnotes in the tables provide the basis and rationale for each selected parameter. Some key assumptions are summarized below.

- Exposures to recreational visitors are quantified for the peak summer months. This is because these are the times when soils are expected to be exposed and people are most likely to be recreating given the climate and weather in this region.

- Soil ingestion rates for recreational visitors are based on the default soil ingestion rates assumed for residents.

- Exposed skin surface areas for dermal exposures to surface waters and sediments within the CFR assume the full body for the camper to account for potential swimming exposures. For the general recreational fisher and the tribal fisher, it is assumed that people will remain on the banks while fishing and only enter the water for significant amounts of time if wearing protective clothing such as waders and waterproof shoes/boots.

- The fish ingestion rate for the general recreational fisher is based on data presented in USEPA (2011) for freshwater recreational fish intake by consuming anglers. Such data are only available for some states. Data for North Dakota were used as being closest and most representative of the Site.

- For the tribal fisher, fish consumption rates were selected in accordance with the approach described in Appendix E

3.5.3 Exposure Areas

An exposure point (also referred to as an exposure unit or exposure area) is an area where a receptor may be exposed to one or more environmental media. In general, receptors are assumed to move about at random within an exposure area. Because the key attribute of an exposure point is the assumption of random exposure, exposure areas represent the entire area that a selected receptor may be exposed to over their entire exposure duration. Realistically, it is possible that any particular receptor does not move entirely at random within an exposure area but instead frequents certain locations more often than others. However, Superfund risk assessments do not seek to estimate risk to any one particular current receptor, but to a hypothetical population who may be exposed in any part of the exposure area.

Soil

For the purposes of this assessment, the OU3 upland area and the OU3 floodplain area were evaluated separately given the differences in historical land use, and the potential for differences in hypothetical future land use. As noted above, building within the floodplain is not preferred. Thus, sampling in the floodplain was conducted to support potential recreational exposures as opposed to potential residential scenarios. In both the upland and floodplain areas, exposure units (EUs) were defined as a geographic area of an assumed size identified based on random grid assignment. In concept, this assumes that a receptor is expected to contact all locations within a grid equally over their exposure duration (26 or 70 years).

The OU3 upland area was subdivided into 20-acre grids as shown in Figure 3-4. Each 20-acre area is assumed to represent the maximum area within which a hypothetical future resident or worker may be exposed at random over their entire exposure duration. Thus, each 20-acre grid represents an individual EU.

The OU3 floodplain area was subdivided into 100-acre grids as shown in Figure 3-5. Each 100-acre area is assumed to represent the maximum area within which a recreational visitor may be exposed at random over their entire exposure duration. Thus, each 100-acre grid represents an individual EU.

Although building in the floodplain will likely only occur under a special circumstance, evaluation of the hypothetical future residential and commercial development was evaluated

because the possibility is not ruled out. For each receptor, the soil EU was identified as the soil sampling grids noted above.

Groundwater

When groundwater is used for drinking water, exposure evaluation is often performed on a well-by-well basis. This is because wells in different areas and screened at different depths may draw water with differing levels of contamination. Thus, each well within OU3 (see Figure 3-2) was evaluated as a separate EU.

Fish

As noted previously, the OU3 Site includes the CFR where hazardous substances from Site activities may have come to be located. As defined for this assessment, the OU3 study area within the CFR includes the area adjacent to and downstream of the Site to the St. Regis sampling location shown in Figure 3-10. This stretch includes two fish sampling reaches: FRN and STR. The entire stretch of the CFR within the study area was evaluated as a single EU for evaluating exposures from fish consumption.

3.5.4 Exposure Point Concentrations

Based on the assumption of random exposure over an exposure area, risk from a contaminant within an exposure area is related to the arithmetic mean concentration of that contaminant averaged over the entire exposure area. An exposure point concentration (EPC) is a COPC-specific and media-specific concentration value used in the dose equation for each receptor and exposure pathway. The EPCs used in this assessment reflect Site-specific conditions and data as described below.

Soil

Surface soil data have been collected at this Site over the course of four years during three separate sampling events (2014, 2015 and 2017). Surface soil sampling conducted in 2014 and 2015 involved the collection of 5-point composites collected over a 1-square meter area (2014 sampling event) or over an area of 1 to 3-meter radius (2015 sampling event) following a biased sampling approach (sampling locations selected based on Site knowledge to identify areas of most concern). During the most recent sampling event in 2017, one 20-point composite surface soil sample was collected from those EUs within OU3 where data were lacking (i.e., fewer than two 5-point composite samples). The 20-point composite sample was comprised of 20 grab samples collected across the entire EU. This sampling approach is recommended by the USEPA

because it is designed to provide a representative sample of the average concentration in the exposure unit (ITRC 2012). The surface soil data available for each exposure area grid (see Figures 3-4 and 3-5) falls into one of the following categories:

a) One 20-point composite sample only
b) One 20-point composite plus one or more 5-point composites
c) One or more 5-point composites

Tables 3-30 and 3-31 summarize the available soil data by grid for the upland and floodplain areas, respectively.

As described in USEPA (1992), the USEPA recommends that a 95% upper confidence limit (95UCL) of the arithmetic mean at each EU be used as the EPC when calculating exposure and risk at that location. This is because the true arithmetic mean concentration cannot be calculated with certainty from a limited number of measurements. However, OU3 soil data are available based on unequally weighted samples which limits characterization of the EPC using a 95UCL. The larger the number of grab samples used to create the composite sample, the lower the variability around the mean estimate. Additionally, the larger the area within the EU that a composite sample is based, the more representative of the mean exposure across the entire EU. Therefore, if available, a 20-point composite comprised of grabs collected across the whole of the EU provides a representative estimate of the mean. Whereas, a mean derived based on a localized 5-point composite is more uncertain, and the variability around the mean could be much greater. Thus, for this assessment, the available data for each EU will be used to represent the best estimate of the mean for each of the data categories listed above as follows:

Category a. For EUs where a single 20-point composite sample is available, this concentration was used as the EPC, since this is the only data point available.

Category b. For EUs in Category b, the EPC was based on weighting the data by the number of grab samples collected. For example, if for a given contaminant, the concentration in a 5-point composite sample collected from an EU was 5 mg/kg and the concentration in a 20-point composite sample was 3 mg/kg, the EPC would be calculated as:

(5 mg/kg * 5) + (3 mg/kg * 20) / (20 + 5) = 3.4 mg/kg

This approach effectively places more confidence in the value of the 20-point composite because this sample provides an unbiased estimate of the mean concentration over the entire exposure area, while the 5-point composite samples represent only a small area of the exposure unit and may tend to be biased high. Data in some EUs include a 20-point

composite and more than one 5-point composite. In this case, the concentrations of the 5-point composites were averaged prior to calculating the weighted EPC.

Category c. For EUs where two or more 5-point composite samples are available and there is no 20-point composite, the average concentration was used as the EPC. If the 5-point composites were unbiased, use of the maximum value would normally be preferred to help ensure that the EPC does not underestimate the true mean. However, since all of the 5-point composites are likely to be biased high, a simple average of the values is likely to be adequately conservative, and use of the maximum value would likely result in a substantial overestimate of the true mean.

Within the center of the OU3 upland area (i.e., grids 50-66), a 30-point composite sample was collected from within a historically defined basin/pond (e.g., aeration basin II, settling pond 8) where previously collected data were lacking. This sampling was primarily conducted to support the ecological risk assessment for the Site, but these data also fill data gaps for EUs with little to no other data. Concentrations based on 30-point composite samples were used in calculating EPCs similar to data based on 20-point composite samples.

Grab samples were also collected from boreholes at depth in the subsurface. For evaluating exposures to hypothetical future construction workers, data for both surface and subsurface soils were combined into a single dataset. The same approach outlined above was followed for calculating grid-specific EPCs, except a grid-specific weighted concentration accounted for an additional sample result based on the average across subsurface samples if available.

Soil EPCs are presented in Tables 3-32 and 3-33.

Airborne Dust from Construction Activities

No Site-specific data are available on particulate levels in air generated during mechanical disturbances with construction equipment. In the absence of measured values, the concentration of contaminants in air that would occur during hypothetical future construction activities was estimated using the following equation:

$$C_{air} = C_{soil} / PEF$$

where:

C_{air} = concentration of contaminant in air (mg/m^3)
C_{soil} = concentration of contaminant in soil (mg/kg)
PEF = particulate emission factor (m^3 of air per kg of soil) for a construction scenario

As noted in Section 3.2.1, inhalation of soil particulates is only quantified for the hypothetical future construction worker scenario in this assessment. The PEF assumed for evaluating exposures related to construction activities is assumed to be 4.4E+08 m^3/kg. This value is consistent with the recommendation in USEPA (2002a) that accounts for the mass of dust emitted by traffic on unpaved roads during construction activities and the mass of dust emitted by wind erosion. USEPA (2002a) notes that the most significant contribution to inhalation of fugitive dust exposure by construction workers comes from disturbance of surface soil by traffic on unpaved roads. Thus, evaluation of this pathway is based on surface soils only.

Because inhalation toxicity values are based on an assumed continuous exposure over a specified exposure duration, when exposure is less than continuous, the value of the EC used to quantify risk is calculated from C_{air} as follows:

$$EC \text{ (non-cancer effects)} = C_{air} \cdot ET/24 \cdot EF/365$$
$$EC \text{ (cancer effects)} = C_{air} \cdot ET/24 \cdot EF/365 \cdot ED/70$$

where:

ET = exposure time (hrs/day)
EF = exposure frequency (days/yr)
ED = exposure duration (years)

Groundwater

As noted above, wells in OU3 were evaluated as individual EUs. The mathematical approach that is most appropriate for computing the 95UCL of a data set depends on a number of factors, including the number of data points available, the shape of the distribution of the values, and the degree of censoring (USEPA 2002b). Because of the complexity of this process, the USEPA Technical Support Center has developed a software application called ProUCL v5.0 (USEPA 2013a) to assist in the estimation of 95UCL values. ProUCL calculates 95UCLs for a data set using several different strategies and recommends which 95UCL is considered preferable based on the properties of the data set. As discussed in USEPA (2015b), a 95UCL can be calculated for data sets containing at least four detected values. If this data requirement was not met, the EPC was set equal to the maximum detected value. Table 3-34 presents the samples evaluated for each well. Data from all years were considered in deriving well-specific EPCs to account for temporal variability. All measured values for each COPC were provided to ProUCL for evaluation. The EPC was based on the 95UCL recommended by ProUCL. If the suggested 95UCL value from ProUCL exceeds the maximum detected concentration, the EPC was selected

consistent with SRC (2021). ProUCL output is included in Appendix C. Table 3-35 presents the groundwater EPCs.

Surface Water and Sediment

CFR surface water and sediment EPCs for arsenic and chromium were derived using ProUCL to generate 95UCLs. Surface water EPCs for arsenic and chromium in the on-site creeks were based on the maximum detected concentrations.

Fish

Exposures based on the consumption of fish were estimated separately for rainbow trout and northern pike, and separately for fillets and whole-body. For each of these categories, EPC values were based on a 95UCL generated using ProUCL. In cases where the recommended 95UCL exceeded the maximum detected concentration, the maximum value was used as the EPC. Table 3-36 presents the fish EPCs.

3.5.5 Relative Bioavailability of Dioxins and Metals in Soil

An accurate assessment of human exposure to ingested chemicals requires knowledge of the amount of chemical absorbed from the gastrointestinal tract into the body from Site media compared to the amount of absorption that occurred in the toxicity studies used to derive the toxicity factors. This ratio (amount absorbed from Site media compared to the amount absorbed in toxicity tests) is referred to as RBA.

The oral RBA value for dioxins in soil is assumed to be 100% in accordance with USEPA (USEPA 2010b). This is considered to be a conservative assumption, because reports summarized by USEPA (2010b) indicate that absorption of dioxins from soils through the gastrointestinal tract is usually less than 50%.

In general, metals in soils exist in the form of mineral particles that are not rapidly solubilized in gastrointestinal fluids when ingested, while toxicity studies often utilize readily soluble forms of the test contaminant. Thus, oral RBA values for metals in soils are often less than 1.0. For arsenic, sufficient data are available to establish that oral RBA values in soil are generally less than 60% (USEPA 2012b). Thus, for the purposes of this HHRA, a RBA of 60% was applied for arsenic in OU2 soils. RBA data are much more limited or absent for other metals (except lead which was not identified as a COPC in this assessment). RBA values for all other metal COPCs were conservatively assumed to be 100%.

4.0 TOXICITY ASSESSMENT

4.1 Toxicity Overview

The basic objective of a toxicity assessment is to identify what adverse health effects a chemical may cause, and how the appearance of these adverse effects depends on exposure level. In addition, the toxic effects of a chemical frequently depend on the route of exposure (oral, inhalation, dermal) and the duration of exposure (subchronic, chronic, or lifetime). Thus, a full description of the toxic effects of a chemical includes a listing of what adverse health effects the chemical may cause, and how the occurrence of these effects depends upon dose, route, and duration of exposure.

The toxicity assessment process is usually divided into two parts: the first characterizes and quantifies the non-cancer effects of the chemical, while the second addresses the cancer effects of the chemical. This two-part approach is employed because there are typically major differences in the time-course of action and the shape of the dose-response curve for cancer and non-cancer effects. The relationship between the dose of the chemical administered or received and the incidence of adverse health effects in the exposed population forms the basis for a quantitative dose-response relationship. Toxicity values (e.g, reference doses and slope factors) are derived based on such dose-response relationships.

4.1.1 Non-cancer Effects

Essentially all chemicals can cause adverse health effects if given at a high enough dose. However, when the dose is sufficiently low, typically adverse non-cancer effects are not observed. Thus, in characterizing the non-cancer effects of a chemical, the key parameter is the threshold dose at which an adverse effect first becomes evident. Doses below the threshold are considered to be safe, while doses above the threshold are likely to cause an effect.

The threshold dose is typically estimated from toxicological data (derived from studies of humans and/or animals) by finding the highest dose that does not produce an observable adverse effect, and the lowest dose which does produce an effect. These are referred to as the "No-observed-adverse-effect-level" (NOAEL) and the "Lowest-observed-adverse-effect-level" (LOAEL), respectively. The threshold is presumed to lie in the interval between the NOAEL and the LOAEL. However, in order to be conservative (health protective), non-cancer risk evaluations are not based directly on the threshold exposure level, but on a value referred to as the Reference Dose (RfD) for oral exposures or Reference Concentration (RfC) for inhalation exposures. The RfD and RfC are estimates (with uncertainty spanning perhaps an order of

magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

The RfD and RfC values are derived from a NOAEL (or a LOAEL if a reliable NOAEL is not available) by dividing by an "uncertainty factor". If the data are from studies in humans, and if the observations are considered to be very reliable, the uncertainty factor may be as small as 1.0. However, the uncertainty factor is normally at least 10, and can be much higher if the data are limited. The effect of dividing the NOAEL or the LOAEL by an uncertainty factor is to ensure that the RfD or RfC is not higher than the threshold level for adverse effects. Thus, there is always a "margin of safety" built into an RfD and RfC values, and doses equal to or less than the RfD or RfC are nearly certain to be without any risk of adverse effect. Doses higher than the RfD or RfC may carry some risk, but because of the margin of safety, a dose above the RfD or RfC does not mean that an effect will necessarily occur.

Chronic oral RfDs and chronic inhalation RfCs are specifically developed to be protective for long-term exposure to that particular contaminant. Chronic RfDs and RfCs are generally used to evaluate the potential noncarcinogenic effects associated with exposure periods greater than 7 years (approximately 10 percent of a human lifetime). Subchronic oral RfDs and inhalation RfCs are specifically developed to be protective for short-term exposure to that particular contaminant. As a guideline for Superfund risk assessments, subchronic RfDs and RfCs are generally used to evaluate potential noncarcinogenic effects of exposure periods between two weeks and seven years.

4.1.2 Cancer Effects

For cancer effects, the toxicity assessment process has two components. The first is a qualitative evaluation of the weight of evidence (WOE) that the chemical does or does not cause cancer in humans. Previously, this evaluation was performed by the USEPA using the system summarized below:

WOE	Meaning	Description
A	Known human carcinogen	Sufficient evidence of cancer in humans.
B1	Probable human carcinogen	Suggestive evidence of cancer incidence in humans.
B2	Probable human carcinogen	Sufficient evidence of cancer in animals, but lack of data or insufficient data in humans.
C	Possible human carcinogen	Suggestive evidence of carcinogenicity in animals.
D	Cannot be evaluated	No evidence or inadequate evidence of cancer in animals or humans.
E	Not carcinogenic to humans	Strong evidence that it does not cause cancer in humans.

More recently, USEPA has developed a revised classification system for characterizing the weight of evidence for carcinogens (USEPA 2005a). However, this system has not yet been implemented for a number of chemicals, so the older classification scheme is retained for use in this assessment.

For chemicals which are classified in Group A, B1, B2, or C, the second part of the toxicity assessment is to describe the carcinogenic potency of the chemical. This is done by quantifying how the number of cancers observed in exposed animals or humans increases as the dose increases. Typically, it is assumed that the dose response curve for cancer has no threshold, arising from the origin and increasing linearly until high doses are reached. Thus, the most convenient descriptor of cancer potency is the slope of the dose-response curve at low doses (where the slope is still linear). This is referred to as the Slope Factor (SF), which has dimensions of risk of cancer per unit dose.

Estimating the cancer SF is often complicated by the fact that observable increases in cancer incidence usually occur only at relatively high doses, frequently in the part of the dose-response curve that is no longer linear. Thus, it is necessary to use mathematical models to extrapolate from the observed high dose data to the desired (but un-measurable) slope at low dose. In order to account for the uncertainty in this extrapolation process, USEPA typically chooses to employ the 95 percent upper confidence limit of the slope as the SF. That is, there is a 95 percent probability that the true cancer potency is lower than the value chosen for the SF. This approach ensures that there is a margin of safety in cancer as well as non-cancer risk estimates.

For inhalation exposures, cancer risk is characterized by an inhalation Unit Risk (UR) value. This value represents the upper-bound excess lifetime cancer risk estimated to result from continuous lifetime exposure to a chemical at a concentration of 1 µg/m^3 in air.

4.2 Human Toxicity Values

In 2003, USEPA's Superfund program revised its hierarchy of human health toxicity values into the following three-tiered approach:

1. USEPA's Integrated Risk Information System (IRIS)[11].

2. The Provisional Peer Reviewed Toxicity Values (PPRTVs) derived by USEPA's Superfund Health Risk Technical Support Center (STSC)[12].

[11] https://www.epa.gov/iris
[12] https://hhpprtv.ornl.gov/

3. Other toxicity values including additional USEPA and non-USEPA sources of toxicity information. Priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed.

Table 4-1 presents the toxicity values used for evaluating human health risks associated with chronic exposures to COPCs at the OU3 Site. Because construction workers are assumed to be exposed for one year or less, the subchronic noncancer toxicity values presented in Table 4-2 were used to evaluate risks from soil exposures to hypothetical future construction workers at the OU3 Site. As seen in Table 4-2, chronic RfDs and RfCs were used if a subchronic value was not available. The basis of these toxicity values is discussed in further detail below.

Organics

Dioxin

Toxicity values developed for TCDD are used to evaluate the exposure to the mixture of dioxins, furans, and coplanar PCBs. In February 2012, USEPA released an IRIS RfD for TCDD of 7E-10 mg/kg-day (USEPA 2021e). This value is based on two epidemiological studies reporting reproductive effects in populations exposed to TCDD from an industrial accident. This RfD was derived based on an adjusted LOAEL of 20 pg/kg-day and an uncertainty factor of 30 (10 for extrapolation from a LOAEL to a NOAEL and 3 for human-to-human variability). The ATSDR minimal risk level (MRL) for intermediate duration oral exposure to TCDD of 2E-08 mg/kg-day was used as the subchronic RfD (ATSDR 1998).

There is no IRIS RfC, oral SF, or inhalation UR for TCDD. However, Tier 3 toxicity values are available from the California EPA (CalEPA). CalEPA recommends a chronic inhalation reference exposure level (REL) of 4.0E-08 mg/m^3 based on route-to-route extrapolation from a dietary study conducted in rats (OEHHA 2008). In addition to route extrapolation, an uncertainty factor of 100 (10 for interspecies extrapolation and 10 for intraspecies variability) was applied to the identified LOAEL of 0.01 µg/kg-day. The chronic RfC was used to evaluate non-cancer hazards for both chronic and subchronic exposures.

The oral SF and inhalation UR recommended by CalEPA for TCDD are 1.3E+05 $(mg/kg\text{-}day)^{-1}$ and 3.8E+01 $(\mu g/m^3)^{-1}$, respectively (OEHHA 2009). These values were derived based on an oncogenicity bioassay of TCDD in rats and mice conducted by the National Toxicology Program (NTP).

PCBs

There is no RfD or RfC available for evaluating non-cancer effects from exposures to Aroclor-1260.

The IRIS WOE characterizes PCBs as probable human carcinogens (based on sufficient evidence of carcinogenicity in animals) (USEPA 2021f). The cancer potency of PCB mixtures is assessed using the IRIS SF of 2 $(mg/kg\text{-}day)^{-1}$ for high risk PCBs. This value was used to calculate a high-risk inhalation UR of 5.7E-04 $(\mu g/m^3)^{-1}$by dividing by body weight over inhalation rate (70 kg / 20 m^3), and applying a conversion factor of 1,000 µg/mg.

1,4-Dichlorobenzene

There is no IRIS RfD for 1,4-dichlorobenzene. ATSDR has developed a toxicological profile for dichlorobenzenes (ATSDR 2006). This review derived a chronic oral MRL of 0.07 mg/kg-day for 1,4-dichlorobenzene based on liver and kidney effects in animals. This value was based on a point of departure derived by benchmark dose analysis using clinical chemistry parameters in dogs fed capsules of 1,4-dichlorobenzene daily for one year. The adjusted benchmark dose was divided by an uncertainty factor of 100 (10 for animal to human extrapolation and 10 for human variability) to derive the MRL.

There is an IRIS RfC of 8E-01 mg/m^3 for 1,4-dichlorobenzene (USEPA 2021g). This value is based on increased liver weights in male rats observed in a multigeneration reproductive inhalation study. An uncertainty factor of 100 (10 for human variability and 3 for interspecies differences) was applied to the NOAEL based human equivalent concentration.

There are no IRIS cancer toxicity values for 1,4-dichlorobenzene. However, an oral cancer SF of 5.4E-03 $(mg/kg\text{-}day)^{-1}$ and an inhalation UR of 1.1E-05 $(\mu g/m^3)^{-1}$ have been derived for 1,4-dichlorobenzene by CalEPA (OEHHA 2009). These values are derived from an NTP study in rats and mice that reported increased incidences of liver and kidney cancers, and leukemia following oral intubation for 103 weeks. The SF was calculated by extrapolating from a linearized multistage model, applying a scaling factor and then using a default animal to human body weight ratio. Route-to-route extrapolation was applied for calculated the UR value.

Benzene

There is an IRIS RfD for benzene of 4E-03 mg/kg-day. This value is based on immune system effects (decreased lymphocyte counts) in workers exposed to benzene by inhalation. The RfD was derived based on route-to-route extrapolation (USEPA 2021h). An uncertainty factor of 300

(3 for use of a minimal LOAEL, 10 for human variability, 3 for subchronic to chronic extrapolation, and 3 for database deficiencies) was applied to the benchmark modeled dose of 1.2 mg/kg-day. The IRIS RfC of 3E-02 mg/m^3 is based on the same occupational exposure study. The same uncertainty factor of 300 was applied to the benchmark modeled concentration of 8.2 mg/m^3.

The IRIS WOE characterizes benzene as a known human carcinogen (Category A). Human studies have demonstrated a causal association between exposure to benzene and acute nonlymphocytic leukemia (USEPA 2021h). Evidence also suggests a relationship between benzene exposure and other types of leukemia. Based on available studies on leukemia in workers exposed to benzene via inhalation, ranges were derived for both the oral cancer SF and the inhalation UR. The oral SF range of 1.5E-02 to 5.5E-02 $(mg/kg\text{-}day)^{-1}$ is based on route-to-route extrapolation from the inhalation UR range of 2.2E-06 to 7.8E-06 $(\mu g/m^3)^{-1}$. The USEPA RSLs are based on the SF of 5.5E-02 $(mg/kg\text{-}day)^{-1}$ and the UR of 7.8E-06 $(\mu g/m^3)^{-1}$. These are the cancer values that were used in this assessment.

Chlorobenzene

There is an IRIS RfD for chlorobenzene of 2E-02 mg/kg-day (USEPA 2021i). This value is based on a NOAEL of 27.25 mg/kg-day derived from a study of dogs given chlorobenzene orally by capsule for 13 weeks. Dogs experienced histopathological changes in their liver at the LOAEL of 54.5 mg/kg-day. The NOAEL was adjusted by an uncertainty factor of 1,000 (10 for interspecies extrapolation, 10 for human variability, and 10 for subchronic-to-chronic extrapolation).

There is no IRIS RfC for chlorobenzene. However, a PPRTV RfC (p-RfC) of 5E-02 mg/m^3 is available (USEPA 2006a). This value is based on kidney lesions among rats in a 2-generation study. The human equivalent concentration was adjusted by an uncertainty factor of 1000 (3 for interspecies extrapolation, 10 for human variability, 3 for database uncertainties, and 10 for subchronic-to-chronic extrapolation).

The IRIS WOE characterizes chlorobenzene as not classifiable as to human carcinogenicity due to inadequate data.

Inorganics

Inorganic COPCs were measured as total concentrations. However, within the environment, inorganic COPCs may exist in multiple forms or valence states. In general, inorganics exist primarily as salts within the environment. Therefore, toxicity values used in this assessment were

based on the salt forms when available. The basis of the toxicity values used in this assessment for inorganic COPCs is discussed in brief below.

Aluminum

IRIS does not report toxicity values for aluminum. However, a PPRTV RfD (p-RfD) of 1E+00 mg/kg-day and PPRTV RfC (p-RfC) of 5.0E-03 mg/m^3 have been derived based on evaluation of available toxicity data (USEPA 2006b). The p-RfD is based on a LOAEL of 100 mg/kg-day for minimal neurotoxicity in the offspring of mice adjusted by an uncertainty factor of 100 (3 for use of a minimal LOAEL, 10 for interspecies extrapolation, and 3 for human variability). The LOAEL was characterized as minimal because postweaning neurobehavioral test battery results indicated that performance deficits may be marginal. The same value of 1E+00 mg/kg-day is recommended for subchronic exposures based on the ATSDR intermediate duration oral MRL (ATSDR 2008). This MRL was derived based on a NOAEL of 26 mg/kg-day protective of neurological effects, neurodevelopmental effects, and delays in maturation. An uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability) was applied to this NOAEL.

The p-RfC is based on a LOAEL of 4.6E+00 mg/m^3 for psychomotor and cognitive impairment for an 8-hour occupational exposure (USEPA 2006b). This LOAEL was adjusted for continuous exposure to a value of 1.6E+00 mg/m^3 and an uncertainty factor of 300 (10 for human variability, 10 for use of a LOAEL, and 3 for an incomplete database) was applied.

USEPA (2006b) determined that there was inadequate information to assess the carcinogenic potential of aluminum.

Antimony

Antimony concentrations in soil were reported based on total antimony. The IRIS RfD of 4.0E-04 mg/kg-day is based on a chronic drinking water study in rats using potassium antimony tartrate (USEPA 2021j). This value is based on a LOAEL of 0.35 mg/kg-day for effects on longevity, blood glucose and cholesterol levels adjusted by an uncertainty factor of 1,000. This value was adopted as the subchronic p-RfD (USEPA 2008a). In October 2019, the ATSDR released an updated evaluation of antimony that derived a chronic inhalation MRL of 3E-04 mg/m^3 based on induction of lung inflammation in female rates exposed to antimony trioxide (ATSDR 2019). This value was based on a benchmark modeled concentration lower confidence limit of 8E-03 mg/m^3 adjusted by an uncertainty factor of 30. This value was added to the USEPA RSL table in May 2020.

Arsenic

Arsenic is a naturally occurring element that is found in combination with either inorganic or organics substances to form many different compounds (ATSDR 2007a). Inorganic arsenic compounds are found in soils, sediments, and groundwater. These compounds occur either naturally or as a result of industrial use of arsenic. Organic arsenic compounds are found mainly in fish and shellfish. IRIS toxicity values for arsenic are based on the carcinogenic inorganic form.

The IRIS RfD of 3.0E-04 mg/kg-day for inorganic arsenic was derived based increased incidences of hyperpigmentation and keratosis in a Taiwanese population exposed to arsenic in drinking water (USEPA 2021k). This RfD is based on a LOAEL of 1.4E-02 mg/kg-day adjusted by an uncertainty factor of 3 (accounts for both the lack of data to preclude reproductive toxicity as a critical effect and to account for uncertainty in whether the NOAEL of the critical study accounts for all sensitive individuals). A subchronic RfD for inorganic arsenic is not available.

No IRIS RfC is available for inorganic arsenic, but a Tier 3 RfC is available from CalEPA. The CalEPA inhalation REL for inorganic arsenic of 1.5E-05 mg/kg-day is based on extrapolation from a chronic drinking water study in children (OEHHA 2008). The estimated LOAEL of 2.3E-04 mg/m^3 for decreased intellectual function and adverse effects on neurobehavioral development was adjusted by an uncertainty factor of 30 (3 for use of an estimated LOAEL and 10 for human variability). Due to the possibility of repeated exposure and the relatively slow clearance of arsenic compounds, CalEPA considers the 8-hour REL to be equivalent to the chronic REL.

The IRIS WOE characterizes inorganic arsenic as a known human carcinogen for both the oral and inhalation routes based on sufficient evidence from human data (USEPA 2021k). Increased lung cancer mortality was observed in multiple human populations exposed primarily through inhalation. Also, increased incidence of skin cancer and increased mortality from multiple internal organ cancers (liver, kidney, lung, and bladder) were observed in populations consuming drinking water high in inorganic arsenic. The oral SF for inorganic arsenic is 1.5E+00 (mg/kg-day)$^{-1}$. The inhalation unit risk for inorganic arsenic is 4.3E-03 (µg/m^3)$^{-1}$.

Barium

The IRIS RfD for barium of 2.0E-01 mg/kg-day is based on nephropathy observed in mice during a two-year drinking water study (USEPA 2021m). Dose response data from the critical study were modeled, and the lower benchmark dose for male mice associated with a benchmark response predicted to affect 5% of the population was used for derived the RfD. An uncertainty

factor of 300 (10 for interspecies extrapolation, 10 for human variability, and 3 for database deficiencies) was applied. The same value of 2.0E-01 mg/kg-day is recommended for subchronic exposures based on the ATSDR intermediate duration oral MRL (ATSDR 2007b). This MRL was derived based on a NOAEL of 65 mg/kg-day protective of kidney effects. An uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability) was applied to this NOAEL.

No IRIS RfC is available for barium. The Health Effects Assessment Summary Table (HEAST) RfC of 5E-04 mg/m^3 is used to evaluated risks from inhalation exposures to barium (USEPA 2021n). This value is based on a NOAEL of 8.0E-01 mg/m^3 derived from a 4-month inhalation study in rats. An uncertainty factor of 1000 was applied (10 for interspecies extrapolation, 10 for human variability, and 10 for extrapolation from subchronic to chronic exposure). Based on the duration of the critical study, a subchronic RfC was also derived by applying an uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability).

There are no cancer toxicity values available for barium.

Cadmium

The IRIS assessment for cadmium reports two RfD values, one for exposures to cadmium in water, and one for exposures to cadmium in food based on significant proteinuria observed in humans exposed orally to cadmium. The food RfD of 0.001 mg Cd/kg/day is used to evaluate oral exposures to soil. The ATSDR MRL of 5E-04 mg/kg-day for intermediate duration oral exposure was used as the subchronic RfD (ATSDR 2012a). No IRIS RfC is available, but a tier 3 RfC is available from ATSDR. A value of 1E-05 mg/m^3 is recommended as a chronic duration MRL (ATSDR 2012a). This value is based on environmental exposure studies that evaluated the urinary cadmium and renal response relationship in European cohorts (ATSDR 2012a). An intermediate duration inhalation MRL was not derived. The IRIS WOE characterizes cadmium as a probably human carcinogen (B1) by the inhalation pathway. The IRIS inhalation UR is 1.8E-03 $\mu g/m^3$. This value is based on a cohort study that demonstrated increased lung cancer risk among cadmium smelter workers (USEPA 2021o).

Chromium

Chromium can exist in the environment in several different forms, the most common being trivalent chromium (Cr(III)) and hexavalent chromium (Cr(VI)). Cr(III) is an essential nutrient and occurs naturally. Cr(VI) rarely occurs naturally, but is usually produced from anthropogenic sources (ATSDR 2012b). Cr(VI) has a higher toxic potency than Cr(III). For the purposes of this assessment, because data on chromium speciation at the Site are not available, a conservative,

health-protective assumption that all of the chromium detected at the Site is in the hexavalent form was applied. Uncertainties associated with this assumption are described under the uncertainty assessment.

An IRIS RfD, RfC and inhalation UR are available for Cr(VI). The IRIS RfD for Cr(VI) is 3.0E-03 mg/kg-day (USEPA 2021p). This value is based on an adjusted NOAEL of 2.5 mg/kg-day derived from a one-year drinking water study in rats. An uncertainty factor of 300 was applied (10 for interspecies extrapolation, 10 for human variability, and 3 to compensate for the less-than-lifetime exposure in the critical study), along with a modifying factor of 3 to account for uncertainties related to reports of gastrointestinal effects following drinking water exposures in a residential population in China. A value of 5E-03 mg/kg-day is recommended for subchronic exposures based on the ATSDR intermediate duration oral MRL (ATSDR 2012b). This MRL was derived based on hematological effects in male rats and female mice after exposure to sodium dichromate dihydrate in drinking water for 22 days. An average benchmark modeled dose of 5.2E-01 mg/kg-day was adjusted by an uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability).

The IRIS RfC for Cr(VI) is 1.0E-04 mg/m^3 (USEPA 2021p). This value is based on the RfC derived for Cr(VI) particulates and was derived from a benchmark modeled concentration of 3.4E-02 mg/m^3 for increased lactate dehydrogenase in bronchioalveolar lavage fluid in rats exposed for up to 90 days. An uncertainty factor of 300 (3 for pharmcodynamic differences, 3 for less-than-lifetime exposure, and 10 for human variability). A value of 3.0E-04 mg/m^3 is recommended for subchronic exposures based on the ATSDR intermediate duration oral MRL (ATSDR 2012b). This MRL was derived based on the same study identified as the critical study for the derivation of the IRIS chronic RfC. The subchronic RfC was based on adjusting a benchmark dose concentration of 1E-02 mg/m^3 by an uncertainty factor of 30 (3 for interspecies extrapolation and 10 for human variability).

The IRIS WOE characterizes Cr(VI) as a known human carcinogen by the inhalation route of exposure. The IRIS assessment determined that the carcinogenic potential of Cr(VI) by the oral route could not be determined. No IRIS oral SF is available, but a Tier 3 oral SF is available from CalEPA. The CalEPA oral SF for Cr(VI) is 5.0E-01 $(mg/kg\text{-}day)^{-1}$ derived based on a dose-related increase of tumors of the small intestine in male mice (OEHHA 2011). The IRIS inhalation UR is 1.2E-02 $(\mu g/m^3)^{-1}$ (USEPA 2021h). However, consistent with the USEPA RSLs, an assumption that the ratio of Cr(VI) to Cr(III) is 1:6 is applied to result in an inhalation UR of 8.4E-02 $(\mu g/m^3)^{-1}$ (USEPA 2021a).

As noted in OEHHA (2011), the carcinogenic effects of Cr(VI) have been shown to be associated with a mutagenic mode of action. Consistent with USEPA (2005b), age-dependent

adjustment factors (ADAFs) were applied to the non-age dependent oral slope factor to account for differences in potency that may occur from exposure during early life (up to age 16). The ADAFs recommended in USEPA (2005b) were applied to the different age intervals as:

Age Interval (years)	ADAF
0 - < 2	10
2 - < 16	3
16 - 18	1

USEPA (2005b) further indicates that any grouping of ages in the exposure assessment will need to be integrated with the ADAF age groupings to derive age group-specific risk estimates. Tables 4-3 through 4-6 present the age group-specific exposure assumptions for the resident, camper, recreational fisher, and tribal fisher (i.e., young child receptors evaluated in this assessment), respectively.

Cobalt

IRIS does not report toxicity values for cobalt. However, chronic and subchronic p-RfD values of 3E-04 mg/kg-day and 3E-03 mg/kg-day, respectively, were derived using a LOAEL of 1 mg/kg-day for decreased iodine uptake in the thyroid and polycythemia in humans following a two-week exposure (USEPA 2008b). An uncertainty factor of 3,000 (10 for subchronic to chronic extrapolation, 10 for LOAEL to NOAEL extrapolation, 10 for human variability, and 3 for database deficiencies) was applied to the LOAEL for derivation of the chronic p-RfD. An uncertainty factor of 300 (10 for LOAEL to NOAEL extrapolation, 10 for human variability, and 3 for database deficiencies) was applied to the LOAEL for derivation of the subchronic p-RfD.

Chronic and subchronic p-RfC values of 6E-06 mg/m^3 and 2E-05 mg/m^3, respectively, were derived using an adjusted NOAEL of 1.9 µg/m^3 based on an occupational exposure study that reported respiratory effects in workers exposed to cobalt dust (USEPA 2008b). An uncertainty factor of 300 (3 for subchronic to chronic extrapolation, 10 for human variability, and 10 for database deficiencies) was applied to the NOAEL for derivation of the chronic p-RfC. An uncertainty factor of 100 (10 for human variability and 10 for database deficiencies) was applied to the NOAEL for derivation of the subchronic p-RfC.

The PPRTV WOE characterizes cobalt as likely to be carcinogenic to humans by the inhalation route (USEPA 2008b). This characterization is based on both limited evidence of carcinogenicity in humans (respiratory tumors following occupational exposures), and sufficient evidence of carcinogenicity in animals (alveolar/bronchiolar tumors in rats and mice, pheochromocytomas in

female rats, and hemangiosarcomas in male mice). No data were available to evaluate the carcinogenicity of cobalt by the oral route. The PPRTV inhalation UR is 9.0E-03 $(\mu g/m^3)^{-1}$.

Copper

IRIS does not report toxicity values for copper. USEPA's RSL tables include an RfD for copper of 4E-02 mg/kg-day attributed to the HEAST (USEPA 1987). This value is based on the HEAST maximum contaminant level goal (MCLG) of 1.3 mg/L. No other toxicity values are available for copper.

Iron

There is no IRIS RfD for iron. However, there is a PPRTV RfD for iron of 7.0E-01 mg/kg-day (USEPA 2006c). This value is based on adverse gastrointestinal effects in humans observed at a LOAEL of 60 mg/day following dietary exposures. The PPRTV RfD was based on an adjusted LOAEL calculated by adding the LOAEL for gastrointestinal effects to the estimated mean dietary intake of 11 mg/day and dividing by a reference body weight of 70 kg. This resulted in an adjusted LOAEL of 1 mg/kg-day which was used to derive the PPRTV RfD by applying an uncertainty factor of 1.5. This value is based on gastrointestinal toxicity, but is also protective against iron deficiency given that iron is an essential element for humans.

Manganese

Two oral RfD values are available for manganese, depending on exposure medium (food, nonfood). The IRIS RfD (1.4E-01 mg/kg-day) includes manganese from all sources, including diet (USEPA 2021q). This RfD is derived to be protective against central nervous system effects in humans following oral exposure, and is based on the upper range of total dietary intake (10 mg/day) as recommended in the 1989 Food and Nutrition Board National Research Council report. USEPA (2021q) notes that intakes above the RfD derived from the upper range of total dietary intake are not necessarily associated with toxicity. The USEPA RSL User's Guide recommends subtracting the dietary contribution when evaluating non-food exposures (e.g., drinking water or soil) to manganese, leading to an RfD of 7.1E-02 mg/kg-day for non-food media (USEPA 2021d). IRIS recommends using a modifying factor of 3 when calculating risks associated with non-food sources due to a number of uncertainties, leading to an RfD of 2.4E-02 mg/kg-day. This RfD is consistent with the RfD of 2.5E-02 mg/kg-day used in the recently derived MDEQ health-based guidance for manganese protective of the most sensitive population, formula-fed infants less than one year of age (MDEQ 2020). A subchronic RfD for manganese in non-food media is not available.

The IRIS RfC for manganese of 5.0E-05 mg/m^3 is based on a number of studies that indicated neurotoxicity associated with low-level occupational exposure to manganese (USEPA 2021q). This RfC was derived based on a LOAEL of 1.5E-01 mg/m^3 adjusted for continuous exposure. An uncertainty factor of 1,000 (10 for human variability, 10 for use of a LOAEL, and 10 for database limitations) was applied to derive the RfC. A separate subchronic RfC for manganese in non-food media is not available.

There are no cancer toxicity values for manganese.

Mercury

Mercury concentrations in soil were reported based on total mercury. There is no oral RfD for total mercury. Mercury exists primarily in salt forms within the environment. There is an IRIS RfD for mercuric chloride (and other mercury salts) of 3.0E-04 mg/kg-day (USEPA 2021r). This RfD was used to evaluate soil exposures in this assessment. An intermediate duration MRL of 2E-03 mg/kg-day is available for inorganic mercury (ATSDR 1999). There is no RfC available for mercuric chloride, but the California EPA offers a RfC for mercuric chloride that is based on a study of elemental mercury. The IRIS RfC for elemental mercury is 3E-04 mg/m^3 based on neurological effects observed in human occupational studies. This value is based on a LOAEL of 0.025 mg/m^3 adjusted for an 8-hour time weighted average exposure scenario and adjusted by an uncertainty factor of 30. This value is used to evaluate inhalation exposures to construction workers to mercury evaluated as mercuric chloride (and other mercury salts); this approach is consistent with the current recommendations within the USEPA RSL User's Guide (USEPA 2021d).

Nickel

The IRIS RfD for nickel soluble salts is 2E-02 mg/kg-day based on a chronic feeding study in rats (USEPA 2021s). The LOAEL for this study was 50 mg/kg-day for decreased body weights, higher heart-to-body weight ratios and lower liver-to-body weight ratios. The NOAEL of 5 mg/kg-day was adjusted by an uncertainty factor of 300 (10 for interspecies extrapolation, 10 for human variability, and 3 for database deficiencies).

There is no IRIS RfC available for nickel soluble salts. ATSDR has derived a chronic-duration MRL of 9E-05 mg/m^3 based on lung inflammation in rodents (ATSDR 2005). This MRL was derived by applying an uncertainty factor of 30 (3 for interspecies extrapolation and 10 for human variability) to the human equivalent concentration.

The carcinogenicity of nickel soluble salts has not been evaluated by IRIS. No oral SF is available. CalEPA has derived an inhalation UR of 2.6E-04 (µg/m^3) (OEHHA 2009). This value was derived from lung cancer data for an Ontario nickel refinery plant worker study.

Thallium

IRIS does not report toxicity values for thallium. However, IRIS does report a qualitative discussion on the limitations of deriving a RfD for thallium (USEPA 2021t). The available toxicity database for thallium contains oral studies that are generally of poor quality. For this same reason, a p-RfD has not been derived for thallium. However, recognizing the associated limitations, screening level p-RfD values were derived for chronic and subchronic exposures (USEPA 2012c). These RfD values are based on an approximated NOAEL of 4E-02 mg/kg-day protective of hair follicle atrophy in female rats following a 90-day gavage exposure to soluble thallium. An uncertainty factor of 3,000 (10 for interspecies extrapolation, 10 for human variability, 10 for database deficiencies, and 3 for extrapolation from subchronic to chronic exposure) was applied to derive a chronic screening p-RfD of 1.0E-05 mg/kg-day. An uncertainty factor of 1,000 (10 for interspecies extrapolation, 10 for human variability, and 10 for database deficiencies) was applied to derive a subchronic screening p-RfD of 4.0E-05 mg/kg-day.

There are no RfC or cancer toxicity values available for thallium.

Vanadium

An IRIS RfD of 9.0E-03 mg/kg-day is available for vanadium pentoxide (USEPA 2021u). This RfD is based on decreased hair cysteine observed in rats exposed to vanadium pentoxide in their diet for 2.5 years. The NOAEL for the critical study of 0.89 mg/kg-day was adjusted by an uncertainty factor of 100 (10 interspecies extrapolation and 10 human variability) to derive the RfD value. Consistent with the USEPA RSL User's Guide (USEPA 2021d), the molecular weight of the oxide ion was factored out to estimate an RfD for vanadium compounds of 5.0E-03 mg/kg-day. A separate subchronic RfD for vanadium is not available from IRIS. An ATSDR intermediate-duration MRL if 1E-02 mg/kg-day is available (ATSDR 2012c).

An IRIS RfC for vanadium is not available. ATSDR has derived a chronic inhalation MRL of 1.0E-04 mg/m^3 (ATSDR 2012c). This MRL is based on a two-year inhalation study in rats and mice that observed lung, larynx, and nasal effects at the lowest dose tested. The MRL was derived based on the benchmark modeled concentration for degeneration of epiglottis respiratory epithelium adjusted by an uncertainty factor of 30 (3 for interspecies extrapolation with dosimetric adjustment and 10 for human variability).

5.0 RISK CHARACTERIZATION

Risk characterization integrates the exposure assessment and the toxicity assessment to estimate non-cancer hazards and cancer risks for the receptor populations of concern at the OU3 Site. Non-cancer health hazards and cancer risks are characterized separately. Non-cancer hazards are evaluated by comparing an estimated exposure level or dose with a reference dose that is without appreciable risk of adverse health effects. Cancer risk is expressed as the probability that an individual will develop cancer over a lifetime as a result of exposure to a potential carcinogen. Risk characterization results are presented below by receptor.

5.1 Risk Characterization of Non-Cancer Effects

The potential for non-cancer effects is evaluated by comparing the estimated DI or EC for a receptor over a specified time period to a reference threshold that represents the exposure below which it is unlikely for even sensitive populations to experience adverse health effects (USEPA 1989). This ratio of exposure to toxicity is called a Hazard Quotient (HQ). When a receptor is exposed to a COPC by more than one route, or is exposed to more than one COPC, these values may be summed to yield a hazard Index (HI). If the HQ or HI value is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If an HQ or HI exceeds one, there is some possibility that non-cancer effects may occur, although an HQ or HI above one does not indicate an effect will definitely occur. This is because of the margin of safety inherent in the derivation of all toxicity values (see Section 4). However, the larger the HQ or HI value, the more likely it is that an adverse effect may occur.

The assumption of dose additivity in the HI approach is most relevant to contaminants that induce the same effect by the same mode of action. If an HI >1E+00 because of summing several HQs across pathways, then the contaminants can be segregated by effect and mode of action, and an HI can be calculated for each target organ group (USEPA, 1989). Target organ HIs were calculated in this HHRA for receptors and pathways where the HI >1E+00 if summed across COPCs within an exposure pathway, or across exposure pathways for a specific exposure scenario. The risk benchmark for non-cancer hazard based on target organ HIs was HI >1E+00.

5.1.1 Ingestion Exposures

For most contaminants, the potential for non-cancer effects is evaluated by comparing the estimated daily intake of the contaminant over a specific time period with the RfD for that contaminant derived for a similar exposure period, as follows (USEPA 1989):

$$HQ = DI / RfD$$

where:

DI = Daily Intake (mg/kg-day)
RfD = Reference Dose (mg/kg-day)

5.1.2 Dermal Exposures

For most contaminants, the potential for non-cancer effects following dermal exposure is evaluated by comparing the estimated absorbed dose of the contaminant over a specific time period with the absorbed RfD for that contaminant derived for a similar exposure period, as follows (USEPA 1989):

$$HQ = DAD / RfD_{ABS}$$

where:

DAD = Dermal absorbed dose (mg/kg-day)
RfD_{ABS} = Absorbed Reference Dose (mg/kg-day)
$RfD_{ABS} = RfD \cdot ABS_{GI}$

The ABS_{GI} term is unitless, chemical-specific and is applied to the available oral toxicity value to account for the absorption efficiency of an administered dose across the gastrointestinal tract and into the bloodstream.

5.1.3 Inhalation Exposures

For inhalation exposures, the potential for non-cancer effects is evaluated by comparing the time-weighted EC over a specific time period to the appropriate inhalation RfC for that contaminant, as follows (USEPA 2009):

$$HQ = EC / RfC$$

where:

EC = Exposure Concentration (mg/m^3)
RfC = Reference Concentration (mg/m^3)

As per the CSM (Figure 3-1), inhalation exposures were only evaluated for hypothetical future construction workers exposed to OU3 upland soils down to a depth of 10 feet during construction activities.

5.2 Risk Characterization of Cancer Effects

The excess risk of cancer from exposure to a contaminant is described in terms of the probability that an exposed individual will develop cancer because of that exposure. Excess cancer risks are summed across all carcinogenic contaminants and all exposure pathways that contribute to exposure of an individual in a given population. The level of total cancer risk that is of concern is a matter of personal, community, and regulatory judgment. In general, the USEPA considers excess cancer risks that are below 1E-06 to be so small as to be negligible, and risks above 1E-04 to be sufficiently large that some sort of remediation is desirable[13]. USEPA policy states that CERCLA actions are generally warranted when the baseline risk assessment indicates that a cumulative site risk to an individual using RME assumptions for either current or future land use is greater than the 1E-04 lifetime excess cancer risk end of the cancer risk range of 1E-04 to 1E-06 (USEPA 1991b). Excess cancer risks that range between 1E-04 and 1E-06 are generally considered to be within USEPA health guidelines (USEPA 1991b), although this is evaluated on a case by case basis, and USEPA may determine that risks lower than 1E-04 are not sufficiently protective and warrant remedial action. Furthermore, the MDEQ allowable cancer risk level is 1E-05, which will be considered as part of the risk management decisions associated with this Site[14]. Cancer risks for each chemical are calculated as described below.

5.2.1 Ingestion Exposures

The excess risk of cancer from ingestion exposure to a chemical is calculated as follows (USEPA 1989):

$$\text{Excess Cancer Risk} = 1 - \exp(-DI_L \cdot SF)$$

where:

DI_L = Daily Intake, averaged over a lifetime (mg/kg-day)

[13] Note that excess cancer risk can be expressed in several formats. A cancer risk expressed in a scientific notation format as 1E-06 is equivalent to 1 in 1,000,000 or 10^{-6}. Similarly, a cancer risk of 1E-04 is equivalent to 1 in 10,000or 10^{-4}. For the purposes of this document, all cancer risks are presented in a scientific notation format (*i.e.*, 1E-06).

[14] Montana DEQ-7 standards will be considered separately in the RI/FS.

SF = Slope Factor $(mg/kg\text{-}day)^{-1}$

In most cases (except when the product of $DI_L \cdot SF$ is larger than about 0.01), this equation may be approximated by the following:

Excess Cancer Risk = $DI_L \cdot SF$

When calculating cancer risks from ingesting fish, cooking loss is accounted for as:

Excess Cancer Risk = $DI_L \cdot 1\text{-}CL \cdot SF$

5.2.2 Dermal Exposures

The excess risk of cancer from dermal exposure to a contaminant is calculated as follows (USEPA 2004):

Excess Cancer Risk = $DAD_L \cdot SF_{ABS}$

where:

DAD_L = Dermal Absorbed Dose, averaged over a lifetime (mg/kg-day)
SF_{ABS} = Absorbed Slope Factor $(mg/kg\text{-}day)^{-1}$
$SF_{ABS} = SF / ABS_{GI}$

5.2.3 Inhalation Exposures

The excess risk of cancer from inhalation exposure is calculated based on inhalation UR values, as follows (USEPA 2009):

Excess Cancer Risk = $EC \cdot UR$

where:

EC = Exposure Concentration $(\mu g/m^3)$
UR = Unit Risk $(\mu g/m^3)^{-1}$

5.3 Risk Characterization Results

Detailed risk calculations are presented in Appendix D. Risk characterization results are presented in Section 5 tables as summarized below. Within the summary tables, non-cancer hazards that exceed the USEPA guidelines of non-cancer hazards ≤1E+00 and cancer risk < 1E-04 are bolded and shaded (orange). Cancer risk that exceeds MDEQs criteria of 1E-05 are also shaded (blue) for reference[15].

5.3.1 Risks to Hypothetical Future Residents

5.3.1.1 Risks from Exposures to COPCs in OU3 Soils

Table 5-1 summarizes the predicted non-cancer HIs and cancer risks for exposures to OU3 surface soils by a hypothetical future resident for each OU3 exposure unit grid. As shown, non-cancer HIs for a RME young child are > 1E+00 for grids 26, 36, 45, 47, 48, 49, 50, 53, 54, 55, 56, 58, 59, 64, 65, 67, 68, 72, 74, 86, 88, 90, 91, 93, 94, 95, and 98. These exceedances are driven by exposure via the incidental ingestion of surface soils within each grid. Total HI values in most of these grids range from 2E+00 to 4E+00, except for grid 74. Total HI for a RME young child in grid 74 is 1E+01. Grid 74 is also the only grid where total HI for a CTE young child also exceeds 1E+00 (HI=4E+00). Table 5-2 presents the COPC HQs for grid 74 which indicates that $TEQ_{D/F}$ is the primary risk driver with an associated HQ of 6E+00 for the RME young child scenario. Grid 74 includes the historic settling pond P17. As shown in Figure 2-4, this was the first settling pond in the process to receive effluent from the lime kiln and the multifuel boiler.

Target organ specific non-cancer hazards for the young child resident are shown by exposure grid in Appendix D. Of all of the grids where the HI for a RME young child exceeds 1E+00, target organ specific HIs based on incidental ingestion of surface soil exceed 1E+00 in grids 55, 58, 67, 68 and 74 as follows:

- Nervous system effects in grid 55: aluminum and manganese; manganese is the primary risk driver in soil within grid 55 (HQ = 1E+00) with aluminum as a minor risk contributor (HQ = 2E-01) that when combined, result in an HI > 1E+00.
- Dermal effects in grid 74: arsenic, thallium, and vanadium; arsenic and thallium are the primary risk drivers in soil within grid 74 (HQ = 1E+00 for each COPC) with vanadium as a minor risk contributor (HQ = 6E-02) that when combined, result in an HI > 1E+00.
- Reproductive effects in grids 58, 67, 68, and 74 are attributable to $TEQ_{D/F}$. The RME HQs for $TEQ_{D/F}$ in each of grids 58, 67 and 68 are equal to 2E+00 (note that the EPC for grid 67 was assumed for grid 68 where data were lacking); CTE HQs for $TEQ_{D/F}$ in these

[15] Montana DEQ's cancer risk criteria of 1E-05 will be considered within the Feasibility Study.

grids are all ≤ 1E+00. The HQs for $TEQ_{D/F}$ in grid 74 are 6E+00 and 2E+00 for the RME and CTE receptors, respectively.

As shown in Table 5-1, RME cancer risks are ≥ 1E-04 in upland exposure area grids 26, 42, 47, 48, 49, 50, 53, 54, 55, 56, 58, 59, 65, 67, 68, 71, 72, 74 and in floodplain exposure area grids 86, 88, 90, 91, 93, 94, 95, and 98. Unacceptable cancer risks for the CTE resident are only predicted in grid 48 (cancer risk = 1E-04). Table 5-3 presents the COPC cancer risks for grid 48; all other COPC specific cancer risks are shown in the Appendix D tables. As shown in these tables, the predicted excess cancer risks to a hypothetical future resident are primarily driven by early lifetime exposures to chromium via incidental ingestion of surface soils (evaluated as Cr(VI) accounting for a mutagenic mode of action).

5.3.1.2 Risks from Exposures to COPCs in OU3 Groundwater

Table 5-4 summarizes the predicted non-cancer HIs and cancer risks for the hypothetical future residential scenario for each OU3 groundwater well. As shown in this table and in Figure 5-1, non-cancer HIs exceed 1E+00 in every OU3 well evaluated for the RME child resident except SMW16d. Predicted HIs for the RME child resident range from 1E+00 (well SMW16d) to 1E+02 (well NFMW19). As shown in Table 5-4, HIs exceed 1E+00 in all but six OU3 wells for the CTE child resident. Predicted HIs for the CTE child resident range from 6E-01 (well SMW16d) to 5E+01 (well NFMW19). The primary groundwater risk drivers are arsenic and manganese, and to a lesser extent cobalt. Figures 5-2, 5-3, and 5-4 plot the HQs for arsenic, manganese, and cobalt, respectively. HQs also exceed 1E+00 for the RME resident for iron in three wells (HQ=2E+00 in wells NFMW9, and SMW19; HQ=3E+00 in NFMW19), and for chromium in one well (HQ=3E+00 in NFMW1s). Primary risk contributors in the well with the highest predicted non-cancer hazard, NFMW19, are cobalt (HQs of 6E+00 and 1E+01 for CTE and RME, respectively), iron (HQs of 1E+00 and 3E+00 for CTE and RME, respectively), and manganese (HQs of 4E=01 and 1E+02 for CTE and RME, respectively). Target organ specific non-cancer hazards are shown in Appendix D. Evaluation of HIs across all wells indicates that target organ specific non-cancer HIs exceed 1E+00 for nervous system effects, dermal effects, gastrointestinal effects, and thyroid effects in different wells. Individual groundwater COPCs that exert toxicity above the respective RfDs on these systems are (as shown in Tables 4-1 and 4-2):

- Nervous system effects: aluminum and manganese; manganese is the primary risk driver in OU3 groundwater with aluminum as a minor risk contributor. For every well where the nervous system HI > 1E+00, the manganese HQ > 1E+00 and the aluminum HQ ≤1E+00.
- Dermal effects: arsenic, thallium, and vanadium; arsenic is the primary risk driver in OU3 groundwater with thallium and vanadium as minor risk contributors. The arsenic HQs exceed 1E+00 in 17 wells for the RME receptor and in eight wells for the CTE

receptor; thallium and vanadium HQs are all below 1E+00. There are two wells (NFMW7 and SMW15) where the dermal HI > 1E+00, but the arsenic HQ ≤ 1E+00.

- Gastrointestinal effects: beryllium and iron; iron is the primary risk driver in OU3 groundwater with beryllium as a minor risk contributor. For the four wells where the gastrointestinal HI > 1E+00, the iron HQ > 1E+00 in three wells.
- Thyroid effects: cobalt. The cobalt HQ > 1E+00 for the RME receptor in six wells, and for the CTE receptor in three wells. The cobalt HQs are highest in well SMW15 (HQ=2E+01 for the CTE receptor; HQ=4E+01 for the RME receptor).

As shown in Table 5-4 and Figure 5-5, RME cancer risks are ≥ 1E-04 in all OU3 wells except NFMW12, SMW7, SMW16d, and SMW17d. CTE cancer risks are ≥ 1E-04 in wells NFMW1d, NFMW1s, NFMW9, NFMW10, NFMW22, NFMW23, SMW10, SMW11, SMW12, SMW16, SMW17, SMW18 and the waste water clarifier well. The primary risk drivers are arsenic and chromium.

5.3.1.3 Risks from Combined Exposures to OU3 COPCs

As outlined in the OU3 CSM (Figure 3-1), hypothetical future residents are assumed to be exposed to both surface soils and groundwater. Based on the results of the individual media presented above, non-cancer hazards to hypothetical future residents would primarily be driven by consuming OU3 groundwater as drinking water. Table 5-5 summarizes the combined non-cancer hazards associated with exposures to COPCs in OU3 soils and COPCs in groundwater within OU3 wells. There is no groundwater well within grid 74 where unacceptable non-cancer hazards were predicted for a child resident exposed to surface soil. Non-cancer HIs for the CTE and RME residents assumed to consume groundwater from well NFMW7 located in the nearby grid 73 were 2E+00 and 4E+00, respectively. Using these estimates, the combined exposure to soil within grid 74 results in HIs of 5E+00 and 1E+01 for the CTE and RME child resident, respectively.

As described above, unacceptable excess cancer risks (risk ≥1E-04) were predicted for the hypothetical future RME resident based on exposures to surface soils (in some, but not all exposure grids) and exposures to groundwater (in most, but not all OU3 wells) separately. As shown in Table 5-6, total cancer risks for exposures to both surface soil and groundwater predicted for the RME resident are all equal to or exceed 1E-04. Of note, acceptable excess cancer risks were predicted for the RME resident assumed to consume groundwater from well NFMW12 and for the RME resident assumed to be exposed via direct contact to surface soils in grid 40 (which includes well NFMW12). However, total risk based on exposures to both soil and groundwater in this grid equal 1E-04. Unacceptable excess cancer risks were also predicted for the CTE resident based on consumption of groundwater as drinking water in wells NFMW1,

NFMW9, NFMW10, NFMW22, NFMW23, SMW10, SMW11, SMW12, SMW16, SMW17, SMW18 and the wastewater clarifier well. However, acceptable excess cancer risks (risk < 1E-04) were predicted for the CTE resident based on direct contact exposures to OU3 surface soils. For the CTE resident, there are several total cancer risk estimates for combined exposure to soil and groundwater that equal or exceed 1E-04 where both the individual soil and groundwater predicted cancer risks were less than 1E-04 (denoted with an x in the table).

5.3.2 Risks to Hypothetical Future Commercial/Industrial Workers

5.3.2.1 Risks from Exposures to COPCs in OU3 Soils

Table 5-7 summarizes the predicted non-cancer HIs and cancer risks for exposures to OU3 surface soils by a hypothetical future commercial/industrial worker for each OU3 exposure unit grid. As shown, non-cancer HI's for hypothetical future commercial/industrial workers do not exceed 1E+00 in any exposure unit. Estimated excess cancer risks for hypothetical future commercial/industrial workers and hypothetical future construction workers are all below 1E-04 for all exposure units.

5.3.2.2 Risks from Exposures to COPCs in OU3 Groundwater

Table 5-8 summarizes the predicted non-cancer HIs and cancer risks for the hypothetical future commercial/industrial worker scenario for each OU3 groundwater well. As shown in this table and in Figure 5-6, non-cancer HIs exceed 1E+00 in 26 OU3 wells for the RME receptor and in 13 OU3 wells for the CTE receptor. Predicted HIs for the RME worker range from 3E-01 (well SMW16d) to 2E+01 (well NFMW19). Predicted HIs for the CTE worker range from 1E-01 (well SMW16d) to 1E+01 (well NFMW19). The primary groundwater risk drivers are arsenic and manganese. The HQ for cobalt also exceeds 1E+00 for both the RME and CTE workers in well SMW15 (RME HQ=9E+00 and CTE HQ=4E+00). Figures 5-7, 5-8 and 5-9 plot the HQs for arsenic, manganese, and cobalt, respectively.

Target organ specific non-cancer hazards are shown in Appendix D. Evaluation of HIs across all wells indicates that target organ specific non-cancer HIs exceed 1E+00 for nervous system effects, dermal effects, and thyroid effects in different wells. Individual groundwater COPCs that exert toxicity above the respective RfDs on these systems are (as shown in Tables 4-1 and 4-2):

- Nervous system effects: aluminum and manganese; manganese is the primary risk driver in OU3 groundwater with aluminum as a minor risk contributor. For every well where the nervous system HI > 1E+00, the manganese HQ > 1E+00 and the aluminum HQ ≤1E+00.

- Dermal effects: arsenic, thallium, and vanadium; arsenic is the primary risk driver in OU3 groundwater with thallium and vanadium as minor risk contributors. The dermal HI exceeds 1E+00 in 3 wells. In one of these wells, the arsenic HQ ≤ 1E+00.
- Thyroid effects: cobalt. There are two wells where the thyroid HI > 1E+00 based on the cobalt HQ > 1E+00.

As shown in Table 5-8 and Figure 5-10, RME cancer risks for hypothetical future commercial/industrial workers assumed to consume groundwater as drinking water are ≥ 1E-04 in OU3 wells NFMW1d, NFMW1s, NFMW9, NFMW10, NFMW23, SMW10, SMW11, SMW12, SMW14, SMW16, SMW17, and the wastewater clarifier well. Arsenic is the primary risk driver with additional contributions primarily from chromium. CTE cancer risks are < 1E-04 in all wells.

5.3.2.3 Risks from Combined Exposures to OU3 COPCs

As outlined in the OU3 CSM (Figure 3-1), hypothetical future commercial/industrial workers are assumed to be exposed to both surface soils and groundwater. Based on the results of the individual media presented above, non-cancer hazards to hypothetical future commercial/industrial workers would primarily be driven by consuming OU3 groundwater as drinking water. Table 5-9 summarizes the combined non-cancer hazards associated with exposures to COPCs in OU3 soils and COPCs in groundwater within OU3 wells.

As described above, acceptable excess cancer risks (risk <1E-04) were predicted for the hypothetical future commercial/industrial worker based on exposures to surface soils, while unacceptable excess cancer risks (risk ≥1E-04) were predicted for the RME receptor consuming groundwater as drinking water from twelve OU3 wells. As shown in Table 5-10, total cancer risks for exposures to both surface soil and groundwater predicted for the hypothetical future commercial/industrial worker are driven by risks attributed to the consumption of groundwater. The additional exposure to hypothetical future commercial/industrial workers from incidental ingestion of and dermal contact with surface soil does not appreciably increase the total risk when combined with exposure to COPCs in groundwater.

5.3.3 Risks to Hypothetical Future Construction Workers

Table 5-11 summarizes the non-cancer HIs and cancer risks for exposures to OU3 surface and subsurface soils by a hypothetical future construction worker scenario for each OU3 exposure unit grid. As shown, non-cancer HI's for hypothetical future construction workers do not exceed 1E+00 in any exposure unit. Estimated excess cancer risks for hypothetical future construction workers are below 1E-04 for all exposure units.

5.3.4 Risks to Current and Hypothetical Recreational Visitors

5.3.4.1 Risks to Hikers

Table 5-12 summarizes the non-cancer HIs and cancer risks for exposures to OU3 surface soils by a hiker for each OU3 exposure unit grid. As shown, non-cancer HIs for the hiker do not exceed 1E+00 in any exposure unit. Estimated excess cancer risks for hiker are below 1E-04 for all exposure units.

5.3.4.2 Risks to Campers

As outlined in the OU3 CSM (Figure 3-1), current and hypothetical future campers are assumed to be exposed to surface soil, surface water, and sediment within the OU3 study area. Estimated non-cancer hazards and cancer risks are discussed by media type first and then combined across exposure media.

Risks were estimated for a camper assuming exposure to surface soils across OU3. Table 5-13 summarizes the non-cancer HIs and cancer risks for exposures to OU3 surface soils by a camper for each OU3 exposure unit grid. As shown, non-cancer HIs for the child camper do not exceed 1E+00 in any exposure unit. Estimated excess cancer risks for a camper are below 1E-04 for all exposure units except grid 74 where the total cancer risk is estimated to be equal to 1E-04. As shown in Table 5-13, this risk is driven by exposure via the incidental ingestion of surface soils within this grid. Cancer risk by COPC for grid 74 is shown in Table 5-14.

Table 5-15 summarizes the estimated non-cancer hazards and cancer risks to a camper from exposure to surface water at the OU3 site. The camper was evaluated for potential risks associated with drinking surface water collected directly (unfiltered) from the on-site creeks (O'Keefe and Lavalle Creeks) or from the CFR as well as with incidental ingestion and dermal contact with the CFR surface water while swimming/tubing. As shown in Table 5-15, acceptable risks (non-cancer HI $\leq$ 1E+00 and cancer risks < 1E-04) are predicted for campers from such surface water exposures. Intentional ingestion of CFR surface waters as drinking water by a camper is estimated to result in cancer risks of 1E-05 and 4E-06 for the RME and CTE campers, respectively.

Similarly, the camper was evaluated for incidental ingestion of and dermal contact with CFR sediments while swimming/tubing. As shown in Table 5-15, acceptable risks (non-cancer HI $\leq$ 1E+00 and cancer risks < 1E-04) are predicted for campers from such sediment exposures.

A hypothetical camper who may drink from and swim in the CFR was also evaluated for a combined exposure to CFR surface water and sediments and floodplain surface soils. As shown in Table 5-15, acceptable risks (non-cancer HI ≤ 1E+00 and cancer risks < 1E-04) are predicted for campers from such a combined exposure scenario. The predicted cancer risks for a RME and CTE camper are 5E-05 and 2E-05, respectively. These risks are primarily contributed by consuming CFR surface water as drinking water and incidental ingestion of floodplain surface soils.

5.3.4.3 Risks to Recreational Fishers

As outlined in the OU3 CSM (Figure 3-1) and described in Section 3.1, the recreational fisher is assumed to include young children, older children/adolescents and adults who are exposed via incidental ingestion of and dermal contact to surface soils, surface water, and sediments while fishing along the banks of the CFR. The recreational fisher is also assumed to consume the fillets of fish collected from the CFR. Estimated non-cancer hazards and cancer risks are discussed by media type first and then combined across exposure media.

Risks were estimated for a recreational fisher assuming exposure to surface soils within the floodplain. Table 5-16 summarizes the non-cancer HIs and cancer risks for exposures to floodplain surface soils by a recreational fisher for each OU3 floodplain exposure unit grid. As shown, non-cancer HIs for the young child do not exceed 1E+00 and total cancer risks are all below 1E-04.

Table 5-17 summarizes the estimated non-cancer hazards and cancer risks to a recreational fisher from exposure to surface water and sediment while fishing along the banks of the CFR. As shown, acceptable risks (non-cancer HI ≤ 1E+00 and cancer risks < 1E-04) are predicted for recreational fishers from such exposures.

Recreational fishers were assumed to consume the fillets of fish caught from the CFR within the OU3 study area. As shown in Table 5-18, the predicted non-cancer HQs based on consumption of $TEQ_{D/F/PCB}$ in northern pike fillets are 8E+00 and 2E+00 for the RME and CTE recreational child fishers, respectively. The predicted non-cancer HQs based on consumption of $TEQ_{D/F/PCB}$ in rainbow trout fillets are 5E+00 and 1E+00 for the RME and CTE recreational child fishers, respectively. As shown in the table, coplanar PCB congeners are contributing the majority of the TEQ hazard as evidenced by HQs ≤ 1E+00 for $TEQ_{D/F.}$ If it is assumed that an RME recreational child fisher consumes 50% northern pike and 50% rainbow trout, the non-cancer HQ for $TEQ_{D/F/PCB}$ is 7E+00 (estimated by summing half of the risk calculated for northern pike and half of the risk calculated for rainbow trout).

Table 5-18 also presents the estimated excess cancer risk for a recreational fisher consuming northern pike or rainbow trout fillets. As shown, the predicted cancer risks based on consumption of $TEQ_{D/F/PCB}$ in northern pike fillets are 2E-04 and 3E-05 for the RME and CTE recreational fishers, respectively. The predicted cancer risks based on consumption of $TEQ_{D/F/PCB}$ in rainbow trout fillets are 1E-04 and 2E-05 for the RME and CTE recreational fishers, respectively. Coplanar PCBs contribute more to the TEQ risk than dioxins and furans. Cancer risks for $TEQ_{D/F}$ fall within USEPA's acceptable cancer risk range (risk = 3E-05 for the RME fisher). Non-cancer hazards and cancer risks for the RME recreational fisher for total PCBs are 5E-05 and 2E-05 for northern pike and rainbow trout fillets, respectively.

The non-cancer hazards and cancer risks based on fish consumption shown in Table 5-18 assume no loss in COPC concentrations during preparation and cooking of the fillets. USEPA (2000) notes that fish preparation and cooking procedures can modify the amount of contaminant ingested by fish consumers. USEPA (2000) indicates that contaminant losses from cooking can be significant for organics, such as dioxins and PCBs. Cooking loss is a function of many variables including cooking method, cooking duration, cooking temperature, preparation techniques, lipid content of fish, and fish species. For this risk characterization, assumed cooking losses for Total PCBs and TEQ were 30% and 54%, respectively. These assumptions were based on the Great Lakes fish data presented in USEPA (2000) that identified an average cooking loss for PCBs of 30%, and a median cooking loss of 54% for TCDD (ranged from 37 to 80%). The 30% (mean) loss for PCBs was based on multiple species, trimming the belly flap area for skin-on fillets. The 54% (median) loss for TCDD was based on multiple species, cooked, with a mixture of skin-on and skin-off. Cooking loss for fish is accounted for using the following equation:

$$HQ = DI \cdot 1\text{-}CL / RfD$$

where:

CL = cooking loss (as a fraction)

The risk results presented in Table 5-19 assumes general cooking loss for dioxins and PCBs. As shown, the non-cancer hazards and cancer risks are reduced by comparison to those shown in Table 5-18 reflecting a loss of contaminant residues in the fish tissue due to preparation and cooking processes. In this case, the non-cancer HQ for the RME child fisher consuming $TEQ_{D/F/PCB}$ in northern pike fillets is 4E+00. The corresponding cancer risk (1E-04) is at the upper end of USEPA's acceptable cancer risk range.

Cumulative non-cancer hazards and cancer risks for a general recreational fisher inclusive of risks from fish consumption are also shown in Table 5-17. As shown in the table and described above, unacceptable total risks are primarily associated with fish consumption.

5.3.4.4 Risks to Tribal Fishers

As outlined in the OU3 CSM (Figure 3-1) and described in Section 3.1, the tribal fisher is assumed to include young children, older children/adolescents, and adults who are exposed via incidental ingestion of and dermal contact to surface soils, surface water, and sediments while fishing along the banks of the CFR. The tribal fisher is also assumed to consume the fillets or whole body of fish collected from the CFR. Estimated non-cancer hazards and cancer risks are discussed by media type first and then combined across exposure media.

Risks were estimated for a tribal fisher assuming exposure to surface soils within the floodplain. Table 5-20 summarizes the non-cancer HIs and cancer risks for exposures to floodplain surface soils by a tribal fisher for each OU3 floodplain exposure unit grid. As shown, non-cancer HIs do not exceed 1E+00 and cancer risks are all below 1E-04. Predicted cancer risks for the RME tribal fisher from incidental ingestion of surface floodplain soils are within USEPA's acceptable cancer risk range (1E-06 to 1E-04). Cancer risks are primarily driven by the assumed early childhood exposures to chromium evaluated as Cr(VI).

Table 5-21 summarizes the estimated non-cancer hazards and cancer risks to a tribal fisher from exposure to surface water and sediment while fishing along the banks of the CFR. As shown, acceptable risks (non-cancer HI ≤ 1E+00 and cancer risks < 1E-04) are predicted for tribal fishers from such exposures.

It was assumed that tribal fishers sometimes consume just the fillets of fish caught from the CFR, but other times will consume other parts of the fish. Thus, risks associated with fish consumption by tribal receptors were estimated based on both measured fillet concentrations and calculated whole body concentrations (on a wet weight basis for both). As shown in Table 5-22, unacceptable risks are predicted for the tribal fisher consuming either fillets or whole-body fish regardless of species. In general, risks decrease in magnitude as follows: northern pike whole body > northern pike fillet > rainbow trout whole body > rainbow trout fillet. Non-cancer HQs exceed 1E+00 for all TEQ-based COPCs evaluated in this assessment ($TEQ_{D/F}$, TEQ_{PCB}, $TEQ_{D/F/PCB}$) for the RME tribal fisher, with the largest magnitude HQs associated with $TEQ_{D/F/PCB}$. Non-cancer HQs exceed 1E+00 for the CTE tribal fisher also, but not for all COPCs; HQs based on $TEQ_{D/F}$ are below 1E+00 for the CTE receptor. Predicted cancer risks exceed 1E-04 for the RME tribal fisher consuming fillets or whole body for both species. Cancer risks are greatest for the RME tribal fisher consuming whole body northern pike with predicted cancer

risks based on $TEQ_{D/F}$ of 1E-04 and based on each TEQ_{PCB} and $TEQ_{D/F/PCB}$ of 1E-03. Predicted cancer risks are estimated at 1E-04 for the CTE tribal fisher consuming whole body northern pike. These results suggest that the TEQ risks are primarily driven by coplanar PCBs. Cancer risks based on total PCBs are also ≥1E-04 for a RME tribal fisher consuming northern pike as fillets or whole body.

The non-cancer hazards and cancer risks based on fish consumption shown in Table 5-22 assume no loss in COPC concentrations during preparation and cooking of the fish. As noted above for the recreational fisher, it is expected that dioxin and PCB residues in fish tissue will be reduced due to preparation and cooking processes. The risk results presented in Table 5-23 assumes general cooking loss for dioxins and PCBs. As shown, the non-cancer hazards and cancer risks are reduced by comparison to those shown in Table 5-22. In this case, the non-cancer HQs for the RME fisher consuming $TEQ_{D/F/PCB}$ exceed 1E+00 for northern pike and rainbow trout, fillets and whole body. The non-cancer HQs for $TEQ_{D/F}$ based on consumption by the RME tribal fisher are > 1E+00 for whole-body northern pike only (HQs = 1E+00 for other fish tissues). The non-cancer HQs based on $TEQ_{D/F}$ remain lower than HQs based on TEQ_{PCB} or $TEQ_{D/F/PCB}$, again reflecting that coplanar PCBs appear to contribute the most to the associated non-cancer TEQ hazards. Cancer risks for the RME tribal fisher exceed 1E-04 for $TEQ_{D/F/PCB}$ and TEQ_{PCB} regardless of species or tissue type. Cancer risks assuming cooking loss are all less than 1E-04 for the CTE tribal fisher.

When evaluating cumulative non-cancer hazards and cancer risks for a tribal fisher, predicted HIs and cancer risks were evaluated based on the range of fish consumption risks. As shown in Table 5-21 and as described above, unacceptable cumulative risks for a tribal fisher are driven by the fish consumption pathway.

6.0 UNCERTAINTY ASSESSMENT

Quantitative evaluation of the risks to humans from environmental contamination is frequently limited by uncertainty regarding a number of key data items, including concentration levels in the environment, the true level of human contact with contaminated media, and the true dose-response curves for non-cancer and cancer effects in humans. This uncertainty is usually addressed by making assumptions or estimates for uncertain parameters based on whatever limited data are available. Because of these assumptions and estimates, the results of risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment.

6.1 Uncertainties in Exposure Assessment

6.1.1 Uncertainties in Exposure Pathways Not Evaluated

Omission of exposure pathways believed to be minor compared to one or more other pathways that were evaluated may result in a small underestimation of exposure and risk, but the magnitude of this underestimation is not expected to be significant.

Evaluation of risks by hypothetical future residents based on consumption of cultivated garden fruits and vegetables was not quantified in this assessment. USEPA (2007) notes that risks to humans from most metals when consuming fruits and vegetables (except roots or green, leafy vegetables) is low. Risks to hypothetical future residents were assessed assuming full-time residential exposure, and full-time residential soil exposures (assuming direct soil ingestion) are expected to be protective of consumption of home-grown produce. Based on this, it is concluded that omission of the home grown produce pathway is not likely to result in a significant underestimation of exposure and risk from dioxin/furan and metal contaminants in soil. Further, as shown in the Appendix D tables, unacceptable risks to a hypothetical future resident were primarily based on chromium. Data on plant uptake of chromium are limited, but ATSDR (2012b) noted that some data indicate that chromium has a low mobility for translocation from roots to above ground parts of plants. Because most of the uptake of chromium in plants is retained in the roots, it is possible that total risks from chromium reported in this HHRA are slightly underestimated when considering the potential for consumption of locally grown root vegetables. Similarly, other metals and dioxins/furans have also been shown to accumulate in roots, suggesting that total risks from other COPCs may also be underestimated. The magnitude of this underestimation associated with the consumption of root vegetables is likely small but would be dependent upon the uptake potential of plant species and the consumption rates by a human receptor.

This HHRA includes evaluation of the fish consumption pathway for both recreational and tribal fishers. For the purposes of this assessment, consumption of rainbow trout and northern pike were evaluated as representative species most likely to be caught and consumed. However, people collecting fish from the CFR for consumption may also catch and consume other species. In general, it is reasonable to assume that concentrations and subsequent risks from consumption of bottom dwelling fish (i.e., suckers) may be similar to or greater than those observed in trout and pike.

This HHRA evaluates risks to a tribal receptor who may fish from the portion of the CFR included within the OU3 study area. Risks were quantified for this exposure scenario to account for potential incidental ingestion of soil, sediment, and surface water while fishing in addition to fish consumption. However, it is recognized that a tribal receptor may also be exposed by other potential exposure pathways that were not evaluated in this HHRA including, but not limited to, consumption of wild game and wild plants, and non-consumptive uses of fish, wildlife, and plants. The exclusion of such non-consumptive pathways is not considered a significant source of uncertainty because such exposures are likely minor relative to the exposures associated with the incidental ingestion of soil/sediment and fish consumption. Site-related risks from consumption of terrestrial wildlife are also considered minor by comparison to incidental ingestion of site soils because it is assumed that the time spent on-site by a herbivorous large home range wild animal (i.e., deer, waterfowl) is limited in duration over a chronic exposure period. ATSDR (2012b) notes that there is no indication of biomagnification of chromium along the terrestrial food chain (soil-plant-animal). Such is not necessarily the case for CDD/CDFs which have been shown to bioaccumulate in fish-eating birds and to a lesser extent in terrestrial mammals (ATSDR 1998). Dioxins and furans demonstrate low water solubilities and high lipophilicity which means they have potential for bioconcentrating in aquatic organisms (ATSDR 1998). However, actual uptake by such organisms may be less than predicted due to the propensity for dioxins and furans to bind to suspended organic matter. Similarly, because dioxins and furans are expected to adsorb strongly to soil and are not very soluble in water, root uptake and translocation of CDD/CDFs to upper plant parts is generally considered minor (ATSDR 1998). Two specific exceptions identified in the literature are zucchini and pumpkin which have previously been found to translocate CDD/CDFs to the shoots and into the fruits (ATSDR 1998). Further, evidence suggests increased concentrations of CDD/CDFs in root vegetables, such as carrots, when grown in dioxin contaminated soils (ATSDR 1998). As noted above, such potential for accumulation of dioxins and metals in root vegetables suggests a possible underestimation in total risks when excluding the consumption of the roots of plants grown within the OU3 study area. Recognizing that contamination of plant foliage via atmospheric deposition is a more important contamination mechanism than uptake via roots, it is assumed that such exposure is generally limited by the washing of plants/produce prior to consumption. This assumption coupled with generally low soil/sediment-to-plant bioconcentration factors (BCFs) (with a few

exceptions), it is expected that risks based on quantitatively evaluated exposure scenarios (residential/occupational/recreational) are protective of the plant ingestion pathway.

6.1.2 Uncertainties from Chemicals Not Evaluated

As discussed above, quantitative risk estimates are derived only for COPCs. Contaminants that were measured in Site samples but excluded as a COPC may contribute a small amount of added risk, but the contribution is expected to be so small that this is not a source of significant uncertainty. The same is expected of contaminants that could not be evaluated as COPCs due to the lack of a risk-based screening level (no toxicity value), or contaminants qualified as not detected but whose sample-specific DL is greater than the available RSL. Although these contaminants are flagged as sources of uncertainty in the COPC screens, their relative contribution to the total risk is expected to be minor.

USEPA (2021b) discusses PCBs at the Site. As noted in USEPA (2021b), hundreds of samples have been collected across OU1, OU2, and OU3 and analyzed for PCBs. PCBs in OU3 soils and groundwater have been analyzed as Aroclor mixtures, but no data are available on PCB congeners in these media. Similarly, only a small number of surface water and sediment samples collected from the CFR were analyzed for PCBs as Aroclor mixtures. The Aroclor-based evaluations were consistent with the data quality objectives in the site-specific QAPP. This approach was considered adequate because the available historical information did not suggest any specific source of PCBs associated with the historical Mill operations. Once PCBs were determined to be present in localized areas of OU2 at concentrations above health protective SLs (based on a target HQ of 1 and a target cancer risk of 1E-04), additional samples were collected from those specific areas and analyzed for PCB congeners. Additional soil and groundwater samples were not collected from OU3 for analysis by PCB congeners because Aroclor concentrations in OU3 soils and groundwater did not similarly exceed USEPA health protective SLs. Aroclor concentrations reported in groundwater samples are flagged as a source of uncertainty given that the reported detection limits exceeded the risk-based SLs for a resident. However, this is not considered a significant source of uncertainty because concentrations similar to the DLs would result in risks from drinking groundwater in the low 1E-06 range and are not expected to substantially contribute to cumulative risk estimates. As reported in NewFields (2018c), approximately 155 cubic yards of material was removed from the localized areas within OU2. PCB congener data were reported for fish tissues evaluated for fish collected from the CFR. The USFWP fish advisory is based on dioxins, furans and PCBs. Evaluation of PCB congener data in fish tissues provides additional information to the USEPA and MDEQ about relative contributions of dioxins and furans versus coplanar PCBs to TEQ concentrations in fish.

6.1.3 Uncertainties in Exposure Point Concentrations

In all exposure calculations, the desired input parameter is the true mean concentration of a contaminant within a medium, averaged over the area where random exposure occurs. However, because the true mean cannot be calculated based on a limited set of measurements, the USEPA (1989, 1992) recommends that the exposure estimate be based on the 95UCL. The groundwater and fish EPCs were based on 95UCLs for the COPCs with enough detected data to support the development of the 95UCL. When data are plentiful and inter-sample variability is not large, the UCL may be only slightly higher than the mean of the data. However, when data are sparse and/or are highly variable, the 95UCL may be substantially greater than the mean of the available data.

When data are presented as summed values (i.e., TEQ and total PCBs), one-half the DL was used as a surrogate concentration for those specific congeners reported as non-detect. Use of one-half the DL assumes that there is equal probability that the actual concentration in the sample may be greater or less than the surrogate value. In general, the detection limits for non-detect results were low relative to detected concentrations. The uncertainty associated with the use of surrogate values for non-detect results was minimized by only including those contaminants that were determined to be present in a given medium.

95UCL values were not calculated for soil due to the mix of sample types and limited sample sizes. The compositing schemes applied to the soil collection efforts were developed to be representative of hypothetical future residential or occupational (the receptors with the highest assumed exposures) exposure units in the upland areas and representative of current and/or hypothetical future recreational exposure units in the floodplain areas. In cases where a 20-point composite or 30-point composite was collected over the entire exposure area, variability around the mean is characterized better than within a 5-point composite. Surface soils collected in 2017 were composited on a grid-by-grid basis, resulting in a single sample result for some exposure units. Without additional data it is uncertain if the use of a single 20-point or 30-point composite may overestimate or underestimate the true mean. In cases where additional data from localized samples (5-point composites collected over a small area, or grab samples) collected through biased sampling at areas identified as being of environmental concern, the weighted EPC is likely biased slightly high. If a soil grid was found to pose an unacceptable risk (i.e., grid 74 for hypothetical future residents), additional samples within that grid may be warranted within the RI/FS. This is because future changes in land use may result in higher density housing than was assumed for the soil sampling conducted on 20-acre grid areas. The composite sampling strategy reduces data variability and provides a reasonably unbiased estimate of mean contaminant concentrations in a specified decision unit (ITRC 2020). Thus, although evaluation based on the maximum spatial extent grid size increases uncertainty about hypothetical future exposure, this is

not considered a significant source of uncertainty for the specific scenarios evaluated within this assessment.

Exposures to hypothetical future construction workers via direct contact with subsurface soils were calculated based on available concentration data in both surface and subsurface soil samples consistent with the CSM. However, the weighting approach applied to calculate the soil EPCs inherently weights the concentrations associated with the available 20-point composite surface soil samples heaviest and the single vertical composite subsurface samples the least. This would represent a significant source of uncertainty if concentrations at depth were significantly higher than concentrations at the surface. This is not anticipated at this Site given that the expected fate and transport systems would have resulted primarily in surface deposition. Nonetheless, to evaluate this source of uncertainty further, the maximum detected concentrations within the subsurface soil samples were used to estimate non-cancer hazards and excess cancer risks to hypothetical future construction workers for this uncertainty assessment. The non-cancer HI calculated following this approach is less than 1E+00 and the cancer risk is less than 1E-06.

Soil concentration data for the OU3 Site are based on evaluation of bulk or coarse soil particles. It is generally expected that small particles (<150 µm, "fine fraction") are more likely to adhere to the hands (or other objects that may be mouthed) than coarse particles (2mm) and be subsequently ingested (USEPA 2016c). Studies of other sites have suggested enrichment of metal concentrations in the fine fraction (Beamer et al. 2012; Siciliano et al. 2009). This indicates that EPCs based on concentrations of COPCs in bulk samples collected at the Site may underestimate true exposure concentrations, but the magnitude of this underestimation is unknown.

Groundwater data for the wastewater clarifier well are limited to a single sample collected in 2019. There is high uncertainty as to whether or not the EPC used to evaluate groundwater exposures associated with this well underestimate or overestimate potential chronic exposures.

During the 2018 RI Addendum 9 sampling event, surface water and sediment samples were collected from a number of the on-Site ponds. As noted in Section 3, it is not anticipated that a person will be exposed in these ponds, so these data were not considered in the risk characterization. However, if these ponds were dried out in the future (during land development), the sediment concentration may represent contamination within the surface soil. Conceivably, the ponded areas may represent areas of increased concentrations due to sediment deposition to low-lying areas. For the purposes of this uncertainty assessment, the maximum detected pond sediment concentrations were compared to the residential soil SLs based on an HQ=0.1 or a cancer risk of 1E-06 similar to how soil data were used in the COPC selection process in Section 3.3. Residential and recreational risk estimates were calculated for those contaminants where the

maximum detected concentration exceeded the SL (the resident represents the most sensitive receptor) based on 95UCL values (calculated across all pond data). For assumed recreational land use, total HI was < 1E+00 and total cancer risk was < 1E-04. Total HI based on incidental ingestion of soil by a hypothetical future child resident was 3E+00, but all individual HQs were ≤1E+00 (see tables in Appendix D). Total cancer risk for an RME resident was at the upper end of USEPA's acceptable cancer risk range at 1E-04. This value was based primarily on assumed early childhood exposures to chromium evaluated as Cr(VI). As noted previously, the evaluation of chromium exposures presented in this assessment are conservative based on assuming the most toxic form of Cr(VI) and likely overestimate actual Site risks.

6.1.4 Uncertainties in Human Exposure Parameters

Accurate calculation of exposures requires accurate estimates of the level of human exposure that is occurring. However, many of the required exposure parameters are not known with certainty and must be estimated from limited data or knowledge. In general, when exposure data were limited or absent, the exposure parameters were chosen in a way that was intended to be conservative. Because of this, the values selected are thought to be more likely to overestimate than underestimate actual exposure and risk.

The risk estimates presented in Table 5-9 for a tribal fisher are based on the fish consumption rates from the Shoshone-Bannock Tribe (USEPA 2016a). As described in Appendix E, the USEPA considers these consumption rates to best represent inland tribes with limited access to abundant fisheries as expected within the stretch of the CFR included in the OU3 study area. However, in the absence of tribe-specific fish consumption data, it is uncertain how representative the Shoshone-Bannock fish consumption rates are for the CSKT. If similar fish consumption rates based on the Nez Perce Tribe (USEPA 2016b) were used instead (mean of 98.4 g/day and 95th percentile of 345 g/day), non-cancer hazards from consuming fish caught in the CFR exceed 1E+00 for both the CTE and RME tribal fisher with HQs as high as 2E+02 based on $TEQ_{D/F/PCB}$ in northern pike whole body as shown in Table 6-1. Using the higher ingestion rates correspond to increased excess cancer risk for the CTE and RME tribal fishers with all cancer risks exceeding 1E-04 for the RME tribal fisher (cancer risks ranging from 3E-04 up to 4E-03). Nearly all predicted cancer risk estimates exceed 1E-04 for the CTE tribal fisher also with the exception of $TEQ_{D/F}$ for both species and tissue types, and except for total PCBs in fillets.

6.1.5 Uncertainties in Chemical Absorption (RBA)

The risk from an ingested chemical depends on how much of the ingested chemical is absorbed from the gastrointestinal tract into the body. Currently available information suggests that RBA

of dioxin in soils can be expected to be less than 100%, but available estimates of soil dioxin RBA are not adequate to derive an alternative to assuming an RBA of 1.0. Similarly, data are not available to derive contaminant-specific RBA values for any of the metal COPCs except arsenic. Using an assumed RBA of 1.0 for these COPCs is likely to overestimate the true risk with the magnitude of the error depending on the true RBA value.

6.2 Uncertainties in Toxicity Assessment

Toxicity information for many chemicals is often limited. Consequently, there are varying degrees of uncertainty associated with toxicity values (i.e., oral SF, RfD, RfC, inhalation UR). For example, uncertainties can arise from the following sources:

- Extrapolation from animal studies to humans
- Extrapolation from high dose to low dose
- Extrapolation from continuous exposure to intermittent exposure
- Limited or inconsistent toxicity studies

In general, uncertainty in toxicity factors is one of the largest sources of uncertainty in risk estimates at a site. Because of the conservative methods USEPA uses in dealing with these uncertainties, it is much more likely that the uncertainty will result in an overestimation rather than an underestimation of risk (USEPA 2014b).

For TEQ, cancer risks were based on using the CalEPA toxicity criteria for TCDD. The CalEPA values assume that there is no level of exposure that is without risk. This assumes that TCDD induces cancer by way of a non-threshold linear dose-response relationship. The National Resource Council (NRC 2006) discussed the primary uncertainties with the toxicity values for dioxin and dioxin-like compounds and reported that the estimation of cancer risks at doses below the range of existing reliable data may result in an overestimation of risk, and that the relative concentrations of the congener mixture in the environment may change over an exposure period. Further, NRC (2006) and members of USEPA's Science Advisory Board (SAB) that reviewed USEPA's 2000 dioxin reassessment suggested that the assumption that TCDD carcinogenicity is consistent with a non-threshold linear dose-response is inconsistent with what is known about the mode of action of TCDD and other dioxins. That evaluation reported that TCDD acts as a cancer promoter and is not directly genotoxic. NRC (2006) noted that the lack of evidence of cancer-initiating activity by TCDD in animal studies further supports this observation. TCDD has been reported to produce toxic effects by binding with a receptor, called the aromatic hydrocarbon (Ah) receptor. This binding, in addition to ligand-receptor interactions and subsequent molecular events, results in a complex, multi-step process to produce dioxin toxicity (NRC 2006). Chemicals that act via a receptor-mediated process produce sublinear responses at low doses. In

previous evaluations of other receptor-mediated carcinogens, USEPA concluded that use of a nonlinear, low-dose model was appropriate for risk assessment. Although USEPA has not completed a cancer reassessment for dioxin, the Agency has established that the 2012 RfD for TCDD will be used to develop site-specific risk-based cleanup levels at Superfund sites. Dioxin cleanup levels based on the 2012 non-cancer RfD are expected to be within the cancer risk range currently used by USEPA's Superfund cleanup program (USEPA 2021e).

For chromium, non-cancer hazards and cancer risks were based on using toxicity values for the more potent form of chromium, Cr(VI). This is a health-protective approach, but likely overestimates actual chromium risks. Chromium was only evaluated as total chromium in Site samples. There is no indication that historical Mill operations used or generated Cr(VI), and there is no information available to understand the ratio of Cr(VI) to Cr(III) in Site soils or groundwater. Adding to this source of uncertainty, Cr(VI) is expected to readily reduce to Cr(III) in soil (USEPA 1998). On this basis, evaluating chromium risks as being attributed to 100% exposure to Cr(VI) is a significant source of uncertainty that suggests that the estimated cancer risks associated with chromium in this assessment are overestimated.

For manganese, toxicity data in humans generally agree that occupational exposures to manganese dust in the air results in central nervous system pathology. However, data on the neurotoxicity of orally ingested manganese at relatively low doses are less consistent, albeit suggestive (USEPA 2021q). Additionally, many variables including environmental factors and biological factors can influence manganese absorption. The IRIS oral RfD for manganese in water is particularly uncertain as it is based on an upper dietary intake rate of 10 mg/day, instead of quantitative information to indicate toxic levels of manganese in the diet of humans. A modifying factor of 3 is applied for evaluating exposures from drinking water adding to the conservativeness of the overall non-diet RfD. Because of the conservativeness of the oral RfD for manganese, it is likely that uncertainty associated with this toxicity value will result in an overestimation rather than an underestimation of risk for the general receptors of concern (USEPA 2021q). However, the RfD of 2.4E-02 mg/kg-day is consistent with the recently derived MDEQ public health goal for manganese in drinking water based on being protective of formula-fed infants (MDEQ 2020).

Where available, subchronic toxicity values were used to evaluate exposures to construction workers. These values were higher than the chronic toxicity values. Similar conclusions of no unacceptable risks to hypothetical future construction workers from exposures to OU3 soils were maintained when chronic toxicity values were used.

6.3 Uncertainties in Risk Characterization

Because risk estimates for a chemical are derived by combining uncertain estimates of exposure and toxicity (see above), the risk estimates for each chemical are more uncertain than either the exposure estimate or the toxicity estimate alone. The hazards and risks presented in this assessment are based on numerous and often conservative assumptions in an effort to be protective of human health. In the absence of definitive information, assumptions are used to ensure that actual site risks are not underestimated. The cumulative effect of these assumptions can result in an evaluation with an overall conservativeness greater than the individual components. Thus, it is important to note that the risks presented in this assessment are more likely to be overestimated rather than underestimated.

6.3.1 Uncertainties Risk Estimates Based on Fish Consumption

Risk estimates for fish consumption presented in this assessment assume that 100% of fish consumed by a fisher is comprised of locally caught fish. This is a conservative assumption that likely overestimates actual risks, particularly for a recreational fisher who likely consumes fish caught from the Site only occasionally. For a tribal fisher, this assumption may not be considered as conservative, but there is no information to determine the magnitude to which this assumption may overestimate risks. Currently, there is a fish advisory in place on the CFR within the OU3 study area that recommends against eating collected fish (State of Montana 2021). This may result in limiting fish consumption (and subsequent exposure), but it is unknown to what extent consumption is actually limited.

Risk estimates for fish consumption are based on fish collected during one sampling event. This presents uncertainty in temporal variability. As noted in Section 2.6, a similar fish sampling effort to that conducted in 2019 was also conducted in 2018. As described in USEPA (2019, 2020), these data were not used in the risk characterization due to sampling compliance issues. As noted in USEPA (2019), these issues included the lack of chain-of-custody (COC) forms and a lack of QC field samples. The lack of COC forms limits the Agency's ability to confirm the integrity of the fish tissue samples (during transmittal to and upon receipt at the laboratory) and the accuracy of sample identification numbers, collection times, etc. in the context of Superfund policies. Similarly, the lack of reliable field QC samples limits the USEPA's ability to verify that contamination of samples and/or cross-contamination between samples did not occur. Under the Superfund requirements to meet data quality, the 2018 fish cannot be quantitatively used as the basis of decision-making. However, USEPA does not consider the data criteria limitations of the 2018 fish to significantly impact the concentrations of contaminants within the fish tissues themselves. Therefore, USEPA considers these data useful for further characterizing the uncertainties in fish consumption risk estimates. Non-cancer hazards and cancer risks were

estimated following the same approach applied in Section 5 using EPCs derived based on the combined 2018 and 2019 dataset. Tables 6-2 and 6-3 summarize the results. As shown, combining the 2018 and 2019 fish tissue samples results in the same general risk conclusions as determined based on the 2019 dataset alone. However, the magnitude of the risk estimates is slightly lower based on the combined dataset.

6.3.2 Uncertainties Based on Background Concentrations

In order to incorporate feedback from USEPA Headquarters, be consistent with guidance, and increase transparency, this risk assessment will no longer use background concentrations as criteria for screening COPCs for targeted risk evaluation as was performed in the previous draft. High background concentrations that are either naturally occurring or attributable to non-Site related sources, such as other industrialized areas, may nevertheless contribute to collective risk at the Site and are thus appropriately included in the risk assessment. Although evaluation of background is an important consideration for risk management decisions, the risk assessment does not make remedial decisions but only documents risks associated with the site as consistent with USEPA guidance. USEPA will narrow the list of COPCs, considering background information, as the remedial investigation process continues.

The USEPA has developed a preferred approach for the consideration of background constituent concentrations of hazardous substances, pollutants, and contaminants in certain steps of the remedy selection process. USEPA does not require remedial action or further investigation of contaminants that are below background (non-site related) levels (USEPA 2002c). Quantitative evaluation of background contributions to risk estimates may be necessary when making risk management decisions. The purpose of the HHRA is to quantify potential Site-related risks to receptors within the currently defined study area. On this basis, risk estimates were generated based on the assumption that 100% of the detected contamination in Site samples is attributed to historical Mill operations. However, some of the estimated risk may be associated with COPC concentrations attributable to natural and/or anthropogenic non-point sources. Naturally occurring constituents are present in the environment in forms that have not been influenced by human activity. MDEQ (2005) notes that arsenic may occur naturally in Montana soils at levels above risk-based concentrations. Conversely, contaminants may also be present in the environment as a result of human activities not specifically related to the Site. Some contaminants detected in Site media may have both natural and non-Site related anthropogenic sources, in addition to contributions from historic Site activities. For instance, dioxins have multiple anthropogenic and natural point and non-point sources, making it difficult to evaluate whether concentrations at the Site are due to the bleaching process conducted as part of historical Mill operations, or other sources (e.g., forest fires, barrel trash burning, etc.).

Sources of background information relevant to OU3 include the MDEQ soil background studies on dioxins/furans and metals (MDEQ 2011, 2013), as well as available groundwater data collected from monitoring wells located upgradient from any potential Site contamination and upstream surface water, sediment and fish sampling within the CFR [16]. Evaluation of these data as part of ongoing RI activities may provide risk managers with a better understanding of the predicted risks presented in this assessment. For example, surface water and sediment concentrations of arsenic and chromium in the CFR within the OU3 study area generally fall within the range of arsenic and chromium concentrations measured in samples collected from locations within the CFR upstream of the Site[17].

[16] These data are included in the Scribe database for the Site.
[17] Based on a qualitative comparison of data collected as part of the RI that are included in the Site-specific Scribe database.

7.0 SUMMARY AND CONCLUSIONS

Multiple investigations performed at the Site have produced data for characterizing exposures to Site-related COPCs and associated risks to potential human receptors within OU3. This HHRA assesses potential risks to hypothetical future residents, commercial/industrial workers, and construction workers within the OU3 upland area based on current Site conditions. This HHRA also assesses potential risks to tribal fishers and recreational visitors including hikers, campers, and fishers within the upland and floodplain areas of OU3. Risk characterization used exposure data for OU3 soils and groundwater from wells within the OU3 boundary, as well as fish tissue data. Predicted risks were calculated as non-cancer hazards (HIs and HQs) and excess cancer risk. Risks were estimated above a level of concern for potential human receptors at the OU3 Site based primarily on ingestion of groundwater as drinking water and consumption of locally caught game fish as summarized below.

7.1 Risks to Hypothetical Future Residents

The evaluation in this HHRA predicts potential unacceptable risks to hypothetical future residents in OU3 from exposures to surface soils and groundwater. Non-cancer hazards for a hypothetical future child resident from incidental ingestion of surface soils are predicted to be > 1E+00 in 27 exposure area grids within OU3. The highest predicted HI for a child resident is within grid 74 (the area of former settling pond 17). The non-cancer HIs for exposures by CTE and RME child residents to soils within this area were 4E+00 and 1E+01, respectively. In this grid, the primary risk driver is $TEQ_{D/F}$ (HQs of 2E+00 and 6E+00 for the CTE and RME receptors, respectively). Dermal non-cancer effects associated with arsenic and thallium also correspond to a target organ HI > 1E+00 for the RME child resident within grid 74 (HI=2E+00). HQs for $TEQ_{D/F}$ also exceed 1E+00 in three other grids (grids 58, 67 and 68). The only other target organ HI that exceeds 1E+00 is based on nervous system effects within grid 55. The predicted target organ HI for a RME child in this grid is 2E+00 based primarily on incidental ingestion of manganese in surface soils. Unacceptable cancer risks for hypothetical future residents exposed to surface soils are also predicted in a number of OU3 soil exposure grids. The estimated cancer risks ≥ 1E-04 are primarily driven by risks associated with chromium when evaluated as Cr(VI). Cr(VI) represents the more toxic, and carcinogenic, form of chromium. Qualitative information suggests that chromium is more likely to exist within the environment as the less toxic trivalent form. Available data are for total chromium only, and there is no data on the ratio of Cr(VI) to Cr(III) in OU3 soils. However, there is no information to suggest that hexavalent chromium was used or produced as a waste product during historic Mill operations. On this basis, these cancer risks are likely overestimated. Further evaluation within the RI/FS regarding chromium forms that exist in OU3 soils and/or relative comparisons with background chromium concentrations will help to address this significant source of uncertainty.

Elevated levels of manganese and arsenic, and to a lesser extent cobalt, chromium, and iron, in groundwater may contribute to risks above a level of concern for hypothetical future residents who consume Site groundwater as drinking water. Non-cancer hazards for these COPCs exceeded USEPA's health guideline (HI≤1E+00) for the CTE resident in most wells and for the RME resident in all wells evaluated in this assessment. In addition to the potential for exposure to arsenic in groundwater to cause non-cancer effects in residential receptors, arsenic is also considered a known human carcinogen. The estimated cancer risks associated with drinking arsenic in groundwater for residential use exceeded 1E-04 for the RME resident in 23 wells, and in five wells for the CTE resident. Levels of arsenic in groundwater may contribute to excess cancer risks above USEPA's health guideline (cancer risk ≤ 1E-04). Chromium may also contribute to unacceptable excess cancer risks associated with the consumption of groundwater as drinking water. However, as noted above chromium was evaluated as Cr(VI) in this assessment which likely overestimates actual cancer risks as chromium is more likely to be present in the environment as the less toxic Cr(III).

7.2 Risks to Hypothetical Future Workers

Acceptable risks are predicted for exposures by hypothetical future commercial/industrial and/or construction workers from exposures to OU3 soils.

Elevated levels of manganese, and to a lesser extent arsenic and cobalt, in groundwater may contribute to risks above a level of concern for hypothetical future commercial/industrial workers who consume Site groundwater as drinking water. Predicted non-cancer HIs for these COPCs exceeded 1E+00 for the CTE worker in seven wells and for the RME worker in twenty wells. However, endpoint specific HIs were below a level of concern in six wells where the total HI exceeds 1E+00 for the RME worker. Levels of arsenic in groundwater may contribute to excess cancer risks above USEPA's health guideline (cancer risk ≤ 1E-04) for hypothetical future commercial/industrial workers at the OU3 Site. There are eleven wells where the estimated cancer risks associated with drinking arsenic in groundwater for commercial use exceeded 1E-04 for the RME worker. There is one well where the estimated cancer risk associated with drinking chromium in groundwater for commercial use exceeded 1E-04 for the RME worker.

Total risks (exposure to soil and groundwater) are driven by exposures to groundwater; risks from exposures to OU3 soils do not contribute significantly to total risk. There is one well (TW2R) where the non-cancer HI was equal to 1E+00, but when adding in the estimated non-cancer hazard from exposure to soil, the total HI > 1E+00. There is one well (NFMW22) where the cancer risk to a hypothetical future worker was estimated below 1E-04, but when adding in the estimated cancer risk from exposure to soil, the total cancer risk equals 1E-04.

7.3 Risks to Recreational Visitors and Tribal Fishers

7.3.1 Risks to Recreational Visitors

In this assessment it was assumed that a hiker may be exposed to surface soils across OU3. Acceptable risks were predicted for potential direct contact exposures (incidental ingestion and dermal contact) to OU3 surface soils while hiking (HI ≤ 1E+00, cancer risk < 1E-04).

In this assessment it was assumed that a camper may be exposed to surface soils while camping, but may also consume surface water from the CFR or on-site creeks as drinking water, and be exposed while recreating within the CFR to surface water and sediments. Acceptable risks were predicted for direct contact exposures by campers to most OU3 soils, with the exception of surface soils in grid 74. The cancer risk predicted from exposures to OU3 soils in Grid 74 is 1E-04 for the RME scenario. This cancer risk is based on total risk from $TEQ_{D/F}$, arsenic, and chromium. However, the individual contaminant predicted cancer risks are all below 1E-04. Cancer risks predicted for campers from exposures to OU3 soils in all other grids are below 1E-04. Acceptable risks are predicted based on exposures by campers to surface waters and sediments in on-site creeks or in the CFR.

In this assessment it was assumed that a recreational fisher may be exposed to surface soils in the OU3 floodplain and surface water and sediment in the CFR while fishing. Acceptable risks were predicted for such exposures while fishing (HI ≤ 1E+00, cancer risk < 1E-04). It was also assumed that a recreational fisher would consume the fillets of fish collected from the CFR. Unacceptable risks based on fish consumption were predicted for the recreational fisher. Levels of TEQ_{PCB}, $TEQ_{D/F/PCB}$, and total PCBs within the tissues of game fish in the CFR from within the OU3 study area may contribute to risks above a level of concern for fishers who consume these fish as a significant portion of their diet. Unacceptable non-cancer hazards and cancer risks are predicted based on the consumption of northern pike and rainbow trout collected from the CFR within the OU3 study area. Specifically, non-cancer hazards exceed 1E+00 and cancer risks are predicted to be ≥ 1E-04 for RME recreational fishers consuming northern pike or rainbow trout. Exceedances of USEPA's risk criteria for the recreational fisher are seen for TEQ_{PCB} and $TEQ_{D/F/PCB}$, but not for $TEQ_{D/F}$. This suggests that coplanar PCBs are contributing most of the risk to TEQ. Non-cancer hazards for a CTE child recreational fisher also exceed 1E+00 for TEQ_{PCB} and $TEQ_{D/F/PCB}$,in northern pike fillets. Non-cancer hazards for the CTE receptor are below 1E+00 for rainbow trout fillets. When cooking loss is assumed, non-cancer hazards and cancer risks are reduced, but HQs > 1E+00 are still observed for the RME child consuming TEQ_{PCB} and $TEQ_{D/F/PCB}$ in northern pike and rainbow trout fillets. Cancer risk is equal to 1E-04 for the RME child consuming $TEQ_{D/F/PCB}$ in northern pike fillets.

Total non-cancer HI and cancer risks summed across exposure pathways for recreational fishers are similar to the predicted HIs and cancer risks based on fish consumption. Consumption of locally caught fish represents the risk driver for a recreational fisher based on the scenario evaluated in this assessment.

7.3.2 Risks to Tribal Fishers

In this assessment it was assumed that a tribal fisher may be exposed to surface soils in the OU3 floodplain and surface water and sediment in the CFR while fishing. Acceptable non-cancer hazards and cancer risks are predicted for a tribal fisher from exposures to OU3 floodplain soils and/or CFR surface waters and sediments while fishing (HI ≤ 1E+00, cancer risk < 1E-04). However, similar to the recreational fisher, unacceptable non-cancer hazards and cancer risks are predicted for the tribal fisher based on the consumption of fish collected from the CFR within the OU3 study area. The highest HQs and cancer risk estimates are based on $TEQ_{D/F/PCB}$. Comparing the HQs and cancer risk estimates for $TEQ_{D/F}$ and TEQ_{PCB} indicates that coplanar PCBs are contributing the majority of risk. However, the non-cancer HQ for $TEQ_{D/F}$ is also above 1E+00 for the child RME tribal fisher when assuming no cooking loss. When cooking loss is assumed, the $TEQ_{D/F}$ HQ for the RME tribal fisher is predicted to be less than 1E+00 when consuming fillets only, or when consuming whole-body rainbow trout. The $TEQ_{D/F}$ HQ remains > 1E+00 for the tribal child consuming whole-body northern pike, even when cooking loss is assumed. Total non-cancer HI and cancer risks summed across exposure pathways for tribal fishers are similar to the predicted HIs and cancer risks based on fish consumption. Consumption of locally caught fish represents the risk driver for a tribal fisher based on the scenario evaluated in this assessment. Uncertainties associated with the amount of fish consumed by members of the CSKT was evaluated by assuming a higher fish ingestion rate as described in Section 6.3.1. Higher non-cancer hazards and cancer risks are predicted when assuming higher ingestion.

7.3.3 Summary of Risks Associated with Recreational and Tribal Activities

Acceptable risks were predicted for potential exposures by hikers and fishers to OU3 soils, CFR and on-site creek surface water, and CFR sediments. Acceptable risks were also predicted for campers with the exception of incidental ingestion exposure to surface soils in grid 74. The unacceptable risk predicted in grid 74 is based on the cumulative cancer risk summed across the predicted risk estimates for $TEQ_{D/F}$, arsenic and chromium. As discussed in the uncertainty assessment, a significant source of uncertainty in this risk estimate for chromium is associated with assuming that the concentration of total chromium measured in soils is 100% attributable to the more toxic hexavalent form of chromium. Chromium is more likely to exist primarily as the less toxic trivalent form in environmental media without a known source of hexavalent

chromium. There is also uncertainty in the cancer slope factor for TCDD which contributes to uncertainty in the cancer risk estimate for $TEQ_{D/F}$.

Unacceptable risks associated with the recreational and tribal scenarios evaluated in this assessment are predicted for fishers consuming fish collected from the CFR within the OU3 study area. Risk estimates derived for the purposes of this assessment were based on conservative exposure assumptions including assuming that 100% of a fisher's diet was comprised of locally caught fish. This type of assumption likely overestimates actual risks associated with fish consumption, but nonetheless it is considered health protective consistent with USEPA Superfund guidance.

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TABLES

OU3 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment

Table 3-1. OU3 Site Data Summary

Media	Sample Date	Sample Description	Analysis	Reference
Upland Surface Soil	April 2014	Surface (0-2.4 inches) soil samples were collected from 7 locations (n=7). Surface (0-6 inches) soil samples were collected from 13 locations (n=13). Samples were 5-point composites collected over a square meter area.	Aroclors (n=19), TAL metals (n=19), dioxins and furans (n=20).	NewFields 2015
	December 2015	Two surface (0-2 inches and 5-7 inches) soil samples were collected at 8 locations (n=16). Samples were 5-point composites collected over an area of 1 to 3-meter radius.	TAL metals and dioxins and furans.	NewFields 2015, 2016a
	October 2017	Composite surface (0-6 inches) soil samples were collected from 24 areas (n=24). Samples were 20-point composites collected over a 20-acre grid. 30-point composites were collected over the area of a historically defined basin/pond.	TAL metals, dioxins and furans and TOC.	NewFields 2017
Upland Subsurface Soil	April/May 2014	Subsurface soil samples were collected from 11 locations at varying depths from 1 to 10 feet (n=12). Samples were discrete samples.	Aroclors (n=10), TAL metals (n=10), dioxins and furans (n=12).	NewFields 2015
	December 2015	Subsurface soil samples were collected from 26 locations at varying depths from 0 to 12 feet (n=26). Samples were a vertical composite.	Aroclors (n=4), TAL metals (n=26), and dioxins and furans (n=26).	NewFields 2016a
	October 2017	Composite subsurface (24-30 inches) soil samples were collected from 14 area (n=14). Samples were discrete samples.	Dioxins and furans, TAL metals, and TOC.	NewFields 2017
Floodplain Surface Soil	April 2014	Surface (0-2.4 inches and 0-6 inches) soil samples were collected from 2 locations (n=2). Samples were 5-point composites collected over a square meter area.	Aroclors, TAL metals, dioxins and furans.	NewFields 2015
	December 2015	Surface (0-2 inches) soil samples were collected at 17 locations (n=17). Samples were 5-point composites collected over an area of 1 to 3-meter radius.	TAL metals, dioxins and furans and TOC.	NewFields 2015, 2016a
	October 2017	Composite surface (0-6 inches) soil samples were collected from 5 areas (n=5). Samples were 20-point composites collected over a 100-acre grid.	TAL metals, dioxins and furans and TOC.	NewFields 2017
Floodplain Subsurface Soil	April/May 2014	Subsurface soil samples were collected from 1 to 1.5 feet at 1 location and from 5.5 to 6 feet at 1 location (n=2). Samples were discrete samples.	Aroclors, TAL metals, and dioxins and furans.	NewFields 2015
	October 2017	Composite subsurface (24-30 inches) soil samples were collected from 6 areas (n=6). Samples were discrete samples. Samples were discrete samples.	Dioxins and furans, TAL metals, and TOC.	NewFields 2017
Groundwater	April 2014	Twenty shallow wells sampled (n=20).	Aroclors, total and dissolved TAL metals, dioxins and furans and miscellaneous parameters (e.g. DO, temperature, etc.).	NewFields 2015
	December 2015	Twenty-six shallow wells sampled (n=26). Eighteen of the wells sampled in 2014 were also sampled during this event.	Aroclors (n=2), total and dissolved TAL metals (n=26), dioxins and furans (n=26), SVOCs (n=8), VOCs (n=8), and miscellaneous parameters (e.g. DO, temperature, etc.; n=26).	NewFields 2015, 2016a
	June 2016	Twenty-three wells sampled (n=23). All of the wells were previoulsy sampled in 2015.	Aroclors (n=5), dissolved TAL metals (n=23), dioxins and furans (n=22), and miscellaneous parameters (e.g. DO, temperature, etc.; n=23).	NewFields 2016b
	January/March/June/ July/December 2017	Twenty-six shallow wells sampled (n=29). All of the wells were previously sampled at least once before in 2015 and 2016.	Aroclors (n=12), total and dissolved TAL metals (n=29), dioxins and furans (n=29), SVOCs (n=12), VOCs (n=12), and miscellaneous parameters (e.g. DO, temperature, etc.; n=29).	NewFields 2017a,b
	January/May/June/ December 2018	Same wells sampled previously.	Aroclors, total and dissolved TAL metals, dioxins and furans, SVOCs and VOCs, and miscellaneous parameters (e.g. DO, temperature, etc.).	NewFields 2017b
	June/September/ October 2019	Same wells sampled previously.	Aroclors, total and dissolved TAL metals, dioxins and furans, SVOCs and VOCs, and miscellaneous parameters (e.g. DO, temperature, etc.).	NewFields 2018a
	June/September 2020	Same wells sampled previously.	Aroclors, total and dissolved TAL metals, dioxins and furans, SVOCs and VOCs, and miscellaneous parameters (e.g. DO, temperature, etc.).	NewFields 2020a
Bed Sediment	November 2015	Bed sediment samples were collected from 6 locations within the CFR adjacent to and downstream of the Site.	Aroclors (n=2), TAL metals (n=6), dioxins and furans (n=6), SVOCs (n=2) and TOC (n=6).	NewFields 2015, 2016a
	August 2018	Sediment samples were collected from the CFR, O'Keefe Creek, Lavalle Creek and on-Site ponds.	Dioxins and furans, TAL metals, and TOC.	NewFields 2018b
Flood Fringe Sediment	December 2015	Flood fringe sediment samples were collected from 1 location within the site boundary and 2 locations downstream of the site (n=3).	TAL metals, dioxins and furans, and TOC.	NewFields 2015, 2016a
Surface Water	November 2015	Surface water was collected from three locations within the CFR adjacent to and downstream of the Site.	Aroclors (n=2), total and dissolved TAL metals (n=3), dioxins and furans (n=3), and SVOCs (n=2).	NewFields 2015, 2016a
	August 2018	Surface water samples were collected from the CFR, O'Keefe Creek, Lavalle Creek and on-Site ponds.	Dioxins and furans, total and dissolved TAL metals, and TOC.	NewFields 2018b
Fish	June 2019	Rainbow trout and northern pike collected from reaches within the Clark Fork River adjacent to and downstream of the Site. Separate fillet (skin-on; belly flap attached) and carcass samples were submitted for analysis.	Dioxin, furan and PCB congeners, as well as percent moisture and percent lipid.	USEPA 2019

TAL = target analyte list; TOC = total organic carbon; DO = dissolved oxygen; SVOC = semi-volatile organic compound; VOC = volatile organic compound; PCB = polychlorinated biphenyl.

Table 3-2. OU3 Upland Surface Soil (0-6 inches) Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	52	52	100	3.16E-05	1.08E-04	7.56E-04	--
	$TEQ_{D/F}$ (ND=1/2DL)	52	52	100	3.17E-05	1.08E-04	7.56E-04	--
PCBs	Aroclor-1016	19	0	0	8.46E-03	4.10E-03	--	1.69E-02
	Aroclor-1221	19	0	0	5.30E-03	1.43E-03	--	1.06E-02
	Aroclor-1232	19	0	0	9.51E-03	2.96E-03	--	1.90E-02
	Aroclor-1242	19	0	0	8.42E-03	3.19E-03	--	1.68E-02
	Aroclor-1248	19	0	0	5.01E-03	1.42E-03	--	1.00E-02
	Aroclor-1254	19	0	0	7.33E-03	1.94E-03	--	1.47E-02
	Aroclor-1260	19	0	0	7.07E-03	4.99E-03	--	1.41E-02
	Aroclor-1262	19	0	0	7.94E-03	2.82E-03	--	1.59E-02
	Aroclor-1268	19	0	0	4.83E-03	1.17E-03	--	9.66E-03
Total Metals	Aluminum	51	51	100	9.88E+03	4.67E+03	1.89E+04	5.16E+00
	Antimony	43	32	74	8.02E-01	9.09E-01	3.90E+00	1.69E-01
	Arsenic	51	51	100	6.50E+00	8.01E+00	4.07E+01	2.84E-01
	Barium	51	51	100	4.58E+02	3.05E+02	1.45E+03	3.03E-01
	Beryllium	43	34	79	3.50E-01	2.40E-01	1.10E+00	9.33E-02
	Cadmium	51	50	98	1.82E+00	2.27E+00	8.30E+00	4.60E-02
	Calcium	43	43	100	9.09E+04	1.25E+05	4.98E+05	8.78E+01
	Chromium	51	51	100	1.87E+01	1.16E+01	5.82E+01	2.05E-01
	Cobalt	51	50	98	3.23E+00	1.59E+00	8.50E+00	2.49E-01
	Copper	51	51	100	3.01E+01	2.06E+01	8.94E+01	6.79E-01
	Iron	51	51	100	8.35E+03	4.59E+03	2.08E+04	2.89E+01
	Lead	51	51	100	1.56E+01	1.93E+01	1.04E+02	3.81E-02
	Magnesium	43	43	100	6.77E+03	5.04E+03	2.93E+04	1.34E+01
	Manganese	51	51	100	7.56E+02	7.75E+02	2.70E+03	3.60E-01
	Mercury	51	44	86	6.24E-01	1.38E+00	8.00E+00	1.40E-02
	Nickel	51	51	100	1.20E+01	6.83E+00	3.79E+01	2.82E-01
	Potassium	43	39	91	1.81E+03	1.77E+03	9.21E+03	5.18E+01
	Selenium	43	19	44	4.99E-01	4.61E-01	1.60E+00	3.36E-01
	Silver	51	27	53	4.96E-01	5.08E-01	1.70E+00	2.62E-01
	Sodium	43	42	98	1.66E+03	2.37E+03	8.89E+03	6.48E+01
	Thallium	51	50	98	1.71E-01	1.55E-01	7.90E-01	3.46E-02
	Vanadium	51	51	100	2.18E+01	2.15E+01	1.19E+02	3.15E-01
	Zinc	51	51	100	1.61E+02	1.61E+02	6.86E+02	1.95E+00

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-3. OU3 Floodplain Surface Soil (0-6 inches) Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	22	22	100	2.56E-05	2.86E-05	1.02E-04	--
	$TEQ_{D/F}$ (ND=1/2DL)	22	22	100	2.56E-05	2.86E-05	1.02E-04	--
PCBs	Aroclor-1016	2	0	0	5.40E-03	5.66E-04	--	1.08E-02
	Aroclor-1221	2	0	0	5.40E-03	5.66E-04	--	1.08E-02
	Aroclor-1232	2	0	0	1.01E-02	1.10E-03	--	2.03E-02
	Aroclor-1242	2	0	0	9.43E-03	1.03E-03	--	1.89E-02
	Aroclor-1248	2	0	0	4.05E-03	4.24E-04	--	8.10E-03
	Aroclor-1254	2	0	0	7.43E-03	8.13E-04	--	1.49E-02
	Aroclor-1260	2	0	0	3.38E-03	3.89E-04	--	6.75E-03
	Aroclor-1262	2	0	0	8.78E-03	9.55E-04	--	1.76E-02
	Aroclor-1268	2	0	0	4.73E-03	5.30E-04	--	9.45E-03
Total Metals	Aluminum	22	22	100	1.22E+04	4.16E+03	2.15E+04	4.70E+00
	Antimony	5	3	60	2.88E-01	2.00E-01	4.70E-01	1.64E-01
	Arsenic	22	22	100	5.73E+00	3.65E+00	1.49E+01	1.69E-01
	Barium	22	22	100	7.51E+02	6.28E+02	2.84E+03	5.04E-01
	Beryllium	5	5	100	5.46E-01	2.56E-01	9.50E-01	8.46E-02
	Cadmium	22	22	100	1.39E+00	1.37E+00	5.10E+00	3.61E-02
	Calcium	5	5	100	1.36E+04	9.56E+03	2.48E+04	1.77E+01
	Chromium	22	22	100	2.09E+01	9.57E+00	4.52E+01	2.22E-01
	Cobalt	22	22	100	3.75E+00	1.44E+00	7.10E+00	2.81E-01
	Copper	22	22	100	5.94E+01	4.36E+01	2.08E+02	4.02E-01
	Iron	22	22	100	1.09E+04	4.07E+03	2.29E+04	2.95E+01
	Lead	22	22	100	1.72E+01	8.56E+00	3.53E+01	4.97E-02
	Magnesium	5	5	100	5.06E+03	2.23E+03	8.63E+03	4.48E+00
	Manganese	22	22	100	5.68E+02	5.56E+02	1.80E+03	4.73E-01
	Mercury	22	22	100	1.02E+00	1.50E+00	5.30E+00	2.45E-02
	Nickel	22	22	100	9.70E+00	3.10E+00	1.45E+01	1.87E-01
	Potassium	5	5	100	2.30E+03	1.06E+03	4.11E+03	1.92E+01
	Selenium	5	2	40	2.22E-01	9.48E-02	3.40E-01	3.04E-01
	Silver	22	18	82	4.53E-01	4.27E-01	1.80E+00	1.69E-01
	Sodium	5	5	100	9.91E+02	8.31E+02	1.84E+03	1.46E+01
	Thallium	22	21	95	1.46E-01	5.41E-02	2.20E-01	4.89E-02
	Vanadium	22	22	100	2.20E+01	1.12E+01	4.62E+01	3.40E-01
	Zinc	22	22	100	1.68E+02	1.05E+02	4.13E+02	1.65E+00

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-4. OU3 Upland Subsurface Soil (0.5-10 feet) Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	46	46	100	5.49E-06	9.97E-06	4.30E-05	--
	$TEQ_{D/F}$ (ND=1/2DL)	46	46	100	5.69E-06	9.88E-06	4.30E-05	--
PCBs	Aroclor-1016	14	0	0	7.31E-03	3.82E-03	--	1.46E-02
	Aroclor-1221	14	0	0	6.98E-03	5.43E-03	--	1.40E-02
	Aroclor-1232	14	0	0	7.03E-03	2.34E-03	--	1.41E-02
	Aroclor-1242	14	0	0	9.06E-03	5.87E-03	--	1.81E-02
	Aroclor-1248	14	0	0	6.03E-03	3.68E-03	--	1.21E-02
	Aroclor-1254	14	1	7	1.32E-02	2.99E-02	1.17E-01	1.05E-02
	Aroclor-1260	14	1	7	1.28E-02	2.55E-02	1.00E-01	1.22E-02
	Aroclor-1262	14	0	0	5.81E-03	2.12E-03	--	1.16E-02
	Aroclor-1268	14	0	0	3.82E-03	1.11E-03	--	7.64E-03
Total Metals	Aluminum	44	44	100	6.62E+03	4.16E+03	2.10E+04	6.27E+00
	Antimony	18	3	17	1.04E-01	9.81E-02	3.80E-01	1.37E-01
	Arsenic	44	44	100	3.82E+00	6.26E+00	4.28E+01	1.83E-01
	Barium	44	44	100	2.18E+02	1.84E+02	5.90E+02	1.33E-01
	Beryllium	18	12	67	3.46E-01	3.38E-01	1.20E+00	8.23E-02
	Cadmium	44	33	75	7.61E-01	1.24E+00	6.40E+00	3.95E-02
	Calcium	18	18	100	2.19E+04	8.17E+04	3.49E+05	2.24E+01
	Chromium	44	44	100	1.22E+01	7.15E+00	3.07E+01	2.44E-01
	Cobalt	44	44	100	3.21E+00	2.09E+00	1.10E+01	2.88E-01
	Copper	44	44	100	2.26E+01	1.47E+01	6.64E+01	5.00E-01
	Iron	44	44	100	7.93E+03	4.62E+03	2.03E+04	3.29E+01
	Lead	44	44	100	1.09E+01	1.58E+01	1.02E+02	4.64E-02
	Magnesium	18	18	100	3.96E+03	2.68E+03	9.54E+03	6.78E+00
	Manganese	44	44	100	4.81E+02	5.76E+02	1.85E+03	5.15E-01
	Mercury	44	35	80	1.81E-01	2.52E-01	9.40E-01	9.55E-03
	Nickel	44	44	100	1.09E+01	9.90E+00	5.87E+01	2.35E-01
	Potassium	18	18	100	1.31E+03	9.44E+02	3.38E+03	1.82E+01
	Selenium	18	4	22	2.92E-01	3.37E-01	1.20E+00	2.94E-01
	Silver	44	17	39	3.32E-01	4.42E-01	1.50E+00	1.97E-01
	Sodium	18	16	89	8.50E+02	2.06E+03	8.90E+03	1.69E+01
	Thallium	44	31	70	1.04E-01	1.47E-01	9.60E-01	4.45E-02
	Vanadium	44	44	100	1.01E+01	5.36E+00	2.42E+01	4.03E-01
	Zinc	44	44	100	8.17E+01	1.02E+02	5.49E+02	1.96E+00

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-5. OU3 Groundwater Summary Statistics[a]

Contaminant		N	N Detect	DF (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average Detection Limit
TEQ	$TEQ_{D/F}$ (ND=0)	285	232	81	4.61E-07	1.64E-06	1.61E-05	--
	$TEQ_{D/F}$ (ND=1/2DL)	285	232	81	2.02E-06	1.73E-06	1.70E-05	--
PCBs	Aroclor-1016	67	0	0	3.92E-02	5.46E-02	--	7.84E-02
	Aroclor-1221	67	0	0	4.00E-02	5.59E-02	--	7.99E-02
	Aroclor-1232	67	0	0	3.51E-02	4.66E-02	--	7.01E-02
	Aroclor-1242	67	0	0	4.03E-02	4.79E-02	--	8.07E-02
	Aroclor-1248	67	0	0	3.75E-02	5.20E-02	--	7.51E-02
	Aroclor-1254	67	0	0	4.07E-02	5.40E-02	--	8.14E-02
	Aroclor-1260	67	5	7.5	4.34E-02	5.86E-02	3.10E-01	7.24E-02
	Aroclor-1262	67	0	0	3.48E-02	4.67E-02	--	6.97E-02
	Aroclor-1268	67	0	0	4.20E-02	6.00E-02	--	8.41E-02
Total Metals	Aluminum	275	223	81	2.75E+02	1.08E+03	1.28E+04	5.91E+01
	Antimony	275	128	47	4.93E-01	8.13E-01	7.70E+00	5.32E-01
	Arsenic	275	269	98	1.09E+01	1.27E+01	7.38E+01	2.03E+00
	Barium	275	275	100	1.73E+02	2.45E+02	1.20E+03	--
	Beryllium	244	53	22	2.56E-01	5.78E-01	4.70E+00	3.09E-01
	Cadmium	275	85	31	1.68E-01	5.73E-01	6.10E+00	1.61E-01
	Calcium	275	275	100	1.05E+05	8.52E+04	4.81E+05	--
	Chromium	275	189	69	3.49E+00	1.01E+01	1.57E+02	1.98E+00
	Cobalt	275	212	77	4.15E+00	2.10E+01	2.64E+02	9.98E-01
	Copper	275	194	71	5.16E+00	1.03E+01	9.72E+01	1.85E+00
	Iron	275	254	92	4.48E+03	8.35E+03	5.73E+04	4.56E+01
	Lead	275	203	74	6.49E-01	1.33E+00	1.49E+01	3.33E-01
	Magnesium	275	275	100	4.52E+04	4.60E+04	2.87E+05	--
	Manganese	275	274	100	4.86E+03	7.18E+03	5.15E+04	3.20E-01
	Mercury	275	11	4	4.68E-02	6.43E-02	9.60E-01	7.68E-02
	Nickel	275	253	92	8.14E+00	2.31E+01	2.60E+02	2.74E+00
	Potassium	275	275	100	2.25E+04	1.84E+04	1.26E+05	--
	Selenium	275	109	40	4.73E-01	8.06E-01	8.90E+00	7.44E-01
	Silver	275	20	7	2.78E-01	4.77E-01	3.40E-01	5.77E-01
	Sodium	275	275	100	4.12E+05	2.70E+05	1.09E+06	--
	Thallium	275	14	5	6.42E-02	8.05E-02	2.20E-01	1.25E-01
	Vanadium	275	250	91	1.40E+01	2.05E+01	1.78E+02	3.03E+00
	Zinc	275	101	37	1.62E+01	5.05E+01	4.92E+02	1.06E+01
Dissolved Metals	Aluminum	333	263	79	1.54E+02	4.75E+02	7.20E+03	2.47E+01
	Antimony	281	123	44	5.71E-01	1.04E+00	8.40E+00	4.98E-01
	Arsenic	333	331	99	1.12E+01	1.30E+01	6.59E+01	1.37E+00
	Barium	333	333	100	1.79E+02	2.46E+02	1.31E+03	--
	Beryllium	244	55	23	1.99E-01	4.80E-01	3.30E+00	1.93E-01
	Cadmium	333	89	27	1.28E-01	5.46E-01	6.20E+00	8.36E-02
	Calcium	333	333	100	1.04E+05	8.41E+04	4.55E+05	--
	Chromium	333	261	78	3.41E+00	8.42E+00	1.32E+02	7.70E-01
	Cobalt	333	283	85	4.96E+00	2.84E+01	3.78E+02	7.05E-01
	Copper	333	223	67	3.37E+00	7.35E+00	9.19E+01	1.31E+00
	Iron	333	302	91	4.18E+03	8.29E+03	5.89E+04	2.47E+01
	Lead	333	230	69	3.89E-01	7.30E-01	5.20E+00	1.73E-01
	Magnesium	333	332	100	4.43E+04	4.45E+04	2.98E+05	2.50E+03
	Manganese	333	331	99	4.75E+03	6.74E+03	5.22E+04	4.35E-01
	Mercury	333	14	4	3.92E-02	4.80E-02	8.30E-01	6.89E-02
	Nickel	333	310	93	8.17E+00	2.58E+01	2.64E+02	4.58E+00
	Potassium	333	332	100	2.26E+04	1.71E+04	1.09E+05	2.33E+03
	Selenium	281	107	38	3.44E-01	4.18E-01	2.80E+00	5.14E-01
	Silver	333	28	8	1.74E-01	3.35E-01	2.00E+00	3.45E-01
	Sodium	333	333	100	4.11E+05	2.62E+05	1.04E+06	--
	Thallium	333	27	8	5.09E-02	1.25E-01	2.00E+00	8.55E-02
	Vanadium	333	313	94	1.38E+01	1.98E+01	1.70E+02	3.54E+00
	Zinc	333	154	46	1.34E+01	4.74E+01	4.96E+02	8.38E+00
Miscellaneous Parameters	Chloride	323	322	100	3.96E+04	3.76E+04	3.32E+05	6.90E+02
	Fluoride	323	287	89	2.25E+02	1.76E+02	2.40E+03	1.58E+02
	Nitrogen, NO2 plus NO3	323	178	55	1.85E+02	6.42E+02	7.90E+03	4.36E+01
	Phosphorus (as P)	323	314	97	7.79E+02	8.60E+02	3.70E+03	6.57E+01
	Sulfate	323	323	100	5.72E+05	6.04E+05	2.75E+06	--
Semivolatiles	1,2-Diphenylhydrazine	86	0	0	1.95E+00	2.09E+00	--	3.91E+00
	1-Methylnaphthalene	86	0	0	1.85E+00	2.17E+00	--	3.71E+00
	2,4,5-Trichlorophenol	86	0	0	1.35E+00	1.65E+00	--	2.70E+00
	2,4,6-Trichlorophenol	86	0	0	1.54E+00	1.83E+00	--	3.09E+00
	2,4-Dichlorophenol	86	0	0	1.51E+00	1.79E+00	--	3.02E+00
	2,4-Dimethylphenol	86	0	0	3.10E+00	3.76E+00	--	6.21E+00

Table 3-5. OU3 Groundwater Summary Statistics[a]

Contaminant		N	N Detect	DF (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average Detection Limit
Semivolatiles	2,4-Dinitrophenol	86	0	0	2.26E+00	2.61E+00	--	4.52E+00
	2,4-Dinitrotoluene	86	0	0	1.46E+00	1.75E+00	--	2.92E+00
	2,6-Dinitrotoluene	86	0	0	1.37E+00	1.68E+00	--	2.73E+00
	2-Chloronaphthalene	86	0	0	1.83E+00	2.21E+00	--	3.67E+00
	2-Chlorophenol	86	1	1	1.44E+00	1.71E+00	1.40E+00	2.88E+00
	2-Methylnaphthalene	86	0	0	1.62E+00	2.22E+00	--	3.24E+00
	2-Nitroaniline	86	0	0	1.77E+00	2.01E+00	--	3.54E+00
	2-Nitrophenol	86	0	0	1.61E+00	1.95E+00	--	3.22E+00
	3&4-Methylphenol	48	6	13	4.07E+00	7.38E+00	4.55E+01	5.31E+00
	3,3`-Dichlorobenzidine	51	0	0	5.40E+00	8.53E+00	--	1.08E+01
	3-Nitroaniline	83	0	0	2.43E+00	2.78E+00	--	4.86E+00
	4,6-Dinitro-o-cresol	86	0	0	2.37E+00	2.69E+00	--	4.73E+00
	4-Bromophenyl phenyl ether	86	0	0	2.03E+00	2.33E+00	--	4.06E+00
	4-Chloro-3-methylphenol	86	0	0	1.43E+00	1.80E+00	--	2.87E+00
	4-Chlorophenyl phenyl ether	86	0	0	1.70E+00	2.00E+00	--	3.39E+00
	4-Nitroaniline	86	0	0	2.05E+00	2.24E+00	--	4.10E+00
	4-Nitrophenol	86	0	0	3.11E+00	3.76E+00	--	6.21E+00
	Acenaphthene	86	0	0	2.00E+00	2.20E+00	--	3.99E+00
	Acenaphthylene	86	0	0	1.89E+00	2.07E+00	--	3.77E+00
	Anthracene	86	0	0	2.28E+00	2.16E+00	--	4.56E+00
	Benzo(a)anthracene	86	0	0	2.01E+00	2.03E+00	--	4.02E+00
	Benzo(a)pyrene	86	0	0	2.07E+00	2.15E+00	--	4.14E+00
	Benzo(b)fluoranthene	86	0	0	1.98E+00	2.14E+00	--	3.97E+00
	Benzo(g,h,i)perylene	86	0	0	2.23E+00	2.30E+00	--	4.46E+00
	Benzo(k)fluoranthene	86	0	0	2.21E+00	2.22E+00	--	4.42E+00
	bis(2-Chloroethoxy)methane	86	1	1	1.54E+00	1.91E+00	7.40E+00	2.94E+00
	bis(2-Chloroethyl)ether	86	0	0	1.51E+00	1.78E+00	--	3.01E+00
	bis(2-Chloroisopropyl)ether	86	0	0	1.76E+00	2.06E+00	--	3.52E+00
	bis(2-Ethylhexyl)phthalate	86	2	2	3.89E+00	4.61E+00	5.80E+00	7.74E+00
	Butyl benzyl phthalate	86	0	0	2.27E+00	2.28E+00	--	4.53E+00
	Carbazole	86	0	0	1.90E+00	2.00E+00	--	3.81E+00
	Chrysene	86	0	0	1.99E+00	2.14E+00	--	3.98E+00
	Dibenzo(a,h)anthracene	86	0	0	2.24E+00	2.34E+00	--	4.47E+00
	Dibenzofuran	86	0	0	1.95E+00	2.09E+00	--	3.91E+00
	Dibutyl phthalate	86	0	0	2.82E+00	2.94E+00	--	5.63E+00
	Diethyl phthalate	86	0	0	1.61E+00	1.93E+00	--	3.21E+00
	Dimethyl phthalate	86	0	0	1.60E+00	1.88E+00	--	3.19E+00
	Di-n-octyl phthalate	86	1	1	2.51E+00	2.47E+00	2.70E+00	5.02E+00
	Fluoranthene	86	0	0	2.30E+00	2.26E+00	--	4.59E+00
	Fluorene	86	1	1	2.01E+00	2.12E+00	6.10E+00	3.92E+00
	Hexachlorobenzene	86	0	0	2.29E+00	2.33E+00	--	4.57E+00
	Hexachloroethane	86	0	0	2.15E+00	2.82E+00	--	4.29E+00
	Indeno(1,2,3-cd)pyrene	86	0	0	2.16E+00	2.28E+00	--	4.32E+00
	Isophorone	86	0	0	1.51E+00	1.83E+00	--	3.01E+00
	m & p-Cresols	38	1	3	3.50E+00	1.37E+01	8.57E+01	2.55E+00
	Nitrobenzene	86	0	0	1.59E+00	1.88E+00	--	3.17E+00
	n-Nitrosodimethylamine	86	0	0	1.30E+00	1.59E+00	--	2.60E+00
	n-Nitrosodi-n-propylamine	86	0	0	1.46E+00	1.74E+00	--	2.93E+00
	n-Nitrosodiphenylamine	86	0	0	2.48E+00	2.18E+00	--	4.97E+00
	o-Cresol	86	0	0	1.74E+00	2.05E+00	--	3.48E+00
	p-Chloroaniline	71	0	0	2.16E+00	2.32E+00	--	4.33E+00
	Pentachlorophenol	86	1	1	3.50E+00	4.52E+00	1.11E+01	6.76E+00
	Phenanthrene	86	0	0	1.87E+00	1.98E+00	--	3.73E+00
	Phenol	86	5	6	2.84E+00	9.42E+00	7.47E+01	2.60E+00
	Pyrene	86	0	0	1.94E+00	2.07E+00	--	3.88E+00
Volatile Organics	1,1,1,2-Tetrachloroethane	86	0	0	1.25E-01	2.59E-01	--	2.50E-01
	1,1,1-Trichloroethane	86	0	0	9.21E-02	1.79E-01	--	1.84E-01
	1,1,2,2-Tetrachloroethane	86	0	0	1.13E-01	2.21E-01	--	2.25E-01
	1,1,2-Trichloroethane	86	0	0	1.20E-01	2.37E-01	--	2.41E-01
	1,1-Dichloroethane	86	0	0	1.10E-01	2.22E-01	--	2.21E-01
	1,1-Dichloroethene	86	0	0	1.09E-01	2.10E-01	--	2.17E-01
	1,1-Dichloropropene	86	0	0	1.26E-01	2.64E-01	--	2.52E-01
	1,2,3-Trichlorobenzene	86	0	0	1.46E-01	2.71E-01	--	2.91E-01
	1,2,3-Trichloropropane	86	0	0	2.10E-01	3.42E-01	--	4.20E-01
	1,2,4-Trichlorobenzene	92	0	0	2.06E-01	4.76E-01	--	4.12E-01
	1,2,4-Trimethylbenzene	86	5	6	1.77E-01	3.22E-01	1.50E+00	2.68E-01
	1,2-Dibromo-3-chloropropane	86	0	0	1.01E+00	2.20E+00	--	2.03E+00
	1,2-Dibromoethane	86	0	0	1.52E-01	3.17E-01	--	3.04E-01

Table 3-5. OU3 Groundwater Summary Statistics[a]

Contaminant		N	N Detect	DF (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average Detection Limit
Volatile Organics	1,2-Dichlorobenzene	92	5	5	1.89E-01	5.31E-01	7.20E-01	3.44E-01
	1,2-Dichloroethane	86	0	0	1.37E-01	2.86E-01	--	2.73E-01
	1,2-Dichloropropane	86	0	0	1.19E-01	2.17E-01	--	2.37E-01
	1,3,5-Trimethylbenzene	86	0	0	8.22E-02	1.58E-01	--	1.64E-01
	1,3-Dichlorobenzene	92	11	12	6.90E-01	1.99E+00	1.19E+01	3.36E-01
	1,3-Dichloropropane	86	0	0	6.07E-02	9.05E-02	--	1.21E-01
	1,4-Dichlorobenzene	92	17	18	1.86E+00	6.01E+00	3.62E+01	3.95E-01
	2,2-Dichloropropane	86	0	0	1.25E-01	2.26E-01	--	2.50E-01
	Acetone	86	17	20	8.36E+00	1.33E+01	4.06E+01	1.41E+01
	Allyl chloride	86	0	0	2.28E-01	3.74E-01	--	4.55E-01
	Benzene	86	7	8	1.01E-01	1.72E-01	6.40E-01	1.46E-01
	Bromobenzene	86	0	0	1.34E-01	2.74E-01	--	2.68E-01
	Bromochloromethane	86	0	0	1.77E-01	3.60E-01	--	3.54E-01
	Bromoform	86	0	0	4.54E-01	1.07E+00	--	9.07E-01
	Bromomethane	86	0	0	9.96E-01	2.44E+00	--	1.99E+00
	Carbon tetrachloride	86	0	0	1.29E-01	2.48E-01	--	2.58E-01
	Chlorobenzene	86	16	19	6.56E+00	2.51E+01	1.49E+02	2.29E-01
	Chloroethane	86	0	0	2.96E-01	6.48E-01	--	5.92E-01
	Chloroform	86	0	0	2.72E-01	5.94E-01	--	5.44E-01
	Chloromethane	86	0	0	1.73E-01	2.40E-01	--	3.47E-01
	cis-1,2-Dichloroethylene	86	0	0	1.12E-01	1.98E-01	--	2.25E-01
	cis-1,3-Dichloropropylene	86	0	0	1.26E-01	2.70E-01	--	2.52E-01
	Cumene	86	7	8	1.66E-01	3.15E-01	1.20E+00	2.35E-01
	Dibromochloromethane	86	0	0	8.34E-02	1.63E-01	--	1.67E-01
	Dichlorobromomethane	86	0	0	1.35E-01	2.86E-01	--	2.70E-01
	Dichlorodifluoromethane	86	0	0	1.66E-01	3.07E-01	--	3.31E-01
	Dichlorofluoromethane	86	0	0	9.74E-02	1.84E-01	--	1.95E-01
	Ethyl ether	86	1	1	9.10E-02	1.31E-01	1.70E-01	1.80E-01
	Ethylbenzene	86	0	0	9.67E-02	1.78E-01	--	1.93E-01
	Hexachlorobutadiene	92	0	0	2.54E-01	4.79E-01	--	5.08E-01
	m & p-Xylenes	86	10	12	3.31E-01	5.35E-01	1.70E+00	4.25E-01
	Methyl ethyl ketone	86	0	0	7.87E-01	1.29E+00	--	1.57E+00
	Methyl isobutyl ketone	86	0	0	4.39E-01	5.93E-01	--	8.78E-01
	Methylcyclohexane	2	0	0	1.80E-01	0.00E+00	--	3.60E-01
	Methylene bromide	86	0	0	1.21E-01	2.14E-01	--	2.41E-01
	Methylene chloride	86	3	3	7.30E-01	1.36E+00	2.60E+00	1.34E+00
	MTBE (Methyl tert-butyl ether)	86	0	0	1.02E-01	2.11E-01	--	2.04E-01
	Naphthalene	92	2	2	3.57E-01	7.98E-01	9.60E-01	7.04E-01
	n-Butyl benzene	86	0	0	1.52E-01	3.16E-01	--	3.04E-01
	n-Propyl benzene	86	4	5	9.67E-02	1.71E-01	7.90E-01	1.51E-01
	o-Chlorotoluene	86	0	0	1.10E-01	2.15E-01	--	2.20E-01
	o-Xylene	86	5	6	1.45E-01	2.93E-01	1.40E+00	2.14E-01
	p-Chlorotoluene	86	0	0	9.01E-02	1.80E-01	--	1.80E-01
	p-Isopropyltoluene	86	8	9	3.53E+01	2.78E+02	2.56E+03	1.62E-01
	sec-Butyl benzene	86	1	1	1.10E-01	2.07E-01	6.30E-01	2.07E-01
	Styrene	86	0	0	1.16E-01	2.49E-01	--	2.32E-01
	tert-Amyl methyl ether	2	0	0	8.00E-02	0.00E+00	--	1.60E-01
	tert-Butyl benzene	86	0	0	9.77E-02	1.95E-01	--	1.95E-01
	Tetrachloroethylene	86	0	0	1.22E-01	2.19E-01	--	2.43E-01
	Tetrahydrofuran	86	0	0	1.63E+00	2.92E+00	--	3.26E+00
	Toluene	86	14	16	1.59E-01	3.98E-01	3.00E+00	1.46E-01
	trans-1,2-Dichloroethylene	86	0	0	9.46E-02	1.49E-01	--	1.89E-01
	trans-1,3-Dichloropropylene	86	0	0	1.15E-01	2.43E-01	--	2.31E-01
	Trichloroethylene	86	0	0	9.82E-02	2.00E-01	--	1.96E-01
	Trichlorofluoromethane	86	0	0	1.42E-01	3.07E-01	--	2.84E-01
	Trichlorotrifluoroethane	86	0	0	1.64E-01	2.83E-01	--	3.28E-01
	Vinyl chloride	86	0	0	7.18E-02	1.20E-01	--	1.44E-01
	Xylenes (Total)	86	8	9	3.41E-01	6.00E-01	2.60E+00	4.18E-01

DF = Detection Frequency; TEQ = Toxicity Equivalence; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; PCBs = Polychlorinated Biphenyls; ND = non-detect; DL = detection limit

[a]Concentrations reported in units of µg/L

[b]Non-detects evaluated at 1/2 the DL

Table 3-6. Clark Fork River Bed Sediment Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	20	20	100	2.75E-07	1.56E-07	5.69E-07	--
	$TEQ_{D/F}$ (ND=1/2DL)	20	20	100	5.81E-07	1.70E-07	9.08E-07	--
PCBs	Aroclor-1016	2	0	0	5.63E-03	5.30E-04	--	1.13E-02
	Aroclor-1221	2	0	0	1.31E-02	1.24E-03	--	2.62E-02
	Aroclor-1232	2	0	0	5.83E-03	5.30E-04	--	1.17E-02
	Aroclor-1242	2	0	0	1.50E-02	1.41E-03	--	2.99E-02
	Aroclor-1248	2	0	0	9.65E-03	9.19E-04	--	1.93E-02
	Aroclor-1254	2	0	0	3.63E-03	3.18E-04	--	7.25E-03
	Aroclor-1260	2	0	0	3.70E-03	3.54E-04	--	7.40E-03
	Aroclor-1262	2	0	0	4.93E-03	4.60E-04	--	9.85E-03
	Aroclor-1268	2	0	0	3.38E-03	3.18E-04	--	6.75E-03
Total Metals	Aluminum	20	20	100	5.80E+03	2.00E+03	1.00E+04	8.54E+00
	Antimony	14	14	100	4.05E-01	1.32E-01	6.70E-01	1.99E-01
	Arsenic	20	20	100	8.78E+00	3.59E+00	1.79E+01	3.10E-01
	Barium	20	20	100	1.48E+02	4.74E+01	2.74E+02	2.05E-01
	Beryllium	14	14	100	4.24E-01	1.26E-01	6.30E-01	8.56E-02
	Cadmium	20	20	100	5.47E-01	2.16E-01	1.00E+00	5.21E-02
	Chromium	20	20	100	7.12E+00	2.16E+00	1.14E+01	2.82E-01
	Cobalt	20	20	100	3.59E+00	1.09E+00	5.60E+00	2.95E-01
	Copper	20	20	100	8.74E+01	4.31E+01	1.92E+02	4.90E-01
	Iron	20	20	100	8.62E+03	2.25E+03	1.32E+04	2.99E+01
	Lead	20	20	100	1.79E+01	6.40E+00	2.93E+01	1.04E-01
	Manganese	20	20	100	3.72E+02	2.02E+02	8.32E+02	3.90E-01
	Mercury	20	20	100	1.53E-01	7.28E-02	3.00E-01	1.53E-02
	Methyl Mercury	14	14	100	6.29E-03	4.25E-03	1.91E-02	1.82E-03
	Nickel	20	20	100	5.99E+00	1.84E+00	9.40E+00	3.77E-01
	Selenium	14	8	57	3.68E-01	3.01E-01	9.60E-01	2.76E-01
	Silver	20	11	55	3.29E-01	1.91E-01	7.20E-01	2.99E-01
	Thallium	20	18	90	1.19E-01	4.21E-02	1.90E-01	6.24E-02
	Vanadium	20	20	100	1.22E+01	3.46E+00	1.90E+01	4.74E-01
	Zinc	20	20	100	1.82E+02	5.68E+01	2.99E+02	2.38E+00
Semivolatiles	1,2,4-Trichlorobenzene	2	0	0	1.65E-01	1.64E-01	--	3.31E-01
	1,2-Dichlorobenzene	2	0	0	6.46E-02	6.42E-02	--	1.29E-01
	1,2-Diphenylhydrazine	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	1,3-Dichlorobenzene	2	0	0	6.32E-02	6.27E-02	--	1.26E-01
	1,4-Dichlorobenzene	2	0	0	6.70E-02	6.65E-02	--	1.34E-01
	1-Methylnaphthalene	2	0	0	1.73E-01	1.72E-01	--	3.46E-01
	2,4,5-Trichlorophenol	2	0	0	1.20E-01	1.19E-01	--	2.40E-01
	2,4,6-Trichlorophenol	2	0	0	1.29E-01	1.28E-01	--	2.58E-01
	2,4-Dichlorophenol	2	0	0	1.89E-01	1.88E-01	--	3.78E-01
	2,4-Dimethylphenol	2	0	0	1.88E-01	1.87E-01	--	3.76E-01
	2,4-Dinitrophenol	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	2,4-Dinitrotoluene	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	2,6-Dinitrotoluene	2	0	0	8.58E-02	8.52E-02	--	1.72E-01
	2-Chloronaphthalene	2	0	0	1.57E-01	1.56E-01	--	3.14E-01
	2-Chlorophenol	2	0	0	2.34E-01	2.33E-01	--	4.68E-01
	2-Methylnaphthalene	2	0	0	1.80E-01	1.78E-01	--	3.59E-01
	2-Nitroaniline	2	0	0	1.09E-01	1.08E-01	--	2.17E-01
	2-Nitrophenol	2	0	0	1.72E-01	1.70E-01	--	3.43E-01
	3,3`-Dichlorobenzidine	2	0	0	1.40E-01	1.39E-01	--	2.80E-01
	3-Nitroaniline	2	0	0	1.03E-01	1.02E-01	--	2.05E-01
	4,6-Dinitro-o-cresol	2	0	0	2.00E-01	1.98E-01	--	3.99E-01
	4-Bromophenyl phenyl ether	2	0	0	1.07E-01	1.06E-01	--	2.13E-01
	4-Chloro-3-methylphenol	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	4-Chlorophenyl phenyl ether	2	0	0	1.15E-01	1.15E-01	--	2.31E-01
	4-Nitroaniline	2	0	0	8.78E-02	8.72E-02	--	1.76E-01
	4-Nitrophenol	2	0	0	1.05E-01	1.04E-01	--	2.10E-01
	Acenaphthene	2	0	0	1.16E-01	1.15E-01	--	2.31E-01
	Acenaphthylene	2	0	0	1.31E-01	1.30E-01	--	2.63E-01
	Anthracene	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Benzo(a)anthracene	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Benzo(a)pyrene	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Benzo(b)fluoranthene	2	0	0	1.27E-01	1.26E-01	--	2.54E-01
	Benzo(g,h,i)perylene	2	0	0	1.22E-01	1.21E-01	--	2.44E-01
	Benzo(k)fluoranthene	2	0	0	1.28E-01	1.27E-01	--	2.57E-01
	bis(2-chloroethoxy)methane	2	0	0	1.96E-01	1.94E-01	--	3.92E-01
	bis(2-chloroethyl)ether	2	0	0	6.99E-02	6.94E-02	--	1.40E-01
	Bis(2-chloroisopropyl)ether	2	0	0	2.32E-01	2.30E-01	--	4.64E-01

Table 3-6. Clark Fork River Bed Sediment Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
Semivolatiles	Bis(2-ethylhexyl)phthalate	2	0	0	1.72E-01	1.70E-01	--	3.43E-01
	Butyl benzyl phthalate	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Carbazole	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Chrysene	2	0	0	1.35E-01	1.34E-01	--	2.69E-01
	Dibenzo(a,h)anthracene	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Dibenzofuran	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Dibutyl phthalate	2	0	0	1.39E-01	1.38E-01	--	2.78E-01
	Diethyl phthalate	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Dimethyl phthalate	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Di-n-octyl phthalate	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Fluoranthene	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Fluorene	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Hexachlorobenzene	2	0	0	1.32E-01	1.31E-01	--	2.64E-01
	Hexachlorobutadiene	2	0	0	8.46E-02	8.40E-02	--	1.69E-01
	Hexachloroethane	2	0	0	6.38E-02	6.33E-02	--	1.28E-01
	Indeno(1,2,3-cd)pyrene	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Isophorone	2	0	0	1.60E-01	1.59E-01	--	3.20E-01
	m & p-cresols	2	0	0	2.01E-01	1.99E-01	--	4.01E-01
	Naphthalene	2	0	0	1.88E-01	1.87E-01	--	3.76E-01
	Nitrobenzene	2	0	0	2.03E-01	2.01E-01	--	4.06E-01
	N-Nitrosodimethylamine	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	N-Nitrosodi-n-propylamine	2	0	0	1.37E-01	1.36E-01	--	2.73E-01
	N-Nitrosodiphenylamine	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	o-Cresol	2	0	0	2.17E-01	2.16E-01	--	4.34E-01
	p-Chloroaniline	2	0	0	1.54E-01	1.53E-01	--	3.08E-01
	Pentachlorophenol	2	0	0	5.02E-01	4.99E-01	--	1.00E+00
	Phenanthrene	2	0	0	1.43E-01	1.42E-01	--	2.87E-01
	Phenol	2	0	0	2.19E-01	2.18E-01	--	4.38E-01
	Pyrene	2	0	0	1.26E-01	1.25E-01	--	2.53E-01

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-7. Clark Fork River Flood Fringe Sediment Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	3	3	100	3.40E-07	1.26E-07	4.22E-07	--
	$TEQ_{D/F}$ (ND=1/2DL)	3	3	100	7.92E-07	6.83E-08	8.71E-07	--
Total Metals	Aluminum	3	3	100	1.14E+04	1.78E+03	1.32E+04	4.90E+00
	Arsenic	3	3	100	1.76E+01	8.29E+00	2.72E+01	1.43E-01
	Barium	3	3	100	2.44E+02	1.55E+01	2.59E+02	9.40E-02
	Cadmium	3	3	100	1.63E+00	3.51E-01	2.00E+00	3.20E-02
	Chromium	3	3	100	1.29E+01	1.75E+00	1.47E+01	2.23E-01
	Cobalt	3	3	100	6.93E+00	7.51E-01	7.70E+00	2.90E-01
	Copper	3	3	100	2.07E+02	9.45E+01	3.13E+02	3.87E-01
	Iron	3	3	100	1.59E+04	2.15E+03	1.80E+04	2.92E+01
	Lead	3	3	100	4.36E+01	9.70E+00	5.32E+01	5.13E-02
	Manganese	3	3	100	6.41E+02	1.70E+02	7.68E+02	5.93E-01
	Mercury	3	3	100	2.33E-01	1.40E-01	3.90E-01	9.67E-03
	Nickel	3	3	100	1.20E+01	1.45E+00	1.34E+01	1.80E-01
	Silver	3	3	100	8.73E-01	3.20E-01	1.20E+00	1.40E-01
	Thallium	3	3	100	2.07E-01	2.52E-02	2.30E-01	5.13E-02
	Vanadium	3	3	100	1.86E+01	1.85E+00	2.04E+01	3.27E-01
	Zinc	3	3	100	4.01E+02	4.77E+01	4.56E+02	1.60E+00

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-8. Clark Fork River Surface Water Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	19	4	21	1.63E-09	5.56E-09	2.43E-08	--
	$TEQ_{D/F}$ (ND=1/2DL)	19	4	21	1.47E-06	1.77E-07	1.71E-06	--
PCBs	Aroclor-1016	2	0	0	2.25E-02	--	--	4.50E-02
	Aroclor-1221	2	0	0	9.75E-03	3.54E-04	--	1.95E-02
	Aroclor-1232	2	0	0	1.83E-02	3.54E-04	--	3.65E-02
	Aroclor-1242	2	0	0	1.40E-02	--	--	2.80E-02
	Aroclor-1248	2	0	0	6.00E-03	--	--	1.20E-02
	Aroclor-1254	2	0	0	7.75E-03	3.54E-04	--	1.55E-02
	Aroclor-1260	2	0	0	7.50E-03	--	--	1.50E-02
	Aroclor-1262	2	0	0	2.10E-02	--	--	4.20E-02
	Aroclor-1268	2	0	0	1.15E-02	--	--	2.30E-02
Total Metals	Aluminum	19	19	100	8.46E+01	1.62E+02	7.47E+02	4.84E+00
	Antimony	16	16	100	2.02E-01	1.07E-01	5.70E-01	8.24E-02
	Arsenic	19	19	100	4.26E+00	4.49E+00	2.22E+01	1.21E-01
	Barium	19	19	100	1.16E+02	1.43E+01	1.33E+02	1.01E-01
	Beryllium	16	0	0	2.76E-02	1.71E-03	--	5.53E-02
	Cadmium	19	3	16	3.19E-02	6.02E-02	2.70E-01	2.66E-02
	Calcium	16	16	100	3.33E+04	4.30E+03	3.74E+04	9.49E+01
	Chromium	19	6	32	1.89E-01	1.57E-01	7.50E-01	2.26E-01
	Cobalt	19	5	26	9.30E-02	1.02E-01	4.00E-01	9.89E-02
	Copper	19	19	100	5.73E+00	8.15E+00	2.99E+01	2.16E-01
	Iron	19	19	100	1.11E+02	1.52E+02	7.21E+02	6.86E+00
	Lead	19	19	100	3.44E-01	4.42E-01	1.60E+00	3.89E-02
	Magnesium	16	16	100	9.12E+03	1.00E+03	1.02E+04	4.75E+00
	Manganese	19	19	100	7.12E+01	9.32E+01	3.30E+02	2.25E-01
	Mercury	19	0	0	3.46E-02	1.05E-02	--	6.92E-02
	Nickel	19	18	95	2.72E-01	2.26E-01	9.10E-01	1.19E-01
	Potassium	16	16	100	2.22E+03	1.50E+03	7.84E+03	1.72E+01
	Selenium	16	1	6	7.63E-02	1.77E-02	1.40E-01	1.44E-01
	Silver	19	1	5	8.21E-02	2.86E-02	2.00E-01	1.52E-01
	Sodium	16	16	100	1.13E+04	1.30E+04	5.76E+04	2.49E+01
	Thallium	19	0	0	1.22E-02	2.13E-03	--	2.45E-02
	Vanadium	19	18	95	7.61E-01	3.60E-01	1.90E+00	2.72E-01
	Zinc	19	19	100	6.95E+00	5.92E+00	2.68E+01	1.87E+00
Dissolved Metals	Aluminum	19	6	32	1.23E+01	1.76E+01	7.09E+01	7.10E+00
	Antimony	16	16	100	7.39E-01	1.14E+00	4.00E+00	8.24E-02
	Arsenic	19	19	100	4.11E+00	4.38E+00	2.18E+01	1.21E-01
	Barium	19	19	100	1.13E+02	1.60E+01	1.38E+02	1.01E-01
	Beryllium	16	0	0	2.76E-02	1.71E-03	0.00E+00	5.53E-02
	Cadmium	19	3	16	2.59E-02	4.31E-02	2.00E-01	2.66E-02
	Calcium	19	19	100	3.16E+04	4.05E+03	4.00E+04	4.01E+01
	Chromium	19	7	37	5.60E-01	1.73E+00	7.70E+00	1.74E-01
	Cobalt	19	18	95	3.35E-01	2.12E-01	9.40E-01	9.89E-02
	Copper	19	19	100	2.80E+00	4.14E+00	1.92E+01	2.16E-01
	Iron	19	17	89	4.56E+01	9.06E+01	4.07E+02	6.86E+00
	Lead	19	10	53	1.04E-01	1.45E-01	5.30E-01	3.89E-02
	Magnesium	19	19	100	8.86E+03	1.12E+03	1.02E+04	7.16E+00
	Manganese	19	19	100	1.44E+02	3.19E+02	1.37E+03	2.76E-01
	Mercury	16	0	0	3.90E-02	6.80E-10	0.00E+00	7.80E-02
	Nickel	19	19	100	3.06E-01	1.97E-01	9.70E-01	1.19E-01
	Potassium	19	19	100	2.08E+03	1.25E+03	7.22E+03	3.44E+01
	Selenium	16	0	0	7.19E-02	5.12E-03	0.00E+00	1.44E-01
	Silver	19	0	0	7.61E-02	3.15E-03	0.00E+00	1.52E-01
	Sodium	19	19	100	1.15E+04	1.65E+04	7.82E+04	2.32E+01
	Thallium	19	0	0	1.22E-02	2.13E-03	0.00E+00	2.45E-02
	Vanadium	19	19	100	8.78E-01	2.36E-01	1.40E+00	2.72E-01
	Zinc	19	16	84	3.91E+00	2.10E+00	1.00E+01	2.05E+00
Miscellaneous Parameters	Chloride	19	19	100	3.96E+03	1.59E+03	1.00E+04	2.48E+02
	Fluoride	19	19	100	1.61E+02	2.32E+01	1.90E+02	1.88E+01
	Nitrogen, NO_2 plus NO_3	19	19	100	5.73E+01	2.68E+01	9.80E+01	4.15E+00
	Phosphorus (as P)	19	19	100	4.34E+01	6.49E+01	3.00E+02	6.53E+00
	Sulfate	19	19	100	1.82E+04	7.28E+03	4.57E+04	1.76E+02

Table 3-8. Clark Fork River Surface Water Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
Semivolatiles	1,2,4-Trichlorobenzene	2	0	0	9.50E-01	--	--	1.90E+00
	1,2-Dichlorobenzene	2	0	0	9.50E-01	--	--	1.90E+00
	1,2-Diphenylhydrazine	2	0	0	1.25E+00	--	--	2.50E+00
	1,3-Dichlorobenzene	2	0	0	8.00E-01	--	--	1.60E+00
	1,4-Dichlorobenzene	2	0	0	9.50E-01	--	--	1.90E+00
	1-Methylnaphthalene	2	0	0	1.05E+00	--	--	2.10E+00
	2,4,5-Trichlorophenol	2	0	0	1.10E+00	--	--	2.20E+00
	2,4,6-Trichlorophenol	2	0	0	1.10E+00	--	--	2.20E+00
	2,4-Dichlorophenol	2	0	0	1.15E+00	--	--	2.30E+00
	2,4-Dimethylphenol	2	0	0	3.40E+00	--	--	6.80E+00
	2,4-Dinitrophenol	2	0	0	1.40E+00	--	--	2.80E+00
	2,4-Dinitrotoluene	2	0	0	1.05E+00	--	--	2.10E+00
	2,6-Dinitrotoluene	2	0	0	1.15E+00	--	--	2.30E+00
	2-Chloronaphthalene	2	0	0	1.10E+00	--	--	2.20E+00
	2-Chlorophenol	2	0	0	1.10E+00	--	--	2.20E+00
	2-Methylnaphthalene	2	0	0	1.05E+00	--	--	2.10E+00
	2-Nitroaniline	2	0	0	1.40E+00	--	--	2.80E+00
	2-Nitrophenol	2	0	0	1.10E+00	--	--	2.20E+00
	3,3`-Dichlorobenzidine	2	0	0	2.45E+00	--	--	4.90E+00
	3-Nitroaniline	2	0	0	2.50E+00	--	--	5.00E+00
	4,6-Dinitro-o-cresol	2	0	0	1.75E+00	--	--	3.50E+00
	4-Bromophenyl phenyl ether	2	0	0	1.20E+00	--	--	2.40E+00
	4-Chloro-3-methylphenol	2	0	0	8.00E-01	--	--	1.60E+00
	4-Chlorophenyl phenyl ether	2	0	0	7.00E-01	--	--	1.40E+00
	4-Nitroaniline	2	0	0	2.20E+00	--	--	4.40E+00
	4-Nitrophenol	2	0	0	1.70E+00	--	--	3.40E+00
	Acenaphthene	2	0	0	8.00E-01	--	--	1.60E+00
	Acenaphthylene	2	0	0	1.10E+00	--	--	2.20E+00
	Anthracene	2	0	0	1.25E+00	--	--	2.50E+00
	Benzo(a)anthracene	2	0	0	2.55E+00	--	--	5.10E+00
	Benzo(a)pyrene	2	0	0	1.20E+00	--	--	2.40E+00
	Benzo(b)fluoranthene	2	0	0	1.25E+00	--	--	2.50E+00
	Benzo(g,h,i)perylene	2	0	0	1.25E+00	--	--	2.50E+00
	Benzo(k)fluoranthene	2	0	0	1.40E+00	--	--	2.80E+00
	bis(2-chloroethoxy)methane	2	0	0	7.50E-01	--	--	1.50E+00
	bis(2-chloroethyl)ether	2	0	0	1.15E+00	--	--	2.30E+00
	Bis(2-chloroisopropyl)ether	2	0	0	1.15E+00	--	--	2.30E+00
	Bis(2-ethylhexyl)phthalate	2	0	0	1.20E+00	--	--	2.40E+00
	Butyl benzyl phthalate	2	0	0	9.50E-01	--	--	1.90E+00
	Carbazole	2	0	0	1.35E+00	--	--	2.70E+00
	Chrysene	2	0	0	1.15E+00	--	--	2.30E+00
	Dibenzo(a,h)anthracene	2	0	0	9.00E-01	--	--	1.80E+00
	Dibenzofuran	2	0	0	1.15E+00	--	--	2.30E+00
	Dibutyl phthalate	2	0	0	1.20E+00	--	--	2.40E+00
	Diethyl phthalate	2	0	0	1.25E+00	--	--	2.50E+00
	Dimethyl phthalate	2	0	0	1.15E+00	--	--	2.30E+00
	Di-n-octyl phthalate	2	0	0	8.50E-01	--	--	1.70E+00
	Fluoranthene	2	0	0	1.25E+00	--	--	2.50E+00
	Fluorene	2	0	0	1.20E+00	--	--	2.40E+00
	Hexachlorobenzene	2	0	0	1.30E+00	--	--	2.60E+00
	Hexachlorobutadiene	2	0	0	8.50E-01	--	--	1.70E+00
	Hexachloroethane	2	0	0	8.50E-01	--	--	1.70E+00
	Indeno(1,2,3-cd)pyrene	2	0	0	9.00E-01	--	--	1.80E+00
	Isophorone	2	0	0	8.00E-01	--	--	1.60E+00
	m & p-cresols	2	0	0	1.15E+00	--	--	2.30E+00
	Naphthalene	2	0	0	1.00E+00	--	--	2.00E+00
	Nitrobenzene	2	0	0	1.25E+00	--	--	2.50E+00
	N-Nitrosodimethylamine	2	0	0	1.15E+00	--	--	2.30E+00
	N-Nitrosodi-n-propylamine	2	0	0	1.15E+00	--	--	2.30E+00
	N-Nitrosodiphenylamine	2	0	0	1.95E+00	--	--	3.90E+00
	o-Cresol	2	0	0	1.00E+00	--	--	2.00E+00
	p-Chloroaniline	2	0	0	1.80E+00	--	--	3.60E+00
	Pentachlorophenol	2	0	0	1.10E+00	--	--	2.20E+00
	Phenanthrene	2	0	0	1.25E+00	--	--	2.50E+00
	Phenol	2	0	0	1.10E+00	--	--	2.20E+00
	Pyrene	2	0	0	1.25E+00	--	--	2.50E+00

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of µg/L.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-9. O'Keefe Creek Sediment Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	4	4	100	6.48E-07	5.78E-07	1.45E-06	--
	$TEQ_{D/F}$ (ND=1/2DL)	4	4	100	8.01E-07	4.75E-07	1.45E-06	--
PCBs	Aroclor-1016	1	0	0	4.65E-03	--	--	9.30E-03
	Aroclor-1221	1	0	0	1.09E-02	--	--	2.18E-02
	Aroclor-1232	1	0	0	4.85E-03	--	--	9.70E-03
	Aroclor-1242	1	0	0	1.25E-02	--	--	2.49E-02
	Aroclor-1248	1	0	0	8.05E-03	--	--	1.61E-02
	Aroclor-1254	1	0	0	3.00E-03	--	--	6.00E-03
	Aroclor-1260	1	0	0	3.10E-03	--	--	6.20E-03
	Aroclor-1262	1	0	0	4.10E-03	--	--	8.20E-03
	Aroclor-1268	1	0	0	2.80E-03	--	--	5.60E-03
Total Metals	Aluminum	4	4	100	1.03E+04	2.41E+03	1.31E+04	7.63E+00
	Antimony	3	0	0	1.00E-01	1.80E-02	--	2.00E-01
	Arsenic	4	4	100	4.10E+00	3.16E-01	4.40E+00	2.88E-01
	Barium	4	4	100	1.84E+02	4.10E+01	2.21E+02	1.91E-01
	Beryllium	3	3	100	6.43E-01	6.51E-02	7.10E-01	8.77E-02
	Cadmium	4	4	100	1.69E-01	6.67E-02	2.30E-01	4.60E-02
	Chromium	4	4	100	1.01E+01	1.60E+00	1.20E+01	2.30E-01
	Cobalt	4	4	100	6.90E+00	1.39E+00	8.50E+00	2.23E-01
	Copper	4	4	100	2.23E+01	5.80E+00	2.83E+01	4.08E-01
	Iron	4	4	100	1.21E+04	9.33E+02	1.29E+04	2.28E+01
	Lead	4	4	100	1.21E+01	1.94E+00	1.32E+01	9.25E-02
	Manganese	4	4	100	2.15E+02	9.08E+01	3.50E+02	3.23E-01
	Mercury	4	4	100	3.00E-02	9.70E-03	3.70E-02	1.32E-02
	Methyl Mercury	3	0	0	8.75E-04	3.90E-04	--	1.75E-03
	Nickel	4	4	100	1.03E+01	9.06E-01	1.13E+01	3.48E-01
	Selenium	3	2	67	2.43E-01	1.10E-01	3.50E-01	2.77E-01
	Silver	4	0	0	1.38E-01	5.44E-02	--	2.75E-01
	Thallium	4	4	100	1.36E-01	4.31E-02	1.90E-01	5.05E-02
	Vanadium	4	4	100	1.33E+01	2.14E+00	1.62E+01	4.08E-01
	Zinc	4	4	100	6.96E+01	2.07E+01	8.95E+01	2.08E+00
Semivolatiles	1,2,4-Trichlorobenzene	1	0	0	4.36E-02	--	--	8.71E-02
	1,2-Dichlorobenzene	1	0	0	1.71E-02	--	--	3.41E-02
	1,2-Diphenylhydrazine	1	0	0	1.32E-01	--	--	2.64E-01
	1,3-Dichlorobenzene	1	0	0	1.67E-02	--	--	3.33E-02
	1,4-Dichlorobenzene	1	0	0	1.76E-02	--	--	3.52E-02
	1-Methylnaphthalene	1	0	0	4.56E-02	--	--	9.11E-02
	2,4,5-Trichlorophenol	1	0	0	3.16E-02	--	--	6.31E-02
	2,4,6-Trichlorophenol	1	0	0	3.40E-02	--	--	6.80E-02
	2,4-Dichlorophenol	1	0	0	4.97E-02	--	--	9.94E-02
	2,4-Dimethylphenol	1	0	0	4.95E-02	--	--	9.89E-02
	2,4-Dinitrophenol	1	0	0	1.32E-01	--	--	2.64E-01
	2,4-Dinitrotoluene	1	0	0	1.32E-01	--	--	2.64E-01
	2,6-Dinitrotoluene	1	0	0	2.26E-02	--	--	4.51E-02
	2-Chloronaphthalene	1	0	0	4.14E-02	--	--	8.28E-02
	2-Chlorophenol	1	0	0	6.15E-02	--	--	1.23E-01
	2-Methylnaphthalene	1	0	0	4.73E-02	--	--	9.45E-02
	2-Nitroaniline	1	0	0	2.87E-02	--	--	5.73E-02
	2-Nitrophenol	1	0	0	4.52E-02	--	--	9.03E-02
	3,3`-Dichlorobenzidine	1	0	0	3.68E-02	--	--	7.36E-02
	3-Nitroaniline	1	0	0	2.70E-02	--	--	5.40E-02
	4,6-Dinitro-o-cresol	1	0	0	5.25E-02	--	--	1.05E-01
	4-Bromophenyl phenyl ether	1	0	0	2.81E-02	--	--	5.62E-02
	4-Chloro-3-methylphenol	1	0	0	1.32E-01	--	--	2.64E-01
	4-Chlorophenyl phenyl ether	1	0	0	3.04E-02	--	--	6.08E-02
	4-Nitroaniline	1	0	0	2.32E-02	--	--	4.63E-02
	4-Nitrophenol	1	0	0	2.77E-02	--	--	5.54E-02
	Acenaphthene	1	0	0	3.05E-02	--	--	6.10E-02
	Acenaphthylene	1	0	0	3.46E-02	--	--	6.92E-02
	Anthracene	1	0	0	1.32E-01	--	--	2.64E-01
	Benzo(a)anthracene	1	0	0	1.32E-01	--	--	2.64E-01
	Benzo(a)pyrene	1	0	0	1.32E-01	--	--	2.64E-01

Table 3-9. O'Keefe Creek Sediment Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
Semivolatiles	Benzo(b)fluoranthene	1	0	0	3.35E-02	--	--	6.69E-02
	Benzo(g,h,i)perylene	1	0	0	3.21E-02	--	--	6.42E-02
	Benzo(k)fluoranthene	1	0	0	3.38E-02	--	--	6.76E-02
	bis(2-chloroethoxy)methane	1	0	0	5.15E-02	--	--	1.03E-01
	bis(2-chloroethyl)ether	1	0	0	1.84E-02	--	--	3.68E-02
	Bis(2-chloroisopropyl)ether	1	0	0	6.10E-02	--	--	1.22E-01
	Bis(2-ethylhexyl)phthalate	1	0	0	4.52E-02	--	--	9.03E-02
	Butyl benzyl phthalate	1	0	0	1.32E-01	--	--	2.64E-01
	Carbazole	1	0	0	1.32E-01	--	--	2.64E-01
	Chrysene	1	0	0	3.55E-02	--	--	7.09E-02
	Dibenzo(a,h)anthracene	1	0	0	1.32E-01	--	--	2.64E-01
	Dibenzofuran	1	0	0	1.32E-01	--	--	2.64E-01
	Dibutyl phthalate	1	0	0	3.67E-02	--	--	7.33E-02
	Diethyl phthalate	1	0	0	1.32E-01	--	--	2.64E-01
	Dimethyl phthalate	1	0	0	1.32E-01	--	--	2.64E-01
	Di-n-octyl phthalate	1	0	0	1.32E-01	--	--	2.64E-01
	Fluoranthene	1	0	0	1.32E-01	--	--	2.64E-01
	Fluorene	1	0	0	1.32E-01	--	--	2.64E-01
	Hexachlorobenzene	1	0	0	3.48E-02	--	--	6.95E-02
	Hexachlorobutadiene	1	0	0	2.23E-02	--	--	4.45E-02
	Hexachloroethane	1	0	0	1.68E-02	--	--	3.36E-02
	Indeno(1,2,3-cd)pyrene	1	0	0	1.32E-01	--	--	2.64E-01
	Isophorone	1	0	0	4.22E-02	--	--	8.44E-02
	m & p-cresols	1	1	100	1.19E-01	--	1.19E-01	1.06E-01
	Naphthalene	1	0	0	4.95E-02	--	--	9.89E-02
	Nitrobenzene	1	0	0	5.35E-02	--	--	1.07E-01
	N-Nitrosodimethylamine	1	0	0	1.32E-01	--	--	2.64E-01
	N-Nitrosodi-n-propylamine	1	0	0	3.60E-02	--	--	7.19E-02
	N-Nitrosodiphenylamine	1	0	0	1.32E-01	--	--	2.64E-01
	o-Cresol	1	0	0	5.70E-02	--	--	1.14E-01
	p-Chloroaniline	1	0	0	4.05E-02	--	--	8.10E-02
	Pentachlorophenol	1	0	0	1.32E-01	--	--	2.64E-01
	Phenanthrene	1	0	0	3.78E-02	--	--	7.56E-02
	Phenol	1	0	0	5.75E-02	--	--	1.15E-01
	Pyrene	1	0	0	3.33E-02	--	--	6.66E-02

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-10. O'Keefe Creek Surface Water Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	2	2	100	2.76E-09	2.29E-10	2.92E-09	--
	$TEQ_{D/F}$ (ND=1/2DL)	2	2	100	1.96E-06	2.45E-07	2.14E-06	--
Total Metals	Aluminum	2	2	100	2.35E+02	2.76E+01	2.54E+02	5.60E+00
	Antimony	2	2	100	1.95E-01	2.12E-02	2.10E-01	7.70E-02
	Arsenic	2	2	100	3.10E+00	0.00E+00	3.10E+00	1.10E-01
	Barium	2	2	100	1.44E+02	2.12E+00	1.45E+02	1.00E-01
	Beryllium	2	1	50	4.10E-02	1.98E-02	5.50E-02	5.40E-02
	Cadmium	2	0	0	1.35E-02	0.00E+00	--	2.70E-02
	Calcium	2	2	100	3.75E+04	1.41E+02	3.76E+04	2.90E+02
	Chromium	2	2	100	2.95E-01	6.36E-02	3.40E-01	1.60E-01
	Cobalt	2	2	100	1.15E-01	7.07E-03	1.20E-01	8.50E-02
	Copper	2	2	100	2.15E+00	2.12E-01	2.30E+00	2.20E-01
	Iron	2	2	100	2.03E+02	2.62E+01	2.21E+02	5.40E+00
	Lead	2	2	100	2.50E-01	2.83E-02	2.70E-01	3.90E-02
	Magnesium	2	2	100	1.12E+04	7.07E+01	1.12E+04	5.00E+00
	Manganese	2	2	100	8.00E+00	1.41E-01	8.10E+00	2.40E-01
	Mercury	2	0	0	3.90E-02	0.00E+00	--	7.80E-02
	Nickel	2	2	100	3.50E-01	1.41E-02	3.60E-01	1.10E-01
	Potassium	2	2	100	1.97E+03	7.07E+00	1.97E+03	1.79E+01
	Selenium	2	0	0	7.00E-02	0.00E+00	--	1.40E-01
	Silver	2	0	0	7.50E-02	0.00E+00	--	1.50E-01
	Sodium	2	2	100	7.96E+03	1.41E+02	8.06E+03	1.84E+01
	Thallium	2	1	50	2.30E-02	1.41E-02	3.30E-02	2.60E-02
	Vanadium	2	2	100	9.20E-01	4.24E-02	9.50E-01	2.70E-01
	Zinc	2	2	100	4.50E+00	0.00E+00	4.50E+00	1.90E+00
Dissolved Metals	Aluminum	2	2	100	1.35E+01	8.70E+00	1.96E+01	5.60E+00
	Antimony	2	2	100	2.35E-01	2.12E-02	2.50E-01	7.70E-02
	Arsenic	2	2	100	2.90E+00	0.00E+00	2.90E+00	1.10E-01
	Barium	2	2	100	1.36E+02	3.54E+00	1.38E+02	1.00E-01
	Beryllium	2	0	0	2.70E-02	0.00E+00	--	5.40E-02
	Cadmium	2	0	0	1.35E-02	0.00E+00	--	2.70E-02
	Calcium	2	2	100	3.53E+04	2.83E+02	3.55E+04	7.25E+01
	Chromium	2	1	50	1.90E-01	1.56E-01	3.00E-01	1.60E-01
	Cobalt	2	1	50	1.46E-01	1.47E-01	2.50E-01	8.50E-02
	Copper	2	2	100	1.90E+00	4.24E-01	2.20E+00	2.20E-01
	Iron	2	2	100	1.65E+01	6.86E+00	2.13E+01	5.40E+00
	Lead	2	1	50	9.48E-02	1.06E-01	1.70E-01	3.90E-02
	Magnesium	2	2	100	1.05E+04	7.07E+01	1.05E+04	5.00E+00
	Manganese	2	2	100	3.10E+00	1.84E+00	4.40E+00	2.40E-01
	Mercury	2	0	0	3.90E-02	0.00E+00	--	7.80E-02
	Nickel	2	2	100	1.70E-01	1.41E-02	1.80E-01	1.10E-01
	Potassium	2	2	100	1.83E+03	7.07E+00	1.83E+03	1.79E+01
	Selenium	2	0	0	7.00E-02	0.00E+00	--	1.40E-01
	Silver	2	0	0	7.50E-02	0.00E+00	--	1.50E-01
	Sodium	2	2	100	7.52E+03	9.19E+01	7.58E+03	1.84E+01
	Thallium	2	0	0	1.30E-02	0.00E+00	--	2.60E-02
	Vanadium	2	2	100	8.20E-01	7.07E-02	8.70E-01	2.70E-01
	Zinc	2	0	0	2.70E+00	0.00E+00	--	5.40E+00
Miscellaneous Parameters	Chloride	2	2	100	6.10E+03	0.00E+00	6.10E+03	2.80E+02
	Fluoride	2	2	100	1.75E+02	7.07E+00	1.80E+02	1.50E+01
	Nitrogen, NO2 plus NO3	2	2	100	3.10E+01	1.27E+01	4.00E+01	3.10E+00
	Phosphorus (as P)	2	2	100	6.45E+01	4.31E+01	9.50E+01	2.50E+00
	Sulfate	2	2	100	1.77E+04	2.12E+02	1.78E+04	1.90E+02

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of µg/L.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-11. Lavalle Creek Sediment Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	7	7	100	6.45E-07	1.09E-06	3.08E-06	--
	$TEQ_{D/F}$ (ND=1/2DL)	7	7	100	8.32E-07	1.07E-06	3.17E-06	--
PCBs	Aroclor-1016	3	0	0	8.10E-03	3.46E-03	--	1.62E-02
	Aroclor-1221	3	0	0	1.89E-02	8.07E-03	--	3.78E-02
	Aroclor-1232	3	0	0	8.40E-03	3.59E-03	--	1.68E-02
	Aroclor-1242	3	0	0	2.16E-02	9.21E-03	--	4.31E-02
	Aroclor-1248	3	0	0	1.39E-02	5.95E-03	--	2.79E-02
	Aroclor-1254	3	0	0	5.23E-03	2.22E-03	--	1.05E-02
	Aroclor-1260	3	0	0	5.38E-03	2.31E-03	--	1.08E-02
	Aroclor-1262	3	0	0	7.10E-03	3.03E-03	--	1.42E-02
	Aroclor-1268	3	0	0	4.88E-03	2.09E-03	--	9.77E-03
Total Metals	Aluminum	7	7	100	7.49E+03	4.28E+03	1.50E+04	8.34E+00
	Antimony	4	3	75	2.78E-01	2.40E-01	6.20E-01	1.68E-01
	Arsenic	7	7	100	6.23E+00	5.38E+00	1.55E+01	2.89E-01
	Barium	7	7	100	1.59E+02	9.38E+01	2.74E+02	1.87E-01
	Beryllium	4	4	100	3.38E-01	2.62E-01	7.30E-01	7.48E-02
	Cadmium	7	7	100	3.23E-01	3.29E-01	8.90E-01	5.23E-02
	Chromium	7	7	100	9.06E+00	4.42E+00	1.57E+01	3.06E-01
	Cobalt	7	7	100	4.07E+00	1.90E+00	6.50E+00	3.47E-01
	Copper	7	7	100	5.72E+01	5.74E+01	1.58E+02	5.36E-01
	Iron	7	7	100	9.99E+03	4.68E+03	1.64E+04	3.50E+01
	Lead	7	7	100	1.40E+01	9.71E+00	2.95E+01	9.60E-02
	Manganese	7	7	100	1.84E+02	1.35E+02	3.83E+02	3.26E-01
	Mercury	7	5	71	6.87E-02	7.69E-02	2.00E-01	1.45E-02
	Methyl Mercury	4	1	25	2.36E-03	3.49E-03	7.60E-03	1.37E-03
	Nickel	7	7	100	7.53E+00	3.34E+00	1.27E+01	3.50E-01
	Selenium	4	1	25	4.01E-01	5.99E-01	1.30E+00	2.38E-01
	Silver	7	2	29	2.39E-01	1.90E-01	5.80E-01	2.74E-01
	Thallium	7	7	100	1.19E-01	6.86E-02	2.10E-01	6.80E-02
	Vanadium	7	7	100	1.44E+01	6.59E+00	2.55E+01	4.91E-01
	Zinc	7	7	100	1.26E+02	1.16E+02	3.29E+02	2.44E+00
Semivolatiles	1,2,4-Trichlorobenzene	3	0	0	7.62E-02	3.23E-02	--	1.52E-01
	1,2-Dichlorobenzene	3	0	0	2.98E-02	1.27E-02	--	5.97E-02
	1,2-Diphenylhydrazine	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	1,3-Dichlorobenzene	3	0	0	2.91E-02	1.24E-02	--	5.83E-02
	1,4-Dichlorobenzene	3	0	0	3.08E-02	1.32E-02	--	6.16E-02
	1-Methylnaphthalene	3	0	0	7.97E-02	3.41E-02	--	1.59E-01
	2,4,5-Trichlorophenol	3	0	0	5.52E-02	2.36E-02	--	1.10E-01
	2,4,6-Trichlorophenol	3	0	0	5.96E-02	2.55E-02	--	1.19E-01
	2,4-Dichlorophenol	3	0	0	8.70E-02	3.72E-02	--	1.74E-01
	2,4-Dimethylphenol	3	0	0	8.65E-02	3.68E-02	--	1.73E-01
	2,4-Dinitrophenol	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	2,4-Dinitrotoluene	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	2,6-Dinitrotoluene	3	0	0	3.95E-02	1.69E-02	--	7.90E-02
	2-Chloronaphthalene	3	0	0	7.23E-02	3.09E-02	--	1.45E-01
	2-Chlorophenol	3	0	0	1.08E-01	4.60E-02	--	2.16E-01
	2-Methylnaphthalene	3	0	0	8.27E-02	3.54E-02	--	1.65E-01
	2-Nitroaniline	3	0	0	5.02E-02	2.15E-02	--	1.00E-01
	2-Nitrophenol	3	0	0	7.90E-02	3.38E-02	--	1.58E-01
	3,3`-Dichlorobenzidine	3	0	0	6.44E-02	2.74E-02	--	1.29E-01
	3-Nitroaniline	3	0	0	4.72E-02	2.02E-02	--	9.44E-02
	4,6-Dinitro-o-cresol	3	0	0	9.18E-02	3.91E-02	--	1.84E-01
	4-Bromophenyl phenyl ether	3	0	0	4.92E-02	2.11E-02	--	9.84E-02
	4-Chloro-3-methylphenol	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	4-Chlorophenyl phenyl ether	3	0	0	5.32E-02	2.28E-02	--	1.06E-01
	4-Nitroaniline	3	0	0	4.05E-02	1.73E-02	--	8.10E-02
	4-Nitrophenol	3	0	0	4.85E-02	2.08E-02	--	9.70E-02
	Acenaphthene	3	0	0	5.33E-02	2.27E-02	--	1.07E-01
	Acenaphthylene	3	0	0	6.06E-02	2.59E-02	--	1.21E-01
	Anthracene	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Benzo(a)anthracene	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Benzo(a)pyrene	3	0	0	2.31E-01	9.87E-02	--	4.62E-01

Table 3-11. Lavalle Creek Sediment Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
Semivolatiles	Benzo(b)fluoranthene	3	0	0	5.86E-02	2.51E-02	--	1.17E-01
	Benzo(g,h,i)perylene	3	0	0	5.62E-02	2.41E-02	--	1.12E-01
	Benzo(k)fluoranthene	3	0	0	5.90E-02	2.51E-02	--	1.18E-01
	bis(2-chloroethoxy)methane	3	0	0	9.03E-02	3.87E-02	--	1.81E-01
	bis(2-chloroethyl)ether	3	0	0	3.22E-02	1.38E-02	--	6.44E-02
	Bis(2-chloroisopropyl)ether	3	0	0	1.07E-01	4.58E-02	--	2.13E-01
	Bis(2-ethylhexyl)phthalate	3	0	0	7.90E-02	3.38E-02	--	1.58E-01
	Butyl benzyl phthalate	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Carbazole	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Chrysene	3	0	0	6.20E-02	2.64E-02	--	1.24E-01
	Dibenzo(a,h)anthracene	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Dibenzofuran	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Dibutyl phthalate	3	0	0	6.41E-02	2.72E-02	--	1.28E-01
	Diethyl phthalate	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Dimethyl phthalate	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Di-n-octyl phthalate	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Fluoranthene	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Fluorene	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Hexachlorobenzene	3	0	0	6.07E-02	2.58E-02	--	1.21E-01
	Hexachlorobutadiene	3	0	0	3.89E-02	1.66E-02	--	7.78E-02
	Hexachloroethane	3	0	0	2.94E-02	1.26E-02	--	5.88E-02
	Indeno(1,2,3-cd)pyrene	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Isophorone	3	0	0	7.37E-02	3.15E-02	--	1.47E-01
	m & p-cresols	3	1	33	2.54E-01	2.62E-01	--	1.85E-01
	Naphthalene	3	0	0	8.65E-02	3.68E-02	--	1.73E-01
	Nitrobenzene	3	0	0	9.35E-02	3.98E-02	--	1.87E-01
	N-Nitrosodimethylamine	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	N-Nitrosodi-n-propylamine	3	0	0	6.29E-02	2.69E-02	--	1.26E-01
	N-Nitrosodiphenylamine	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	o-Cresol	3	0	0	1.00E-01	4.29E-02	--	2.00E-01
	p-Chloroaniline	3	0	0	7.10E-02	3.03E-02	--	1.42E-01
	Pentachlorophenol	3	0	0	2.31E-01	9.87E-02	--	4.62E-01
	Phenanthrene	3	0	0	6.60E-02	2.82E-02	--	1.32E-01
	Phenol	3	0	0	1.01E-01	4.30E-02	--	2.02E-01
	Pyrene	3	0	0	5.83E-02	2.49E-02	--	1.17E-01

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-12. Lavalle Creek Surface Water Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{D/F}$ (ND=0)	3	3	100	3.26E-08	5.15E-08	9.21E-08	--
	$TEQ_{D/F}$ (ND=1/2DL)	3	3	100	1.66E-06	5.11E-08	1.70E-06	--
PCBs	Aroclor-1016	1	0	0	2.30E-02	--	--	4.60E-02
	Aroclor-1221	1	0	0	1.00E-02	--	--	2.00E-02
	Aroclor-1232	1	0	0	1.85E-02	--	--	3.70E-02
	Aroclor-1242	1	0	0	1.40E-02	--	--	2.80E-02
	Aroclor-1248	1	0	0	6.50E-03	--	--	1.30E-02
	Aroclor-1254	1	0	0	8.00E-03	--	--	1.60E-02
	Aroclor-1260	1	0	0	7.50E-03	--	--	1.50E-02
	Aroclor-1262	1	0	0	2.10E-02	--	--	4.20E-02
	Aroclor-1268	1	0	0	1.15E-02	--	--	2.30E-02
Total Metals	Aluminum	3	3	100	2.56E+02	6.08E+01	3.05E+02	4.73E+00
	Antimony	2	2	100	1.65E-01	7.07E-03	1.70E-01	7.70E-02
	Arsenic	3	3	100	2.60E+00	9.54E-01	3.50E+00	1.10E-01
	Barium	3	3	100	1.90E+02	5.17E+01	2.50E+02	9.37E-02
	Beryllium	2	0	0	2.70E-02	0.00E+00	--	5.40E-02
	Cadmium	3	0	0	1.30E-02	8.66E-04	--	2.60E-02
	Calcium	2	2	100	3.94E+04	2.12E+02	3.95E+04	2.90E+02
	Chromium	3	3	100	3.43E-01	1.50E-01	5.10E-01	1.63E-01
	Cobalt	3	2	67	1.02E-01	3.33E-02	1.30E-01	1.00E-01
	Copper	3	3	100	1.68E+00	7.35E-01	2.40E+00	2.17E-01
	Iron	3	3	100	2.50E+02	1.77E+01	2.69E+02	8.17E+00
	Lead	3	3	100	3.20E-01	3.46E-02	3.40E-01	4.13E-02
	Magnesium	2	2	100	1.37E+04	7.07E+01	1.37E+04	5.00E+00
	Manganese	3	3	100	4.79E+01	6.94E+01	1.28E+02	2.40E-01
	Mercury	3	1	33	3.60E-02	5.20E-03	3.00E-02	5.93E-02
	Nickel	3	3	100	3.57E-01	3.51E-02	3.90E-01	1.27E-01
	Potassium	2	2	100	2.17E+03	1.34E+02	2.26E+03	1.79E+01
	Selenium	2	0	0	7.00E-02	0.00E+00	--	1.40E-01
	Silver	3	0	0	7.50E-02	1.32E-09	--	1.50E-01
	Sodium	2	2	100	1.03E+04	3.19E+03	1.26E+04	1.84E+01
	Thallium	3	0	0	1.12E-02	3.18E-03	--	2.23E-02
	Vanadium	3	3	100	1.10E+00	1.00E-01	1.20E+00	2.73E-01
	Zinc	3	2	67	3.47E+00	2.08E+00	5.30E+00	2.07E+00
Dissolved Metals	Aluminum	3	2	67	7.67E+00	5.96E+00	1.34E+01	4.73E+00
	Antimony	2	2	100	2.40E-01	0.00E+00	2.40E-01	7.70E-02
	Arsenic	3	3	100	2.37E+00	8.74E-01	3.10E+00	1.10E-01
	Barium	3	3	100	1.83E+02	5.29E+01	2.44E+02	9.37E-02
	Beryllium	2	0	0	2.70E-02	0.00E+00	--	5.40E-02
	Cadmium	3	0	0	1.30E-02	8.66E-04	--	2.60E-02
	Calcium	3	3	100	4.33E+04	7.88E+03	5.23E+04	7.07E+01
	Chromium	3	2	67	1.83E-01	1.00E-01	2.80E-01	1.63E-01
	Cobalt	3	3	100	4.72E-01	4.16E-01	9.20E-01	1.00E-01
	Copper	3	3	100	8.93E-01	5.40E-01	1.30E+00	2.17E-01
	Iron	3	2	67	1.83E+01	1.44E+01	3.45E+01	8.17E+00
	Lead	3	1	33	3.58E-02	2.53E-02	6.50E-02	4.13E-02
	Magnesium	3	3	100	1.61E+04	5.40E+03	2.23E+04	1.00E+01
	Manganese	3	3	100	4.58E+01	6.94E+01	1.26E+02	2.40E-01
	Mercury	2	0	0	3.90E-02	0.00E+00	--	7.80E-02
	Nickel	3	3	100	2.30E-01	3.00E-02	2.60E-01	1.27E-01
	Potassium	3	3	100	2.08E+03	8.66E+01	2.13E+03	5.39E+01
	Selenium	2	0	0	7.00E-02	0.00E+00	--	1.40E-01
	Silver	3	0	0	7.50E-02	1.32E-09	--	1.50E-01
	Sodium	3	3	100	9.30E+03	2.17E+03	1.18E+04	2.34E+01
	Thallium	3	0	0	1.12E-02	3.18E-03	--	2.23E-02
	Vanadium	3	3	100	9.23E-01	6.66E-02	9.80E-01	2.73E-01
	Zinc	3	0	0	2.20E+00	8.66E-01	--	4.40E+00
Miscellaneous Parameters	Chloride	3	3	100	6.37E+03	5.77E+01	6.40E+03	2.13E+02
	Fluoride	3	3	100	1.32E+02	4.85E+01	1.60E+02	2.30E+01
	Nitrogen, NO_2 plus NO_3	3	3	100	2.96E+02	4.71E+02	8.40E+02	5.07E+00
	Phosphorus (as P)	3	3	100	3.17E+01	4.04E+00	3.60E+01	2.00E+00
	Sulfate	3	3	100	1.54E+04	3.43E+03	1.85E+04	1.60E+02

Table 3-12. Lavalle Creek Surface Water Summary Statistics[a]

Contaminant		N Samples	N Detected	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
Semivolatiles	1,2,4-Trichlorobenzene	1	0	0	9.50E-01	--	--	1.90E+00
	1,2-Dichlorobenzene	1	0	0	9.50E-01	--	--	1.90E+00
	1,2-Diphenylhydrazine	1	0	0	1.25E+00	--	--	2.50E+00
	1,3-Dichlorobenzene	1	0	0	8.50E-01	--	--	1.70E+00
	1,4-Dichlorobenzene	1	0	0	9.50E-01	--	--	1.90E+00
	1-Methylnaphthalene	1	0	0	1.05E+00	--	--	2.10E+00
	2,4,5-Trichlorophenol	1	0	0	1.10E+00	--	--	2.20E+00
	2,4,6-Trichlorophenol	1	0	0	1.10E+00	--	--	2.20E+00
	2,4-Dichlorophenol	1	0	0	1.15E+00	--	--	2.30E+00
	2,4-Dimethylphenol	1	0	0	3.45E+00	--	--	6.90E+00
	2,4-Dinitrophenol	1	0	0	1.40E+00	--	--	2.80E+00
	2,4-Dinitrotoluene	1	0	0	1.10E+00	--	--	2.20E+00
	2,6-Dinitrotoluene	1	0	0	1.15E+00	--	--	2.30E+00
	2-Chloronaphthalene	1	0	0	1.15E+00	--	--	2.30E+00
	2-Chlorophenol	1	0	0	1.10E+00	--	--	2.20E+00
	2-Methylnaphthalene	1	0	0	1.05E+00	--	--	2.10E+00
	2-Nitroaniline	1	0	0	1.40E+00	--	--	2.80E+00
	2-Nitrophenol	1	0	0	1.15E+00	--	--	2.30E+00
	3,3`-Dichlorobenzidine	1	0	0	2.50E+00	--	--	5.00E+00
	3-Nitroaniline	1	0	0	2.55E+00	--	--	5.10E+00
	4,6-Dinitro-o-cresol	1	0	0	1.80E+00	--	--	3.60E+00
	4-Bromophenyl phenyl ether	1	0	0	1.20E+00	--	--	2.40E+00
	4-Chloro-3-methylphenol	1	0	0	8.00E-01	--	--	1.60E+00
	4-Chlorophenyl phenyl ether	1	0	0	7.00E-01	--	--	1.40E+00
	4-Nitroaniline	1	0	0	2.20E+00	--	--	4.40E+00
	4-Nitrophenol	1	0	0	1.70E+00	--	--	3.40E+00
	Acenaphthene	1	0	0	8.50E-01	--	--	1.70E+00
	Acenaphthylene	1	0	0	1.15E+00	--	--	2.30E+00
	Anthracene	1	0	0	1.25E+00	--	--	2.50E+00
	Benzo(a)anthracene	1	0	0	2.55E+00	--	--	5.10E+00
	Benzo(a)pyrene	1	0	0	1.20E+00	--	--	2.40E+00
	Benzo(b)fluoranthene	1	0	0	1.25E+00	--	--	2.50E+00
	Benzo(g,h,i)perylene	1	0	0	1.25E+00	--	--	2.50E+00
	Benzo(k)fluoranthene	1	0	0	1.40E+00	--	--	2.80E+00
	bis(2-chloroethoxy)methane	1	0	0	8.00E-01	--	--	1.60E+00
	bis(2-chloroethyl)ether	1	0	0	1.15E+00	--	--	2.30E+00
	Bis(2-chloroisopropyl)ether	1	0	0	1.15E+00	--	--	2.30E+00
	Bis(2-ethylhexyl)phthalate	1	0	0	1.20E+00	--	--	2.40E+00
	Butyl benzyl phthalate	1	0	0	9.50E-01	--	--	1.90E+00
	Carbazole	1	0	0	1.35E+00	--	--	2.70E+00
	Chrysene	1	0	0	1.15E+00	--	--	2.30E+00
	Dibenzo(a,h)anthracene	1	0	0	9.00E-01	--	--	1.80E+00
	Dibenzofuran	1	0	0	1.15E+00	--	--	2.30E+00
	Dibutyl phthalate	1	0	0	1.25E+00	--	--	2.50E+00
	Diethyl phthalate	1	0	0	1.25E+00	--	--	2.50E+00
	Dimethyl phthalate	1	0	0	1.20E+00	--	--	2.40E+00
	Di-n-octyl phthalate	1	0	0	8.50E-01	--	--	1.70E+00
	Fluoranthene	1	0	0	1.25E+00	--	--	2.50E+00
	Fluorene	1	0	0	1.20E+00	--	--	2.40E+00
	Hexachlorobenzene	1	0	0	1.30E+00	--	--	2.60E+00
	Hexachlorobutadiene	1	0	0	8.50E-01	--	--	1.70E+00
	Hexachloroethane	1	0	0	8.50E-01	--	--	1.70E+00
	Indeno(1,2,3-cd)pyrene	1	0	0	9.00E-01	--	--	1.80E+00
	Isophorone	1	0	0	8.00E-01	--	--	1.60E+00
	m & p-cresols	1	0	0	1.15E+00	--	--	2.30E+00
	Naphthalene	1	0	0	1.00E+00	--	--	2.00E+00
	Nitrobenzene	1	0	0	1.25E+00	--	--	2.50E+00
	N-Nitrosodimethylamine	1	0	0	1.15E+00	--	--	2.30E+00
	N-Nitrosodi-n-propylamine	1	0	0	1.15E+00	--	--	2.30E+00
	N-Nitrosodiphenylamine	1	0	0	2.00E+00	--	--	4.00E+00
	o-Cresol	1	0	0	1.00E+00	--	--	2.00E+00
	p-Chloroaniline	1	0	0	1.85E+00	--	--	3.70E+00
	Pentachlorophenol	1	0	0	1.10E+00	--	--	2.20E+00
	Phenanthrene	1	0	0	1.30E+00	--	--	2.60E+00
	Phenol	1	0	0	1.15E+00	--	--	2.30E+00
	Pyrene	1	0	0	1.25E+00	--	--	2.50E+00

TEQ = toxicity equivalent; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; ND = non-detect; DL = sample-specific detection limit; PCB = polychlorinated biphenyl

[a]All concentrations reported in units of µg/L.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-13. Summary Statistics for Fish Collected from the Clark Fork River within the OU3 Study Area[a]

Fish Species	Tissue Type	Contaminant		N Samples[b]	N Detected	Detection Frequency (%)	Average Concentration[c]	Standard Deviation[c]	Maximum Detected Concentration
Northern Pike	Fillet	TEQ	$TEQ_{D/F}$ (ND=1/2 DL)	4	4	100	0.51	0.11	0.64
			TEQ_{PCB} (ND=1/2 DL)	4	4	100	1.87	1.47	3.69
			$TEQ_{D/F/PCB}$ (ND=1/2 DL)	4	4	100	2.38	1.42	4.11
		PCB	Total PCBs	4	4	100	39,925	21,429	68,200
	Whole Body[d]	TEQ	$TEQ_{D/F}$ (ND=1/2 DL)	4	4	100	0.72	0.18	0.95
			TEQ_{PCB} (ND=1/2 DL)	4	4	100	5.53	3.06	8.60
			$TEQ_{D/F/PCB}$ (ND=1/2 DL)	4	4	100	6.25	2.98	9.36
		PCB	Total PCBs	4	4	100	103,516	58,844	187,089
Rainbow Trout	Fillet	TEQ	$TEQ_{D/F}$ (ND=1/2 DL)	8	8	100	0.49	0.21	0.86
			TEQ_{PCB} (ND=1/2 DL)	8	8	100	1.29	1.04	2.48
			$TEQ_{D/F/PCB}$ (ND=1/2 DL)	8	8	100	1.79	1.16	3.34
		PCB	Total PCBs	8	8	100	19,875	4,291	29,100
	Whole Body[d]	TEQ	$TEQ_{D/F}$ (ND=1/2 DL)	8	8	100	0.57	0.19	0.96
			TEQ_{PCB} (ND=1/2 DL)	8	8	100	2.25	1.45	3.58
			$TEQ_{D/F/PCB}$ (ND=1/2 DL)	8	8	100	2.82	1.51	4.41
		PCB	Total PCBs	8	8	100	29,403	3,458	34,760

TEQ = toxicity equivalence; $TEQ_{D/F}$ = toxicity equivalence for dioxins/furans; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/PCB}$ = toxicity equivalence for dioxins/furans/dioxin-like polychlorinated biphenyls; ND = non-detect; DL = sample-specific detection limit.

[a]Concentrations are reported in units of picograms per gram (pg/g) wet weight (ww).

[b]Number of composite samples analyzed for fish collected from the Frenchtown (FRN) and St. Regis (STR) reaches. For northern pike, four composite samples comprised of five fish each were available for the FRN reach, but no fish were collected from the STR reach. For rainbow trout, four composite samples comprised of five fish each were available for both the FRN and STR reaches.

[c]Non-detects were evaluated at 1/2 the DL.

[d]Whole-body concentrations were estimated based on fillet and carcass tissue concentrations as:
(fillet concentration x fillet weight + carcass concentration x carcass weight) / (fillet weight + carcass weight).

Table 3-14. Exposure Parameters for a Camper

Exposure Pathway	Exposure Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body weight as adult	kg	80	[1]	80	[1]
	Body weight as child	kg	15	[1]	15	[1]
	Exposure frequency	days/yr	32	[4, a]	48	[4, a]
	Exposure duration as adult	yr	9	[4, b]	20	[1,4, b]
	Exposure duration as child	yr	3	[4, b]	6	[1,4, b]
	Exposure duration (total)	yr	12		26	
	Averaging Time, Cancer	yr	70	[3]	70	[3]
Incidental Ingestion of Soil	Ingestion rate as adult - soil	mg/day	50	[4, c]	100	[1,4, b]
	Ingestion rate as child - soil	mg/day	100	[4, c]	200	[1,4, b]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
Incidental Ingestion of Sediment	Ingestion rate as adult - sediment	mg/day	25	[4, c]	50	[4]
	Ingestion rate as child - sediment	mg/day	50	[4, c]	100	[4]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
Incidential Ingestion of Surface Water	Ingestion rate as adult - water	mL/hour	21	[4, c]	71	[2, e]
	Ingestion rate as child - water	mL/hour	49	[4, c]	120	[2, e]
	Exposure time	hr/day	0.5	[4]	1	[4]
	Conversion Factor	L/mL	1.00E-03		1.00E-03	
Ingestion of Surface Water (as drinking water)	Ingestion rate as adult - water	L/day	1.2	[4, d]	2.5	[1]
	Ingestion rate as child - water	L/day	0.45	[4, d]	0.78	[1]
Dermal Exposure to Soil	Exposed Surface Area as adult	cm^2/event	6,032	[1, b]	6,032	[1, b]
	Exposed Surface Area as child	cm^2/event	2,373	[1, b]	2,373	[1, b]
	Adherence Factor as adult	mg/cm^2	0.01	[5]	0.07	[5]
	Adherence Factor as child	mg/cm^2	0.04	[5]	0.2	[5]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
Dermal Exposure to Surface Water	Exposed Surface Area as adult	cm^2/event	19,652	[1, g]	19,652	[1, g]
	Exposed Surface Area as child	cm^2/event	6,365	[1, g]	6,365	[1, g]
	Adherence Factor as adult	mg/cm^2	0.01	[5]	0.07	[5]
	Adherence Factor as child	mg/cm^2	0.04	[5]	0.2	[5]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Dermal Permeability Coefficient (Kp)	cm/hr	CS		CS	
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific

Sources:

[1] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[2] USEPA 2011. Exposure Factors Handbook.

[3] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Part A.

[4] Professional judgement

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

Notes:

[a] Assumes exposure occurs over the course of 16 weeks (roughly Memorial Day to Labor Day) at a frequency of 2 day/week for a CTE visitor and 3 days/week for an RME visitor.

[b] Assumes a value similar to that of a resident.

[c] CTE value is assumed to be half that of the RME receptor.

[d] Assumes half the soil value.

[e] Weighted mean of consumer-only ingestion of drinking water (Table 3-1).

[f] For soil, surface area value for an adult assumes exposure to head, hands, forearms, and lower legs as an adult; also to feet for sediment. For soil and sediment, surface area value for a child assumes exposure to head, hands, forearms, lower legs and feet.

[g] Assumes full body exposure to while swimming.

Table 3-15. Exposure Parameters for a Tribal Fisher

Exposure Pathway	Exposure Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body weight as adult	kg	80	[2]	80	[2]
	Body weight as older child	kg	44	[1, a]	44	[1, a]
	Body weight as young child	kg	15	[1]	15	[1]
	Exposure frequency	days/yr	48	[4, b]	96	[4, b]
	Exposure duration as adult	yr	9	[4]	20	[2,4, d]
	Exposure duration as older child	yr	6	[4]	10	[4, c]
	Exposure duration as young child	yr	3	[4]	6	[2,4, d]
	Exposure duration (total)	yr	18		36	
	Averaging Time, Cancer	yr	70	[3]	70	[3]
Incidental Ingestion of Soil	Ingestion rate - adult	mg/day	50	[4, e]	100	[2,4, d]
	Ingestion rate - older child	mg/day	50	[4, e]	100	[2,4, d]
	Ingestion rate - young child	mg/day	100	[4, e]	200	[2,4, d]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
Incidental Ingestion of Sediment	Ingestion rate - adult	mg/day	25	[4, e]	50	[4, f]
	Ingestion rate - older child	mg/day	25	[4, e]	50	[4, f]
	Ingestion rate - young child	mg/day	50	[4, e]	100	[4, f]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
Incidental Ingestion of Surface Water	Ingestion rate - adult	mL/hour	3.6	[1, g]	10.8	[1, g]
	Ingestion rate - older child	mL/hour	3.6	[1, g]	10.8	[1, g]
	Ingestion rate - young child	mL/hour	4.9	[4, h]	12	[4, h]
	Exposure Time	hr/day	1	[4]	1.5	[4]
	Conversion Factor	L/mL	1.00E-03		1.00E-03	
Ingestion of Fish - Tribal Fisher	Ingestion rate - adult	g/day	23	[6, i]	93	[6, i]
	Ingestion rate - older child	g/day	23	[6, i]	93	[6, i]
	Ingestion rate - young child	g/day	11.5	[4, j]	46.5	[4, j]
	Exposure frequency	days/yr	365	[3]	365	[3]
	Conversion Factor	kg/g	1.00E-03		1.00E-03	
Dermal Exposure to Soil/Sediment	Exposed Surface Area as adult	cm^2/event	3,945	[1,4, k]	3,945	[1,4, k]
	Exposed Surface Area as older child	cm^2/event	2,392	[1,4, k]	2,392	[1,4, k]
	Exposed Surface Area as young child	cm^2/event	2,624	[1,4, l]	2,624	[1,4, l]
	Adherence Factor	mg/cm^2	0.01	[5]	0.07	[5]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
Dermal Exposure to Surface Water	Exposed Surface Area as adult	cm^2/event	3,945	[1,4, k]	3,945	[1,4, k]
	Exposed Surface Area as older child	cm^2/event	2,392	[1,4, k]	2,392	[1,4, k]
	Exposed Surface Area as young child	cm^2/event	2,624	[1,4, l]	2,624	[1,4, l]
	Dermal Permeability Coefficient (Kp)	cm/hr	CS		CS	
	Event Frequency	events/day	1	[4]	1	[4]
	Event Duration (tevent)	hr/event	1	[4]	1.5	[4]

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific

Sources:

[1] USEPA 2011. Exposure Factors Handbook.

[2] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[3] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Part A.

[4] Professional judgement

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] USEPA 2014. Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010).

[7] USEPA 2016. A Fish Consumption Survey of the Shoshone-Bannock Tribes. December.

Notes:

[a] Table 8-1. Age-weighted average based on body weights of children 6-<11 years old and 11-<16 years old.

[b] Assumes exposure occurs over the course of 24 weeks (roughly April - September) at a frequency of 2 day/week for a CTE receptor and 4 days/week for an RME receptor.

[c] Accounts for an older child exposed from 6 to 16 years of age.

[d] Assumes a value similar to that of a resident.

[e] CTE value is assumed to be half that of the RME receptor.

[f] Assumes half the soil value.

[g] Based on the mean and upper confidence limit for estimated water ingestion while fishing (Table 3-93).

[h] Incidental ingestion from splashing or hand-to-face contact during fishing assumed to be 10% of the incidental ingestion rate while swimming assumed for the camper scenario.

[i] RME value based on 95th percentile NCI value and CTE value based on mean NCI value for Group 2 adult consuming fishers of the Shoshone-Bannock Tribes (Table S2).

[j] Child fish ingestion rates were estiamted by multiplying the adult ingestion rate by a ratio of child-to-adult estimated energy requirements (0.5).

[k] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, and forearms. It is assumed that in general, people will remain on the banks while fishing and only e for significant amounts of time if wearing protective clothing such as waders and waterproof shoes/boots.

[l] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, forearms, lower legs and feet. It is assumed that in general, children will remain on the banks while fi an adult wearing short-sleeves and shorts.

Table 3-16. OU3 Soil COPC Screen[a]

Contaminant		DF (%)	Maximum Detected Concentration	Average DL	Risk-Based SL[b]		COPC SELECTION STEPS				OU3 UPLAND SOIL COPCs		
							Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > SL?	Detection Limit[c] Is DL > SL?	COPC	Not a COPC	Source of Uncertainty
TEQ	**TEQ_{DF} (ND=1/2DL)**	100	7.56E-04	--	4.8E-06	C	yes	yes	yes		X		
PCBs	Aroclor-1016	0	--	1.55E-02	4.1E-01	NC	yes	no		no		X	
	Aroclor-1221	0	--	1.17E-02	2.0E-01	C	yes	no		no		X	
	Aroclor-1232	0	--	1.69E-02	1.7E-01	C	yes	no		no		X	
	Aroclor-1242	0	--	1.71E-02	2.3E-01	C	yes	no		no		X	
	Aroclor-1248	0	--	1.05E-02	2.3E-01	C	yes	no		no		X	
	Aroclor-1254	3	1.17E-01	1.29E-02	1.2E-01	NC	yes	no		no		X	
	Aroclor-1260	3	1.00E-01	1.28E-02	2.4E-01	C	yes	no		no		X	
	Aroclor-1262	0	--	1.41E-02			no						X
	Aroclor-1268	0	--	8.73E-03			no						X
Total Metals	**Aluminum**	100	2.15E+04	5.35E+00	7.7E+03	NC	yes	yes	yes		X		
	Antimony	51	3.90E+00	1.60E-01	3.1E+00	NC	yes	yes	yes		X		
	Arsenic	100	4.28E+01	2.25E-01	6.8E-01	C	yes	yes	yes		X		
	Barium	100	2.84E+03	2.67E-01	1.5E+03	NC	yes	yes	yes		X		
	Beryllium	80	1.20E+00	8.81E-02	1.6E+01	NC	yes	yes	no			X	
	Cadmium	86	8.30E+00	4.14E-02	7.1E+00	NC	yes	yes	yes		X		
	Calcium	100	4.98E+05	5.96E+01			no						X
	Chromium	100	5.82E+01	2.18E-01	3.0E-01	C	yes	yes	yes		X		
	Cobalt	99	1.10E+01	2.62E-01	2.3E+00	NC	yes	yes	yes		X		
	Copper	100	2.08E+02	5.43E-01	3.1E+02	NC	yes	yes	no			X	
	Iron	100	2.29E+04	2.99E+01	5.5E+03	NC	yes	yes	yes		X		
	Lead	100	1.04E+02	4.28E-02	4.0E+02	NC	yes	yes	no			X	
	Magnesium	100	2.93E+04	1.02E+01			no						X
	Manganese	100	2.70E+03	4.18E-01	1.8E+02	NC	yes	yes	yes		X		
	Mercury	85	8.00E+00	1.39E-02	2.3E+00	NC	yes	yes	yes		X		
	Nickel	100	5.87E+01	2.41E-01	1.5E+02	NC	yes	yes	no			X	
	Potassium	95	9.21E+03	3.78E+01			no						X
	Selenium	35	1.60E+00	3.17E-01	3.9E+01	NC	yes	yes	no			X	
	Silver	50	1.80E+00	2.20E-01	3.9E+01	NC	yes	yes	no			X	
	Sodium	96	8.90E+03	4.44E+01			no						X
	Thallium	86	9.60E-01	4.04E-02	7.8E-02	NC	yes	yes	yes		X		
	Vanadium	100	1.19E+02	3.53E-01	3.9E+01	NC	yes	yes	yes		X		
	Zinc	100	6.86E+02	1.86E+00	2.3E+03	NC	yes	yes	no			X	

DF = Detection Frequency; TEQ = Toxicity Equivalence; TEQ_{DF} = toxicity equivalent for dioxins/furans; PCBs = Polychlorinated Biphenyls; ND = non-detect; MDL = method detection limit; EN = essential nutrient.

Bolded contaminants are those where the maximum detected concentration exceeds the respective risk-based SL.

[a]Concentrations in units of mg/kg. Includes both surface and subsurface soil.

[b]Risk-based concentrations are based on USEPA's generic residential soil RSL values (May 2021) using a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value).

[c]Detection limts were evaluated for those chemicals with a detection frequency <5%.

Table 3-17. OU3 Groundwater COPC Screen[a]

	Contaminant	Detection Frequency (%)	Maximum Detected Concentration	Average DL	RBC[b]		COPC SELECTION STEPS: Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > RBC?	Detection Limit[c]: Is DL > RBC?	OU3 GROUNDWATER COPCs: COPC	Not a COPC	Source of Uncertainty
TEQ	**TEQ (ND = 1/2 DL)**	81	1.7E-05	--	1.2E-07	C	yes	yes	yes		X		
PCBs	Aroclor-1016	0	--	7.8E-02	1.4E-01	NC	yes	no		no		X	
	Aroclor-1221	0	--	8.0E-02	4.7E-03	C	yes	no		yes			X
	Aroclor-1232	0	--	7.0E-02	4.7E-03	C	yes	no		yes			X
	Aroclor-1242	0	--	8.1E-02	7.8E-03	C	yes	no		yes			X
	Aroclor-1248	0	--	7.5E-02	7.8E-03	C	yes	no		yes			X
	Aroclor-1254	0	--	8.1E-02	7.8E-03	C	yes	no		yes			X
	Aroclor-1260	7	3.1E-01	7.2E-02	7.8E-03	C	yes	yes	yes		X		
	Aroclor-1262	0	--	7.0E-02			no						X
	Aroclor-1268	0	--	8.4E-02			no						X
Total Metals	**Aluminum**	81	1.3E+04	5.9E+01	2.0E+03	NC	yes	yes	yes		X		
	Antimony	47	7.7E+00	5.3E-01	7.8E-01	NC	yes	yes	yes		X		
	Arsenic	98	7.4E+01	2.0E+00	5.2E-02	C	yes	yes	yes		X		
	Barium	100	1.2E+03	--	3.8E+02	NC	yes	yes	yes		X		
	Beryllium	22	4.7E+00	3.1E-01	2.5E+00	NC	yes	yes	yes		X		
	Cadmium	31	6.1E+00	1.6E-01	9.2E-01	NC	yes	yes	yes		X		
	Calcium	100	4.8E+05	--	4.4E+05	EN	yes	yes	yes				X[d]
	Chromium	69	1.6E+02	2.0E+00	3.5E-02	C	yes	yes	yes		X		
	Cobalt	77	2.6E+02	1.0E+00	6.0E-01	NC	yes	yes	yes		X		
	Copper	71	9.7E+01	1.9E+00	8.0E+01	NC	yes	yes	yes		X		
	Iron	92	5.7E+04	4.6E+01	1.4E+03	NC	yes	yes	yes		X		
	Lead	74	1.5E+01	3.3E-01	1.5E+01	NC	yes	yes	no			X	
	Magnesium	100	2.9E+05	--	1.3E+05	EN	yes	yes	yes				X[d]
	Manganese	100	5.2E+04	3.2E-01	4.3E+01	NC	yes	yes	yes		X		
	Mercury	4	9.6E-01	7.7E-02	5.7E-01	NC	yes	no		no		X	
	Nickel	92	2.6E+02	2.7E+00	3.9E+01	NC	yes	yes	yes		X		
	Potassium	100	1.3E+05	--	1.9E+06	EN	yes	yes	no			X	
	Selenium	40	8.9E+00	7.4E-01	1.0E+01	NC	yes	yes	no			X	
	Silver	7	3.4E-01	5.8E-01	9.4E+00	NC	yes	yes	no			X	
	Sodium	100	1.1E+06	--	5.6E+05	EN	yes	yes	yes				X[d]
	Thallium	5	2.2E-01	1.3E-01	2.0E-02	NC	yes	yes	yes		X		
	Vanadium	91	1.8E+02	3.0E+00	8.6E+00	NC	yes	yes	yes		X		
	Zinc	37	4.9E+02	1.1E+01	6.0E+02	NC	yes	yes	no			X	
Miscellaneous Parameters	Chloride	100	3.3E+05	6.9E+02	3.1E+05	EN	yes	yes	yes				X[d]
	Fluoride	89	2.4E+03	1.6E+02	3.5E+05	EN	yes	yes	no			X	
	Nitrogen, NO2 plus NO3	55	7.9E+03	4.4E+01	1.0E+04	MCL	yes	yes	no			X	
	Phosphorus (as P)	97	3.7E+03	6.6E+01	1.3E+08	EN	yes	yes	no			X	
	Sulfate	100	2.8E+06	--			no						X
Semivolatiles	1,2-Diphenylhydrazine	0	--	3.9E+00	7.8E-02	C	yes	no		yes			X
	1-Methylnaphthalene	0	--	3.7E+00	1.1E+00	C	yes	no		yes			X
	2,4,5-Trichlorophenol	0	--	2.7E+00	1.2E+02	NC	yes	no		no		X	
	2,4,6-Trichlorophenol	0	--	3.1E+00	1.2E+00	NC	yes	no		yes			X
	2,4-Dichlorophenol	0	--	3.0E+00	4.6E+00	NC	yes	no		no		X	
	2,4-Dimethylphenol	0	--	6.2E+00	3.6E+01	NC	yes	no		no		X	
	2,4-Dinitrophenol	0	--	4.5E+00	3.9E+00	NC	yes	no		yes			X
	2,4-Dinitrotoluene	0	--	2.9E+00	2.4E-01	C	yes	no		yes			X
	2,6-Dinitrotoluene	0	--	2.7E+00	4.9E-02	C	yes	no		yes			X
	2-Chloronaphthalene	0	--	3.7E+00	7.5E+01	NC	yes	no		no		X	
	2-Chlorophenol	1	1.4E+00	2.9E+00	9.1E+00	NC	yes	no		no		X	
	2-Methylnaphthalene	0	--	3.2E+00	3.6E+00	NC	yes	no		no		X	
	2-Nitroaniline	0	--	3.5E+00	1.9E+01	NC	yes	no		no		X	
	2-Nitrophenol	0	--	3.2E+00			no						X
	3&4-Methylphenol	13	4.6E+01	5.3E+00			no						X
	3,3`-Dichlorobenzidine	0	--	1.1E+01	1.3E-01	C	yes	no		yes			X
	3-Nitroaniline	0	--	4.9E+00			no						X
	4,6-Dinitro-o-cresol	0	--	4.7E+00	1.5E-01	NC	yes	no		yes			X
	4-Bromophenyl phenyl ether	0	--	4.1E+00			no						X
	4-Chloro-3-methylphenol	0	--	2.9E+00	1.4E+02	NC	yes	no		no		X	
	4-Chlorophenyl phenyl ether	0	--	3.4E+00			no						X
	4-Nitroaniline	0	--	4.1E+00	3.8E+00	C	yes	no		yes			X
	4-Nitrophenol	0	--	6.2E+00			no						X
	Acenaphthene	0	--	4.0E+00	5.3E+01	NC	yes	no		no		X	
	Acenaphthylene	0	--	3.8E+00			no						X
	Anthracene	0	--	4.6E+00	1.8E+02	NC	yes	no		no		X	
	Benzo(a)anthracene	0	--	4.0E+00	3.0E-02	C	yes	no		yes			X
	Benzo(a)pyrene	0	--	4.1E+00	2.5E-02	C	yes	no		yes			X
	Benzo(b)fluoranthene	0	--	4.0E+00	2.5E-01	C	yes	no		yes			X
	Benzo(g,h,i)perylene	0	--	4.5E+00			no						X
	Benzo(k)fluoranthene	0	--	4.4E+00	2.5E+00	C	yes	no		yes			X
	bis(2-chloroethoxy)methane	1	7.4E+00	2.9E+00	5.9E+00	NC	yes	no		no		X	
	bis(2-chloroethyl)ether	0	--	3.0E+00	1.4E-02	C	yes	no		yes			X
	Bis(2-chloroisopropyl)ether	0	--	3.5E+00	7.1E+01	NC	yes	no		no		X	
	Bis(2-ethylhexyl)phthalate	2	5.8E+00	7.7E+00	5.6E+00	C	yes	no		yes			X
	Butyl benzyl phthalate	0	--	4.5E+00	1.6E+01	C	yes	no		no		X	
	Carbazole	0	--	3.8E+00			no						X
	Chrysene	0	--	4.0E+00	2.5E+01	C	yes	no		no		X	
	Dibenzo(a,h)anthracene	0	--	4.5E+00	2.5E-02	C	yes	no		yes			X
	Dibenzofuran	0	--	3.9E+00	7.9E-01	NC	yes	no		yes			X
	Dibutyl phthalate	0	--	5.6E+00	9.0E+01	NC	yes	no		no		X	
	Diethyl phthalate	0	--	3.2E+00	1.5E+03	NC	yes	no		no		X	
	Dimethyl phthalate	0	--	3.2E+00			no						X
	Di-n-octyl phthalate	1	2.7E+00	5.0E+00	2.0E+01	NC	yes	no		no		X	
	Fluoranthene	0	--	4.6E+00	8.0E+01	NC	yes	no		no		X	
	Fluorene	1	6.1E+00	3.9E+00	2.9E+01	NC	yes	no		no		X	
	Hexachlorobenzene	0	--	4.6E+00	9.8E-03	C	yes	no		yes			X
	Hexachloroethane	0	--	4.3E+00	3.3E-01	C	yes	no		yes			X
	Indeno(1,2,3-cd)pyrene	0	--	4.3E+00	2.5E-01	C	yes	no		yes			X
	Isophorone	0	--	3.0E+00	7.8E+01	C	yes	no		no		X	
	m & p-cresols	3	8.6E+01	2.6E+00	9.3E+01	NC	yes	no		no		X	
	Nitrobenzene	0	--	3.2E+00	1.4E-01	C	yes	no		yes			X
	N-Nitrosodimethylamine	0	--	2.6E+00	1.1E-04	C	yes	no		yes			X
	N-Nitrosodi-n-propylamine	0	--	2.9E+00	1.1E-02	C	yes	no		yes			X
	N-Nitrosodiphenylamine	0	--	5.0E+00	1.2E+01	C	yes	no		no		X	
	o-Cresol	0	--	3.5E+00	9.3E+01	NC	yes	no		no		X	

Table 3-17. OU3 Groundwater COPC Screen[a]

	Contaminant	Detection Frequency (%)	Maximum Detected Concentration	Average DL	RBC[b]		COPC SELECTION STEPS: Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > RBC?	Detection Limit[c]: Is DL > RBC?	OU3 GROUNDWATER COPCs: COPC	Not a COPC	Source of Uncertainty
	p-Chloroaniline	0	--	4.3E+00	3.7E-01	C	yes	no		yes			X
	Pentachlorophenol	1	1.1E+01	6.8E+00	4.1E-02	C	yes	no		yes			X
Semivolatiles	Phenanthrene	0	--	3.7E+00			no						X
	Phenol	6	7.5E+01	2.6E+00	5.8E+02	NC	yes	yes	no			X	
	Pyrene	0	--	3.9E+00	1.2E+01	NC	yes	no		no		X	
	1,1,1,2-Tetrachloroethane	0	--	2.5E-01	5.7E-01	C	yes	no		no		X	
	1,1,1-Trichloroethane	0	--	1.8E-01	8.0E+02	NC	yes	no		no		X	
	1,1,2,2-Tetrachloroethane	0	--	2.3E-01	7.6E-02	C	yes	no		yes			X
	1,1,2-Trichloroethane	0	--	2.4E-01	4.1E-02	NC	yes	no		yes			X
	1,1-Dichloroethane	0	--	2.2E-01	2.8E+00	C	yes	no		no		X	
	1,1-Dichloroethene	0	--	2.2E-01	2.8E+01	NC	yes	no		no		X	
	1,1-Dichloropropene	0	--	2.5E-01			no						X
	1,2,3-Trichlorobenzene	0	--	2.9E-01	7.0E-01	NC	yes	no		no		X	
	1,2,3-Trichloropropane	0	--	4.2E-01	7.5E-04	C	yes	no		yes			X
	1,2,4-Trichlorobenzene	0	--	4.1E-01	4.0E-01	NC	yes	no		yes			X
	1,2,4-Trimethylbenzene	6	1.5E+00	2.7E-01	5.6E+00	NC	yes	yes	no			X	
	1,2-Dibromo-3-chloropropane	0	--	2.0E+00	3.3E-04	C	yes	no		yes			X
	1,2-Dibromoethane	0	--	3.0E-01	7.5E-03	C	yes	no		yes			X
	1,2-Dichlorobenzene	5	7.2E-01	3.4E-01	3.0E+01	NC	yes	yes	no			X	
	1,2-Dichloroethane	0	--	2.7E-01	1.7E-01	C	yes	no		yes			X
	1,2-Dichloropropane	0	--	2.4E-01	8.2E-01	NC	yes	no		no		X	
	1,3,5-Trimethylbenzene	0	--	1.6E-01	6.0E+00	NC	yes	no		no		X	
	1,3-Dichlorobenzene	12	1.2E+01	3.4E-01			no						X
	1,3-Dichloropropane	0	--	1.2E-01	3.7E+01	NC	yes	no		no		X	
	1,4-Dichlorobenzene	18	3.6E+01	4.0E-01	4.8E-01	C	yes	yes	yes		X		
	2,2-Dichloropropane	0	--	2.5E-01			no						X
	Acetone	20	4.1E+01	1.4E+01	1.4E+03	NC	yes	yes	no			X	
	Allyl chloride	0	--	4.6E-01	2.1E-01	NC	yes	no		yes			X
	Benzene	8	6.4E-01	1.5E-01	4.6E-01	C	yes	yes	yes		X		
	Bromobenzene	0	--	2.7E-01	6.2E+00	NC	yes	no		no		X	
	Bromochloromethane	0	--	3.5E-01	8.3E+00	NC	yes	no		no		X	
	Bromoform	0	--	9.1E-01	3.3E+00	C	yes	no		no		X	
	Bromomethane	0	--	2.0E+00	7.5E-01	NC	yes	no		yes			X
	Carbon tetrachloride	0	--	2.6E-01	4.6E-01	C	yes	no		no		X	
	Chlorobenzene	19	1.5E+02	2.3E-01	7.8E+00	NC	yes	yes	yes		X		
	Chloroethane	0	--	5.9E-01	2.1E+03	NC	yes	no		no		X	
	Chloroform	0	--	5.4E-01	2.2E-01	C	yes	no		yes			X
	Chloromethane	0	--	3.5E-01	1.9E+01	NC	yes	no		no		X	
	cis-1,2-Dichloroethylene	0	--	2.2E-01	3.6E+00	NC	yes	no		no		X	
	cis-1,3-Dichloropropylene	0	--	2.5E-01			no						X
Volatile Organics	Cumene	8	1.2E+00	2.4E-01	4.5E+01	NC	yes	yes	no			X	
	Dibromochloromethane	0	--	1.7E-01	8.7E-01	C	yes	no		no		X	
	Dichlorobromomethane	0	--	2.7E-01	1.3E-01	C	yes	no		yes			X
	Dichlorodifluoromethane	0	--	3.3E-01	2.0E+01	NC	yes	no		no		X	
	Dichlorofluoromethane	0	--	1.9E-01			no						X
	Ethyl ether	1	1.7E-01	1.8E-01	3.9E+02	NC	yes	no		no		X	
	Ethylbenzene	0	--	1.9E-01	1.5E+00	C	yes	no		no		X	
	Hexachlorobutadiene	0	--	5.1E-01	1.4E-01	C	yes	no		yes			X
	m & p-Xylenes	12	1.7E+00	4.3E-01			no						X
	Methyl ethyl ketone	0	--	1.6E+00	5.6E+02	NC	yes	no		no		X	
	Methyl isobutyl ketone	0	--	8.8E-01	6.3E+02	NC	yes	no		no		X	
	Methylcyclohexane	0	--	3.6E-01			no						X
	Methylene bromide	0	--	2.4E-01	8.3E-01	NC	yes	no		no		X	
	Methylene chloride	3	2.6E+00	1.3E+00	1.1E+01	NC	yes	no		no		X	
	MTBE (Methyl tert-butyl ether)	0	--	2.0E-01	1.4E+01	C	yes	no		no		X	
	Naphthalene	2	9.6E-01	7.0E-01	1.2E-01	C	yes	no		yes			X
	n-Butyl benzene	0	--	3.0E-01	1.0E+02	NC	yes	no		no		X	
	n-Propyl benzene	5	7.9E-01	1.5E-01	6.6E+01	NC	yes	no		no		X	
	o-Chlorotoluene	0	--	2.2E-01	2.4E+01	NC	yes	no		no		X	
	o-Xylene	6	1.4E+00	2.1E-01	1.9E+01	NC	yes	yes	no			X	
	p-Chlorotoluene	0	--	1.8E-01	2.5E+01	NC	yes	no		no		X	
	p-Isopropyltoluene	9	2.6E+03	1.6E-01			no						X
	sec-Butyl benzene	1	6.3E-01	2.1E-01	2.0E+02	NC	yes	no		no		X	
	Styrene	0	--	2.3E-01	1.2E+02	NC	yes	no		no		X	
	tert-Amyl methyl ether	0	--	1.6E-01			no						X
	tert-Butyl benzene	0	--	2.0E-01	6.9E+01	NC	yes	no		no		X	
	Tetrachloroethylene	0	--	2.4E-01	4.1E+00	NC	yes	no		no		X	
	Tetrahydrofuran	0	--	3.3E+00	3.4E+02	NC	yes	no		no		X	
	Toluene	16	3.0E+00	1.5E-01	1.1E+02	NC	yes	yes	no			X	
	trans-1,2-Dichloroethylene	0	--	1.9E-01	6.8E+00	NC	yes	no		no		X	
	trans-1,3-Dichloropropylene	0	--	2.3E-01			no						X
	Trichloroethylene	0	--	2.0E-01	2.8E-01	NC	yes	no		no		X	
	Trichlorofluoromethane	0	--	2.8E-01	5.2E+02	NC	yes	no		no		X	
	Trichlorotrifluoroethane	0	--	3.3E-01	1.0E+03	NC	yes	no		no		X	
	Vinyl chloride	0	--	1.4E-01	1.9E-02	C	yes	no		yes			X
	Xylenes (total)	9	2.6E+00	4.2E-01	1.9E+01	NC	yes	yes	no			X	

DF = Detection Frequency; TEQ = Toxicity Equivalence; PCBs = Polychlorinated Biphenyls; ND = non-detect; DL = detection limit; EN = essential nutrient; MCL = maximum contaminant level

Bolded contaminants are those where the maximum detected concentration exceeds the respective risk-based SL.

[a]Concentrations in units of µg/L. Data from wells in Units 1 and 3 were used to generate these summary statistics.

[b]Risk-based SLs are based on generic residential tapwater RSL values using a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value) (USEPA 2016). For essential nutrients, tolerable Upper Intake levels derived by the Food and Nutrition Information Center (FNIC) were used to derive a RBC assuming a water intake rate of 0.78 L/day for a child receptor (there is no Tolerable Upper Intake Level for Potassium, so a Dietary Reference Intake was used instead).

[c]Detection limts were evaluated for those chemicals with a detection frequency <5%.

[d]Excluded as a COPC for being an essential nutrient. This is identified as a source of uncertainty.

Table 3-18. OU3 Clark Fork River Sediments COPC Screen

Contaminant		DF (%)	Maximum Detected Concentration	Average DL	Risk-based SL[b]	COPC SELECTION STEPS				OU3 CFR SEDIMENT COPCs		
						Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > RBC?	Detection Limit[c] Is DL > RBC?	COPC	Not a COPC	Source of Uncertainty
TEQ	TEQ_{DF} (ND=1/2 DL)	100	9.08E-07	--	3.6E-05 C	yes	yes	no			X	
PCBs	Aroclor-1016	0	--	1.13E-02	2.9E+00 NC	yes	no		no		X	
	Aroclor-1221	0	--	2.62E-02	1.7E+00 C	yes	no		no		X	
	Aroclor-1232	0	--	1.17E-02	1.7E+00 C	yes	no		no		X	
	Aroclor-1242	0	--	2.99E-02	1.8E+00 C	yes	no		no		X	
	Aroclor-1248	0	--	1.93E-02	1.8E+00 C	yes	no		no		X	
	Aroclor-1254	0	--	7.25E-03	8.2E-01 NC	yes	no		no		X	
	Aroclor-1260	0	--	7.40E-03	1.8E+00 C	yes	no		no		X	
	Aroclor-1262	0	--	9.85E-03		no						X
	Aroclor-1268	0	--	6.75E-03		no						X
Total Metals	Aluminum	100	1.32E+04	8.07E+00	5.7E+04 NC	yes	yes	no			X	
	Antimony	100	6.70E-01	1.99E-01	2.3E+01 NC	yes	yes	no			X	
	Arsenic	100	2.72E+01	2.88E-01	4.9E+00 C	yes	yes	yes		X		
	Barium	100	2.74E+02	1.90E-01	1.1E+04 NC	yes	yes	no			X	
	Beryllium	100	6.30E-01	8.56E-02	1.1E+02 NC	yes	yes	no			X	
	Cadmium	100	2.00E+00	4.94E-02	5.1E+01 NC	yes	yes	no			X	
	Chromium	100	1.47E+01	2.74E-01	2.2E+00 C	yes	yes	yes		X		
	Cobalt	100	7.70E+00	2.94E-01	1.7E+01 NC	yes	yes	no			X	
	Copper	100	3.13E+02	4.77E-01	2.3E+03 NC	yes	yes	no			X	
	Iron	100	1.80E+04	2.98E+01	4.0E+04 NC	yes	yes	no			X	
	Lead	100	5.32E+01	9.68E-02	4.0E+02 NC	yes	yes	no			X	
	Manganese	100	8.32E+02	4.17E-01	1.4E+03 NC	yes	yes	no			X	
	Mercury	100	3.90E-01	1.45E-02	1.7E+01 NC	yes	yes	no			X	
	Methyl Mercury	100	1.91E-02	1.82E-03	5.7E+00 NC	yes	yes	no			X	
	Nickel	100	1.34E+01	3.51E-01	1.1E+03 NC	yes	yes	no			X	
	Selenium	57	9.60E-01	2.76E-01	2.9E+02 NC	yes	yes	no			X	
	Silver	61	1.20E+00	2.78E-01	2.9E+02 NC	yes	yes	no			X	
	Thallium	91	2.30E-01	6.09E-02	5.7E-01 NC	yes	yes	no			X	
	Vanadium	100	2.04E+01	4.54E-01	2.9E+02 NC	yes	yes	no			X	
	Zinc	100	4.56E+02	2.28E+00	1.7E+04 NC	yes	yes	no			X	
Semivolatiles	1,2,4-Trichlorobenzene	0	--	3.31E-01	1.8E+02 C	yes	no		no		X	
	1,2-Dichlorobenzene	0	--	1.29E-01	3.8E+03 NC	yes	no		no		X	
	1,2-Diphenylhydrazine	0	--	1.00E+00	4.9E+00 C	yes	no		no		X	
	1,3-Dichlorobenzene	0	--	1.26E-01		no						X
	1,4-Dichlorobenzene	0	--	1.34E-01	1.3E+02 C	yes	no		no		X	
	1-Methylnaphthalene	0	--	3.46E-01	1.3E+02 C	yes	no		no		X	
	2,4,5-Trichlorophenol	0	--	2.40E-01	4.5E+03 NC	yes	no		no		X	
	2,4,6-Trichlorophenol	0	--	2.58E-01	4.5E+01 NC	yes	no		no		X	
	2,4-Dichlorophenol	0	--	3.78E-01	1.3E+02 NC	yes	no		no		X	
	2,4-Dimethylphenol	0	--	3.76E-01	9.0E+02 NC	yes	no		no		X	
	2,4-Dinitrophenol	0	--	1.00E+00	9.0E+01 NC	yes	no		no		X	
	2,4-Dinitrotoluene	0	--	1.00E+00	1.3E+01 C	yes	no		no		X	
	2,6-Dinitrotoluene	0	--	1.72E-01	2.6E+00 C	yes	no		no		X	
	2-Chloronaphthalene	0	--	3.14E-01	3.4E+03 NC	yes	no		no		X	
	2-Chlorophenol	0	--	4.68E-01	2.9E+02 NC	yes	no		no		X	
	2-Methylnaphthalene	0	--	3.59E-01	1.7E+02 NC	yes	no		no		X	
	2-Nitroaniline	0	--	2.17E-01	4.5E+02 NC	yes	no		no		X	
	2-Nitrophenol	0	--	3.43E-01		no						X
	3,3`-Dichlorobenzidine	0	--	2.80E-01	8.6E+00 C	yes	no		no		X	
	3-Nitroaniline	0	--	2.05E-01		no						X
	4,6-Dinitro-o-cresol	0	--	3.99E-01	3.6E+00 NC	yes	no		no		X	
	4-Bromophenyl phenyl ether	0	--	2.13E-01		no						X
	4-Chloro-3-methylphenol	0	--	1.00E+00	4.5E+03 NC	yes	no		no		X	
	4-Chlorophenyl phenyl ether	0	--	2.31E-01		no						X
	4-Nitroaniline	0	--	1.76E-01	1.8E+02 NC	yes	no		no		X	
	4-Nitrophenol	0	--	2.10E-01		no						X
	Acenaphthene	0	--	2.31E-01	2.5E+03 NC	yes	no		no		X	
	Acenaphthylene	0	--	2.63E-01		no						X
	Anthracene	0	--	1.00E+00	1.3E+04 NC	yes	no		no		X	
	Benzo(a)anthracene	0	--	1.00E+00	8.1E+00 C	yes	no		no		X	
	Benzo(a)pyrene	0	--	1.00E+00	8.1E-01 C	yes	no		yes			X
	Benzo(b)fluoranthene	0	--	2.54E-01	8.1E+00 C	yes	no		no		X	
	Benzo(g,h,i)perylene	0	--	2.44E-01		no						X
	Benzo(k)fluoranthene	0	--	2.57E-01	8.1E+01 C	yes	no		no		X	
	bis(2-chloroethoxy)methane	0	--	3.92E-01	1.3E+02 NC	yes	no		no		X	
	bis(2-chloroethyl)ether	0	--	1.40E-01	3.8E+00 C	yes	no		no		X	
	Bis(2-chloroisopropyl)ether	0	--	4.64E-01	2.3E+03 NC	yes	no		no		X	
	Bis(2-ethylhexyl)phthalate	0	--	3.43E-01	2.8E+02 C	yes	no		no		X	
	Butyl benzyl phthalate	0	--	1.00E+00	2.1E+03 C	yes	no		no		X	
	Carbazole	0	--	1.00E+00		no						X
	Chrysene	0	--	2.69E-01	8.1E+02 C	yes	no		no		X	
	Dibenzo(a,h)anthracene	0	--	1.00E+00	8.1E-01 C	yes	no		yes			X
	Dibenzofuran	0	--	1.00E+00	5.7E+01 NC	yes	no		no		X	
	Dibutyl phthalate	0	--	2.78E-01	4.5E+03 NC	yes	no		no		X	
	Diethyl phthalate	0	--	1.00E+00	3.6E+04 NC	yes	no		no		X	
	Dimethyl phthalate	0	--	1.00E+00		no						X
	Di-n-octyl phthalate	0	--	1.00E+00	4.5E+02 NC	yes	no		no		X	
	Fluoranthene	0	--	1.00E+00	1.7E+03 NC	yes	no		no		X	
	Fluorene	0	--	1.00E+00	1.7E+03 NC	yes	no		no		X	
	Hexachlorobenzene	0	--	2.64E-01	2.8E+00 C	yes	no		no		X	
	Hexachlorobutadiene	0	--	1.69E-01	3.6E+01 C	yes	no		no		X	
	Hexachloroethane	0	--	1.28E-01	3.9E+01 NC	yes	no		no		X	
	Indeno(1,2,3-cd)pyrene	0	--	1.00E+00	8.1E+00 C	yes	no		no		X	
	Isophorone	0	--	3.20E-01	4.1E+03 C	yes	no		no		X	
	m & p-cresols	0	--	4.01E-01	2.2E+03 NC	yes	no		no		X	
	Naphthalene	0	--	3.76E-01	2.7E+01 C	yes	no		no		X	
	Nitrobenzene	0	--	4.06E-01	1.1E+02 NC	yes	no		no		X	
	N-Nitrosodimethylamine	0	--	1.00E+00	2.1E-02 C	yes	no		yes			X
	N-Nitrosodi-n-propylamine	0	--	2.73E-01	5.6E-01 C	yes	no		no		X	
	N-Nitrosodiphenylamine	0	--	1.00E+00	7.9E+02 C	yes	no		no		X	
	o-Cresol	0	--	4.34E-01	2.2E+03 NC	yes	no		no		X	
	p-Chloroaniline	0	--	3.08E-01	1.9E+01 C	yes	no		no		X	
	Pentachlorophenol	0	--	1.00E+00	7.2E+00 C	yes	no		no		X	
	Phenanthrene	0	--	2.87E-01		no						X
	Phenol	0	--	4.38E-01	1.3E+04 NC	yes	no		no		X	
	Pyrene	0	--	2.53E-01	1.3E+03 NC	yes	no		no		X	

DF = Detection Frequency; TEQ = Toxicity Equivalence; PCB = polychlorinated biphenyl; ND = non-detect; DL = sample-specific detection limit; EN = essential nutrient.
Bolded contaminants are those where the maximum detected concentration exceeds the respective RBC.

[a]Concentrations in units of mg/kg.

[b]Risk-based concentrations are based on USEPA's generic residential soil RSL values (May 2021) using a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value).

[c]Detection limts were evaluated for those contaminants with a detection frequency <5%.

[d]Only those contaminants identified as having a detection frequency ≥5% and a maximum detected concentration > RBC were evaluated for comparison to background.

Table 3-19. OU3 Creek Sediments COPC Screen

Contaminant		DF (%)	Maximum Detected Concentration	Average DL	Risk-Based SL[b]	COPC SELECTION STEPS				OU3 CREEK SEDIMENT COPCs		
						Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > RBC?	Detection Limit[c] Is DL > RBC?	COPC	Not a COPC	Source of Uncertainty
TEQ	$TEQ_{D/F}$ (ND=1/2 DL)	100	3.17E-06	--	3.6E-05 C	yes	yes	no			X	
PCBs	Aroclor-1016	0	--	1.45E-02	2.9E+00 NC	yes	no		no		X	
	Aroclor-1221	0	--	3.38E-02	1.7E+00 C	yes	no		no		X	
	Aroclor-1232	0	--	1.50E-02	1.7E+00 C	yes	no		no		X	
	Aroclor-1242	0	--	3.86E-02	1.8E+00 C	yes	no		no		X	
	Aroclor-1248	0	--	2.49E-02	1.8E+00 C	yes	no		no		X	
	Aroclor-1254	0	--	9.35E-03	8.2E-01 NC	yes	no		no		X	
	Aroclor-1260	0	--	9.63E-03	1.8E+00 C	yes	no		no		X	
	Aroclor-1262	0	--	1.27E-02		no						X
	Aroclor-1268	0	--	8.73E-03		no						X
Total Metals	Aluminum	100	1.50E+04	8.08E+00	5.7E+04 NC	yes	yes	no			X	
	Antimony	43	6.20E-01	1.81E-01	2.3E+01 NC	yes	yes	no			X	
	Arsenic	100	1.55E+01	2.88E-01	4.9E+00 C	yes	yes	yes		X		
	Barium	100	2.74E+02	1.88E-01	1.1E+04 NC	yes	yes	no			X	
	Beryllium	100	7.30E-01	8.03E-02	1.1E+02 NC	yes	yes	no			X	
	Cadmium	100	8.90E-01	5.00E-02	5.1E+01 NC	yes	yes	no			X	
	Chromium	100	1.57E+01	2.78E-01	2.2E+00 C	yes	yes	yes		X		
	Cobalt	100	8.50E+00	3.02E-01	1.7E+01 NC	yes	yes	no			X	
	Copper	100	1.58E+02	4.89E-01	2.3E+03 NC	yes	yes	no			X	
	Iron	100	1.64E+04	3.06E+01	4.0E+04 NC	yes	yes	no			X	
	Lead	100	2.95E+01	9.47E-02	4.0E+02 NC	yes	yes	no			X	
	Manganese	100	3.83E+02	3.25E-01	1.4E+03 NC	yes	yes	no			X	
	Mercury	82	2.00E-01	1.41E-02	1.7E+01 NC	yes	yes	no			X	
	Methyl Mercury	14	7.60E-03	1.53E-03	5.7E+00 NC	yes	yes	no			X	
	Nickel	100	1.27E+01	3.49E-01	1.1E+03 NC	yes	yes	no			X	
	Selenium	43	1.30E+00	2.54E-01	2.9E+02 NC	yes	yes	no			X	
	Silver	18	5.80E-01	2.75E-01	2.9E+02 NC	yes	yes	no			X	
	Thallium	100	2.10E-01	6.16E-02	5.7E-01 NC	yes	yes	no			X	
	Vanadium	100	2.55E+01	4.61E-01	2.9E+02 NC	yes	yes	no			X	
	Zinc	100	3.29E+02	2.31E+00	1.7E+04 NC	yes	yes	no			X	
Semivolatiles	1,2,4-Trichlorobenzene	0	--	3.31E-01	1.8E+02 C	yes	no		no		X	
	1,2-Dichlorobenzene	0	--	1.29E-01	3.8E+03 NC	yes	no		no		X	
	1,2-Diphenylhydrazine	0	--	1.00E+00	4.9E+00 C	yes	no		no		X	
	1,3-Dichlorobenzene	0	--	1.26E-01		no						X
	1,4-Dichlorobenzene	0	--	1.34E-01	1.3E+02 C	yes	no		no		X	
	1-Methylnaphthalene	0	--	3.46E-01	1.3E+02 C	yes	no		no		X	
	2,4,5-Trichlorophenol	0	--	2.40E-01	4.5E+03 NC	yes	no		no		X	
	2,4,6-Trichlorophenol	0	--	2.58E-01	4.5E+01 NC	yes	no		no		X	
	2,4-Dichlorophenol	0	--	3.78E-01	1.3E+02 NC	yes	no		no		X	
	2,4-Dimethylphenol	0	--	3.76E-01	9.0E+02 NC	yes	no		no		X	
	2,4-Dinitrophenol	0	--	1.00E+00	9.0E+01 NC	yes	no		no		X	
	2,4-Dinitrotoluene	0	--	1.00E+00	1.3E+01 C	yes	no		no		X	
	2,6-Dinitrotoluene	0	--	1.72E-01	2.6E+00 C	yes	no		no		X	
	2-Chloronaphthalene	0	--	3.14E-01	3.4E+03 NC	yes	no		no		X	
	2-Chlorophenol	0	--	4.68E-01	2.9E+02 NC	yes	no		no		X	
	2-Methylnaphthalene	0	--	3.59E-01	1.7E+02 NC	yes	no		no		X	
	2-Nitroaniline	0	--	2.17E-01	4.5E+02 NC	yes	no		no		X	
	2-Nitrophenol	0	--	3.43E-01		no						X
	3,3`-Dichlorobenzidine	0	--	2.80E-01	8.6E+00 C	yes	no		no		X	
	3-Nitroaniline	0	--	2.05E-01		no						X
	4,6-Dinitro-o-cresol	0	--	3.99E-01	3.6E+00 NC	yes	no		no		X	
	4-Bromophenyl phenyl ether	0	--	2.13E-01		no						X
	4-Chloro-3-methylphenol	0	--	1.00E+00	4.5E+03 NC	yes	no		no		X	
	4-Chlorophenyl phenyl ether	0	--	2.31E-01		no						X
	4-Nitroaniline	0	--	1.76E-01	1.8E+02 NC	yes	no		no		X	
	4-Nitrophenol	0	--	2.10E-01		no						X
	Acenaphthene	0	--	2.31E-01	2.5E+03 NC	yes	no		no		X	
	Acenaphthylene	0	--	2.63E-01		no						X
	Anthracene	0	--	1.00E+00	1.3E+04 NC	yes	no		no		X	
	Benzo(a)anthracene	0	--	1.00E+00	8.1E+00 C	yes	no		no		X	
	Benzo(a)pyrene	0	--	1.00E+00	8.1E-01 C	yes	no		yes			X
	Benzo(b)fluoranthene	0	--	2.54E-01	8.1E+00 C	yes	no		no		X	
	Benzo(g,h,i)perylene	0	--	2.44E-01		no						X
	Benzo(k)fluoranthene	0	--	2.57E-01	8.1E+01 C	yes	no		no		X	
	bis(2-chloroethoxy)methane	0	--	3.92E-01	1.3E+02 NC	yes	no		no		X	
	bis(2-chloroethyl)ether	0	--	1.40E-01	3.8E+00 C	yes	no		no		X	
	Bis(2-chloroisopropyl)ether	0	--	4.64E-01	2.3E+03 NC	yes	no		no		X	
	Bis(2-ethylhexyl)phthalate	0	--	3.43E-01	2.8E+02 C	yes	no		no		X	
	Butyl benzyl phthalate	0	--	1.00E+00	2.1E+03 C	yes	no		no		X	
	Carbazole	0	--	1.00E+00		no						X
	Chrysene	0	--	2.69E-01	8.1E+02 C	yes	no		no		X	
	Dibenzo(a,h)anthracene	0	--	1.00E+00	8.1E-01 C	yes	no		yes			X
	Dibenzofuran	0	--	1.00E+00	5.7E+01 NC	yes	no		no		X	
	Dibutyl phthalate	0	--	2.78E-01	4.5E+03 NC	yes	no		no		X	
	Diethyl phthalate	0	--	1.00E+00	3.6E+04 NC	yes	no		no		X	
	Dimethyl phthalate	0	--	1.00E+00		no						X
	Di-n-octyl phthalate	0	--	1.00E+00	4.5E+02 NC	yes	no		no		X	
	Fluoranthene	0	--	1.00E+00	1.7E+03 NC	yes	no		no		X	
	Fluorene	0	--	1.00E+00	1.7E+03 NC	yes	no		no		X	
	Hexachlorobenzene	0	--	2.64E-01	2.8E+00 C	yes	no		no		X	
	Hexachlorobutadiene	0	--	1.69E-01	3.6E+01 C	yes	no		no		X	
	Hexachloroethane	0	--	1.28E-01	3.9E+01 NC	yes	no		no		X	
	Indeno(1,2,3-cd)pyrene	0	--	1.00E+00	8.1E+00 C	yes	no		no		X	
	Isophorone	0	--	3.20E-01	4.1E+03 C	yes	no		no		X	
	m & p-cresols	50	5.54E-01	4.01E-01	2.2E+03 NC	yes	yes	no			X	
	Naphthalene	0	--	3.76E-01	2.7E+01 C	yes	no		no		X	
	Nitrobenzene	0	--	4.06E-01	1.1E+02 NC	yes	no		no		X	
	N-Nitrosodimethylamine	0	--	1.00E+00	2.1E-02 C	yes	no		yes			X
	N-Nitrosodi-n-propylamine	0	--	2.73E-01	5.6E-01 C	yes	no		no		X	
	N-Nitrosodiphenylamine	0	--	1.00E+00	7.9E+02 C	yes	no		no		X	
	o-Cresol	0	--	4.34E-01	2.2E+03 NC	yes	no		no		X	
	p-Chloroaniline	0	--	3.08E-01	1.9E+01 C	yes	no		no		X	
	Pentachlorophenol	0	--	1.00E+00	7.2E+00 C	yes	no		no		X	
	Phenanthrene	0	--	2.87E-01		no						X
	Phenol	0	--	4.38E-01	1.3E+04 NC	yes	no		no		X	
	Pyrene	0	--	2.53E-01	1.3E+03 NC	yes	no		no		X	

DF = Detection Frequency; TEQ = Toxicity Equivalence; PCB = polychlorinated biphenyl; ND = non-detect; DL = sample-specific detection limit; EN = essential nutrient.
Bolded contaminants are those where the maximum detected concentration exceeds the respective risk-based SL.

[a]Concentrations in units of mg/kg.

[b]Risk-based concentrations are based on USEPA's generic residential soil RSL values (May 2021) using a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value).

[c]Detection limts were evaluated for those contaminants with a detection frequency <5%.

[d]Only those contaminants identified as having a detection frequency ≥5% and a maximum detected concentration > RBC were evaluated for comparison to background.

Table 3-20. OU3 Clark Fork River Surface Water COPC Screen[a]

Analysis	Contaminant	DF (%)	Maximum Detected Concentration	Average DL	RBC[b]		COPC SELECTION STEPS				OU3 CFR SURFACE WATER COPCs		
							Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > RBC?	Detection Limit[c] Is DL > RBC?	COPC	Not a COPC	Source of Uncertainty
TEQ	TEQ_{DF} (ND=1/2 DL)	21	1.71E-06	--	4.4E-06	C	yes	yes	no			X	
PCBs	Aroclor-1016	0	--	4.50E-02	1.0E+00	NC	yes	no		no		X	
	Aroclor-1221	0	--	1.95E-02	6.9E-02	C	yes	no		no		X	
	Aroclor-1232	0	--	3.65E-02	6.9E-02	C	yes	no		no		X	
	Aroclor-1242	0	--	2.80E-02	2.8E-01	C	yes	no		no		X	
	Aroclor-1248	0	--	1.20E-02	2.8E-01	C	yes	no		no		X	
	Aroclor-1254	0	--	1.55E-02	2.8E-01	C	yes	no		no		X	
	Aroclor-1260	0	--	1.50E-02	2.8E-01	C	yes	no		no		X	
	Aroclor-1262	0	--	4.20E-02			no						X
	Aroclor-1268	0	--	2.30E-02			no						X
Total Metals	Aluminum	100	7.47E+02	4.84E+00	1.5E+04	NC	yes	yes	no			X	
	Antimony	100	5.70E-01	8.24E-02	5.9E+00	NC	yes	yes	no			X	
	Arsenic	100	2.22E+01	1.21E-01	3.8E-01	C	yes	yes	yes		X		
	Barium	100	1.33E+02	1.01E-01	2.9E+03	NC	yes	yes	no			X	
	Beryllium	0	--	5.53E-02	2.2E+01	NC	yes	no		no		X	
	Cadmium	16	2.70E-01	2.66E-02	7.3E+00	NC	yes	yes	no			X	
	Chromium	32	7.50E-01	2.26E-01	3.7E-01	C	yes	yes	yes		X		
	Cobalt	26	4.00E-01	9.89E-02	4.4E+00	NC	yes	yes	no			X	
	Copper	100	2.99E+01	2.16E-01	5.9E+02	NC	yes	yes	no			X	
	Iron	100	7.21E+02	6.86E+00	1.0E+04	NC	yes	yes	no			X	
	Lead	100	1.60E+00	3.89E-02	1.5E+01	MCL	yes	yes	no			X	
	Manganese	100	3.30E+02	2.25E-01	3.5E+02	NC	yes	yes	no			X	
	Mercury	0	--	6.92E-02	4.4E+00	NC	yes	no		no		X	
	Nickel	95	9.10E-01	1.19E-01	2.9E+02	NC	yes	yes	no			X	
	Selenium	6	1.40E-01	1.44E-01	7.3E+01	NC	yes	yes	no			X	
	Silver	5	2.00E-01	1.52E-01	7.3E+01	NC	yes	yes	no			X	
	Thallium	0	--	2.45E-02	1.5E-01	NC	yes	no		no		X	
	Vanadium	95	1.90E+00	2.72E-01	7.4E+01	NC	yes	yes	no			X	
	Zinc	100	2.68E+01	1.87E+00	4.4E+03	NC	yes	yes	no			X	
Miscellaneous Parameters	Chloride	100	1.00E+04	2.48E+02			no						X
	Fluoride	100	1.90E+02	1.88E+01	5.9E+02	NC	yes	yes	no			X	
	Nitrogen, NO2 plus NO3	100	9.80E+01	4.15E+00	1.0E+04	MCL	yes	yes	no			X	
	Phosphorus (as P)	100	3.00E+02	6.53E+00	7.1E+05	NC	yes	yes	no			X	
	Sulfate	100	4.57E+04	1.76E+02			no						X
Semivolatiles	1,2,4-Trichlorobenzene	0	--	1.90E+00	1.2E+01	C	yes	no		no		X	
	1,2-Dichlorobenzene	0	--	1.90E+00	1.3E+03	NC	yes	no		no		X	
	1,2-Diphenylhydrazine	0	--	2.50E+00	7.1E-01	C	yes	no		yes			X
	1,3-Dichlorobenzene	0	--	1.60E+00			no						X
	1,4-Dichlorobenzene	0	--	1.90E+00	1.1E+02	C	yes	no		no		X	
	1-Methylnaphthalene	0	--	2.10E+00	1.1E+01	C	yes	no		no		X	
	2,4,5-Trichlorophenol	0	--	2.20E+00	1.3E+03	NC	yes	no		no		X	
	2,4,6-Trichlorophenol	0	--	2.20E+00	1.4E+01	NC	yes	no		no		X	
	2,4-Dichlorophenol	0	--	2.30E+00	4.4E+01	NC	yes	no		no		X	
	2,4-Dimethylphenol	0	--	6.80E+00	2.9E+02	NC	yes	no		no		X	
	2,4-Dinitrophenol	0	--	2.80E+00	2.9E+01	NC	yes	no		no		X	
	2,4-Dinitrotoluene	0	--	2.10E+00	1.8E+00	C	yes	no		yes			X
	2,6-Dinitrotoluene	0	--	2.30E+00	3.8E-01	C	yes	no		yes			X
	2-Chloronaphthalene	0	--	2.20E+00	6.8E+02	NC	yes	no		no		X	
	2-Chlorophenol	0	--	2.20E+00	7.3E+01	NC	yes	no		no		X	
	2-Methylnaphthalene	0	--	2.10E+00	3.2E+01	NC	yes	no		no		X	
	2-Nitroaniline	0	--	2.80E+00	1.5E+02	NC	yes	no		no		X	
	2-Nitrophenol	0	--	2.20E+00			no						X
	3,3'-Dichlorobenzidine	0	--	4.90E+00	1.3E+00	C	yes	no		yes			X
	3-Nitroaniline	0	--	5.00E+00			no						X
	4,6-Dinitro-o-cresol	0	--	3.50E+00	1.2E+00	NC	yes	no		yes			X
	4-Bromophenyl phenyl ether	0	--	2.40E+00			no						X
	4-Chloro-3-methylphenol	0	--	1.60E+00	1.5E+03	NC	yes	no		no		X	
	4-Chlorophenyl phenyl ether	0	--	1.40E+00			no						X
	4-Nitroaniline	0	--	4.40E+00	2.8E+01	C	yes	no		no		X	
	4-Nitrophenol	0	--	3.40E+00			no						X
	Acenaphthene	0	--	1.60E+00	4.7E+02	NC	yes	no		no		X	
	Acenaphthylene	0	--	2.20E+00			no						X
	Anthracene	0	--	2.50E+00	1.3E+03	NC	yes	no		no		X	
	Benzo(a)anthracene	0	--	5.10E+00	1.8E+00	C	yes	no		yes			X
	Benzo(a)pyrene	0	--	2.40E+00	1.8E-01	C	yes	no		yes			X
	Benzo(b)fluoranthene	0	--	2.50E+00	1.8E+00	C	yes	no		yes			X
	Benzo(g,h,i)perylene	0	--	2.50E+00			no						X
	Benzo(k)fluoranthene	0	--	2.80E+00	1.8E+01	C	yes	no		no		X	
	bis(2-chloroethoxy)methane	0	--	1.50E+00	4.4E+01	NC	yes	no		no		X	
	bis(2-chloroethyl)ether	0	--	2.30E+00	5.2E-01	C	yes	no		yes			X
	Bis(2-chloroisopropyl)ether	0	--	2.30E+00	5.9E+02	NC	yes	no		no		X	
	Bis(2-ethylhexyl)phthalate	0	--	2.40E+00	4.1E+01	C	yes	no		no		X	
	Butyl benzyl phthalate	0	--	1.90E+00	1.6E+02	C	yes	no		no		X	
	Carbazole	0	--	2.70E+00			no						X
	Chrysene	0	--	2.30E+00	1.8E+02	C	yes	no		no		X	
	Dibenzo(a,h)anthracene	0	--	1.80E+00	1.8E-01	C	yes	no		yes			X
	Dibenzofuran	0	--	2.30E+00	6.5E+00	NC	yes	no		no		X	
	Dibutyl phthalate	0	--	2.40E+00	8.1E+02	NC	yes	no		no		X	
	Diethyl phthalate	0	--	2.50E+00	1.2E+04	NC	yes	no		no		X	
	Dimethyl phthalate	0	--	2.30E+00			no						X
	Di-n-octyl phthalate	0	--	1.70E+00	1.5E+02	NC	yes	no		no		X	
	Fluoranthene	0	--	2.50E+00	5.9E+02	NC	yes	no		no		X	
	Fluorene	0	--	2.40E+00	2.3E+02	NC	yes	no		no		X	
	Hexachlorobenzene	0	--	2.60E+00	3.6E-01	C	yes	no		yes			X
	Hexachlorobutadiene	0	--	1.70E+00	2.5E+00	C	yes	no		no		X	
	Hexachloroethane	0	--	1.70E+00	6.6E+00	NC	yes	no		no		X	
	Indeno(1,2,3-cd)pyrene	0	--	1.80E+00	1.8E+00	C	yes	no		no		X	
	Isophorone	0	--	1.60E+00	6.0E+02	C	yes	no		no		X	
	m & p-cresols	0	--	2.30E+00	7.3E+02	NC	yes	no		no		X	
	Naphthalene	0	--	2.00E+00	4.7E+00	C	yes	no		no		X	
	Nitrobenzene	0	--	2.50E+00	2.9E+01	NC	yes	no		no		X	
	N-Nitrosodimethylamine	0	--	2.30E+00	3.6E-03	C	yes	no		yes			X
	N-Nitrosodi-n-propylamine	0	--	2.30E+00	8.1E-02	C	yes	no		yes			X
	N-Nitrosodiphenylamine	0	--	3.90E+00	1.2E+02	C	yes	no		no		X	
	o-Cresol	0	--	2.00E+00	7.3E+02	NC	yes	no		no		X	
	p-Chloroaniline	0	--	3.60E+00	2.8E+00	C	yes	no		yes			X
	Pentachlorophenol	0	--	2.20E+00	3.1E-01	C	yes	no		yes			X
	Phenanthrene	0	--	2.50E+00			no						X
	Phenol	0	--	2.20E+00	4.4E+03	NC	yes	no		no		X	
	Pyrene	0	--	2.50E+00	7.9E+01	NC	yes	no		no		X	

DL = sample-specific detection limit; RBC = risk-based concentration; TEQ_{DF} = toxicity equivalence for dioxins and furans; PCBs = polychlorinated biphenyls; ND = non-detect; EN = essential nutrient; MCL = maximum contaminant limit.

Bolded contaminants are those where the maximum detected concentration exceeds the respective RBC.

[a]Concentrations in units of µg/L.

[b]Risk-based concentrations using the USEPA RSL Calculator assuming a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value). Values represent the minimum RSL based on the site-specific camper scenario.

[c]Detection limts were evaluated for those chemicals with a detection frequency <5%.

Table 3-21. OU3 Creek Surface Water COPC Screen[a]

Contaminant		DF (%)	Maximum Detected Concentration	Average DL	RBC[a]		COPC SELECTION STEPS				OU3 Creek SURFACE WATER COPCs		
							Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > RBC?	Detection Limit[c]			
										Is DL > RBC?	COPC	Not a COPC	Source of Uncertainty
TEQ	TEQ_{DF} (ND=1/2 DL)	100	2.14E-06	--	4.4E-06	C	yes	yes	no			X	
PCBs	Aroclor-1016	0	--	4.60E-02	1.0E+00	NC	yes	no		no		X	
	Aroclor-1221	0	--	2.00E-02	6.9E-02	C	yes	no		no		X	
	Aroclor-1232	0	--	3.70E-02	6.9E-02	C	yes	no		no		X	
	Aroclor-1242	0	--	2.80E-02	2.8E-01	C	yes	no		no		X	
	Aroclor-1248	0	--	1.30E-02	2.8E-01	C	yes	no		no		X	
	Aroclor-1254	0	--	1.60E-02	2.8E-01	C	yes	no		no		X	
	Aroclor-1260	0	--	1.50E-02	2.8E-01	C	yes	no		no		X	
	Aroclor-1262	0	--	4.20E-02			no						X
	Aroclor-1268	0	--	2.30E-02			no						X
Total Metals	Aluminum	100	3.05E+02	5.08E+00	1.5E+04	NC	yes	yes	no			X	
	Antimony	100	2.10E-01	7.70E-02	5.9E+00	NC	yes	yes	no			X	
	Arsenic	100	3.50E+00	1.10E-01	3.8E-01	C	yes	yes	yes		X		
	Barium	100	2.50E+02	9.62E-02	2.9E+03	NC	yes	yes	no			X	
	Beryllium	25	5.50E-02	5.40E-02	2.2E+01	NC	yes	yes	no			X	
	Cadmium	0	--	2.64E-02	7.3E+00	NC	yes	no		no		X	
	Chromium	100	5.10E-01	1.62E-01	3.7E-01	C	yes	yes	yes		X		
	Cobalt	80	1.30E-01	9.40E-02	4.4E+00	NC	yes	yes	no			X	
	Copper	100	2.40E+00	2.18E-01	5.9E+02	NC	yes	yes	no			X	
	Iron	100	2.69E+02	7.06E+00	1.0E+04	NC	yes	yes	no			X	
	Lead	100	3.40E-01	4.04E-02		MCL	no						X
	Manganese	100	1.28E+02	2.40E-01	3.5E+02	NC	yes	yes	no			X	
	Mercury	20	3.00E-02	6.68E-02	4.4E+00	NC	yes	yes	no			X	
	Nickel	100	3.90E-01	1.20E-01	2.9E+02	NC	yes	yes	no			X	
	Selenium	0	--	1.40E-01	7.3E+01	NC	yes	no		no		X	
	Silver	0	--	1.50E-01	7.3E+01	NC	yes	no		no		X	
	Thallium	20	3.30E-02	2.38E-02	1.5E-01	NC	yes	yes	no			X	
	Vanadium	100	1.20E+00	2.72E-01	7.4E+01	NC	yes	yes	no			X	
	Zinc	80	5.30E+00	2.00E+00	4.4E+03	NC	yes	yes	no			X	
Miscellaneous Parameters	Chloride	100	6.40E+03	2.40E+02			no						X
	Fluoride	100	1.80E+02	1.98E+01	5.9E+02	EN	yes	yes	no			X	
	Nitrogen, NO2 plus NO3	100	8.40E+02	4.28E+00	1.0E+04	MCL	yes	yes	no			X	
	Phosphorus (as P)	100	9.50E+01	2.20E+00	7.1E+05	NC	yes	yes	no			X	
	Sulfate	100	1.85E+04	1.72E+02			no						X
Semivolatiles	1,2,4-Trichlorobenzene	0	--	1.90E+00	1.2E+01	C	yes	no		no		X	
	1,2-Dichlorobenzene	0	--	1.90E+00	1.3E+03	NC	yes	no		no		X	
	1,2-Diphenylhydrazine	0	--	2.50E+00	7.1E-01	C	yes	no		yes			X
	1,3-Dichlorobenzene	0	--	1.70E+00			no						X
	1,4-Dichlorobenzene	0	--	1.90E+00	1.1E+02	C	yes	no		no		X	
	1-Methylnaphthalene	0	--	2.10E+00	1.1E+01	C	yes	no		no		X	
	2,4,5-Trichlorophenol	0	--	2.20E+00	1.3E+03	NC	yes	no		no		X	
	2,4,6-Trichlorophenol	0	--	2.20E+00	1.4E+01	NC	yes	no		no		X	
	2,4-Dichlorophenol	0	--	2.30E+00	4.4E+01	NC	yes	no		no		X	
	2,4-Dimethylphenol	0	--	6.90E+00	2.9E+02	NC	yes	no		no		X	
	2,4-Dinitrophenol	0	--	2.80E+00	2.9E+01	NC	yes	no		no		X	
	2,4-Dinitrotoluene	0	--	2.20E+00	1.8E+00	C	yes	no		yes			X
	2,6-Dinitrotoluene	0	--	2.30E+00	3.8E-01	C	yes	no		yes			X
	2-Chloronaphthalene	0	--	2.30E+00	6.8E+02	NC	yes	no		no		X	
	2-Chlorophenol	0	--	2.20E+00	7.3E+01	NC	yes	no		no		X	
	2-Methylnaphthalene	0	--	2.10E+00	3.2E+01	NC	yes	no		no		X	
	2-Nitroaniline	0	--	2.80E+00	1.5E+02	NC	yes	no		no		X	
	2-Nitrophenol	0	--	2.30E+00			no						X
	3,3'-Dichlorobenzidine	0	--	5.00E+00	1.3E+00	C	yes	no		yes			X
	3-Nitroaniline	0	--	5.10E+00			no						X
	4,6-Dinitro-o-cresol	0	--	3.60E+00	1.2E+00	NC	yes	no		yes			X
	4-Bromophenyl phenyl ether	0	--	2.40E+00			no						X
	4-Chloro-3-methylphenol	0	--	1.60E+00	1.5E+03	NC	yes	no		no		X	
	4-Chlorophenyl phenyl ether	0	--	1.40E+00			no						X
	4-Nitroaniline	0	--	4.40E+00	2.8E+01	C	yes	no		no		X	
	4-Nitrophenol	0	--	3.40E+00			no						X
	Acenaphthene	0	--	1.70E+00	4.7E+02	NC	yes	no		no		X	
	Acenaphthylene	0	--	2.30E+00			no						X
	Anthracene	0	--	2.50E+00	1.3E+03	NC	yes	no		no		X	
	Benzo(a)anthracene	0	--	5.10E+00	1.8E+00	C	yes	no		yes			X
	Benzo(a)pyrene	0	--	2.40E+00	1.8E-01	C	yes	no		yes			X
	Benzo(b)fluoranthene	0	--	2.50E+00	1.8E+00	C	yes	no		yes			X
	Benzo(g,h,i)perylene	0	--	2.50E+00			no						X
	Benzo(k)fluoranthene	0	--	2.80E+00	1.8E+01	C	yes	no		no		X	
	bis(2-chloroethoxy)methane	0	--	1.60E+00	4.4E+01	NC	yes	no		no		X	
	bis(2-chloroethyl)ether	0	--	2.30E+00	5.2E-01	C	yes	no		yes			X
	Bis(2-chloroisopropyl)ether	0	--	2.30E+00	5.9E+02	NC	yes	no		no		X	
	Bis(2-ethylhexyl)phthalate	0	--	2.40E+00	4.1E+01	C	yes	no		no		X	
	Butyl benzyl phthalate	0	--	1.90E+00	1.6E+02	C	yes	no		no		X	
	Carbazole	0	--	2.70E+00			no						X
	Chrysene	0	--	2.30E+00	1.8E+02	C	yes	no		no		X	
	Dibenzo(a,h)anthracene	0	--	1.80E+00	1.8E-01	C	yes	no		yes			X
	Dibenzofuran	0	--	2.30E+00	6.5E+00	NC	yes	no		no		X	
	Dibutyl phthalate	0	--	2.50E+00	8.1E+02	NC	yes	no		no		X	
	Diethyl phthalate	0	--	2.50E+00	1.2E+04	NC	yes	no		no		X	
	Dimethyl phthalate	0	--	2.40E+00			no						X
	Di-n-octyl phthalate	0	--	1.70E+00	1.5E+02	NC	yes	no		no		X	
	Fluoranthene	0	--	2.50E+00	5.9E+02	NC	yes	no		no		X	
	Fluorene	0	--	2.40E+00	2.3E+02	NC	yes	no		no		X	
	Hexachlorobenzene	0	--	2.60E+00	3.6E-01	C	yes	no		yes			X
	Hexachlorobutadiene	0	--	1.70E+00	2.5E+00	C	yes	no		no		X	
	Hexachloroethane	0	--	1.70E+00	6.6E+00	NC	yes	no		no		X	
	Indeno(1,2,3-cd)pyrene	0	--	1.80E+00	1.8E+00	C	yes	no		no		X	
	Isophorone	0	--	1.60E+00	6.0E+02	C	yes	no		no		X	
	m & p-cresols	0	--	2.30E+00	7.3E+02	NC	yes	no		no		X	
	Naphthalene	0	--	2.00E+00	4.7E+00	C	yes	no		no		X	
	Nitrobenzene	0	--	2.50E+00	2.9E+01	NC	yes	no		no		X	
	N-Nitrosodimethylamine	0	--	2.30E+00	3.6E-03	C	yes	no		yes			X
	N-Nitrosodi-n-propylamine	0	--	2.30E+00	8.1E-02	C	yes	no		yes			X
	N-Nitrosodiphenylamine	0	--	4.00E+00	1.2E+02	C	yes	no		no		X	
	o-Cresol	0	--	2.00E+00	7.3E+02	NC	yes	no		no		X	
	p-Chloroaniline	0	--	3.70E+00	2.8E+00	C	yes	no		yes			X
	Pentachlorophenol	0	--	2.20E+00	3.1E-01	C	yes	no		yes			X
	Phenanthrene	0	--	2.60E+00			no						X
	Phenol	0	--	2.30E+00	4.4E+03	NC	yes	no		no		X	
	Pyrene	0	--	2.50E+00	7.9E+01	NC	yes	no		no		X	

DL = sample-specific detection limit; RBC = risk-based concentration; TEQ_{DF} = toxicity equivalence for dioxins and furans; PCBs = polychlorinated biphenyls; ND = non-detect; EN = essential nutrient; MCL = maximum contaminant limit.

Bolded contaminants are those where the maximum detected concentration exceeds the respective RBC.

[a]Concentrations in units of µg/L.

[b]Risk-based concentrations using the USEPA RSL Calculator assuming a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value). Values represent the minimum RSL based on the site-specific camper scenario.

[c]Detection limts were evaluated for those chemicals with a detection frequency <5%.

Table 3-22. Fish Tissue COPC Screen[a]

Fish Species	Tissue Type	Contaminant		Detection Frequency (%)	Maximum Detected Concentration	RBC[b]			COPC Selection: Is Max Detect > RBC?		FISH TISSUE COPCs	
						Recreational Fisher	Tribal Fisher		Recreational RBC	Tribal RBC	COPC	Not a COPC
Northern Pike	Fillet	TEQ	**$TEQ_{D/F}$ (ND=1/2 DL)**	100	0.64	0.14	0.063	NC	yes	yes	X	
			TEQ_{PCB} (ND=1/2 DL)	100	3.69	0.14	0.063	NC	yes	yes	X	
			$TEQ_{D/F/PCB}$ (ND=1/2 DL)	100	4.11	0.14	0.063	NC	yes	yes	X	
		PCB	**Total PCBs**	100	68,200	2,610	1,210	C	yes	yes	X	
	Whole Body[c]	TEQ	**$TEQ_{D/F}$ (ND=1/2 DL)**	100	0.95	0.14	0.063	NC	yes	yes	X	
			TEQ_{PCB} (ND=1/2 DL)	100	8.60	0.14	0.063	NC	yes	yes	X	
			$TEQ_{D/F/PCB}$ (ND=1/2 DL)	100	9.36	0.14	0.063	NC	yes	yes	X	
		PCB	**Total PCBs**	100	187,089	2,610	1,210	C	yes	yes	X	
Rainbow Trout	Fillet	TEQ	**$TEQ_{D/F}$ (ND=1/2 DL)**	100	0.86	0.14	0.063	NC	yes	yes	X	
			TEQ_{PCB} (ND=1/2 DL)	100	2.48	0.14	0.063	NC	yes	yes	X	
			$TEQ_{D/F/PCB}$ (ND=1/2 DL)	100	3.34	0.14	0.063	NC	yes	yes	X	
		PCB	**Total PCBs**	100	29,100	2,610	1,210	C	yes	yes	X	
	Whole Body[c]	TEQ	**$TEQ_{D/F}$ (ND=1/2 DL)**	100	0.96	0.14	0.063	NC	yes	yes	X	
			TEQ_{PCB} (ND=1/2 DL)	100	3.58	0.14	0.063	NC	yes	yes	X	
			$TEQ_{D/F/PCB}$ (ND=1/2 DL)	100	4.41	0.14	0.063	NC	yes	yes	X	
		PCB	**Total PCBs**	100	34,760	2,610	1,210	C	yes	yes	X	

DL = sample-specific detection limit; RBC = risk-based concentration; COPC = contaminant of potential concern; COG = Council Grove; MIS = Missoula; LOL = Lolo; TEQ = toxicity equivalence; $TEQ_{D/F}$ = toxicity equivalence for dioxins and furans; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/P}$ = toxicity equivalence for dioxins, furans and dioxin-like polychlorinated biphenyl congeners; PCBs = polychlorinated biphenyls; ND = non-detect; NC = non-cancer; C = cancer.

Bolded contaminants are those where the maximum detected concentration exceeds the respective RBC.

[a]Concentrations in units of pg/g wet weight.

[b]Risk-based concentrations are based on values calcualted using USEPA's RSL calculator and assumed ingestion rates (43 g/day recreational fisher; 93 g/day tribal fisher) using a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value).

Table 3-23. Exposure Parameters for a Hypothetical Future Resident and Calculated Human Intake Factors (HIFs)

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight - adult	kg	80	[1]	80	[1]
	Body Weight - child	kg	15	[1]	15	[1]
	Exposure frequency	days/yr	256	[4, a]	350	[1]
	Exposure duration - adult	yr	9	[4, b]	20	[1]
	Exposure duration - child	yr	3	[4, b]	6	[1]
	Exposure duration (total)	yr	12	[4, b]	26	[1]
	Averaging Time, Cancer	yr	70	[2]	70	[2]
Incidental Ingestion of Soil	Ingestion rate - adult	mg/day	50	[3, c]	100	[1]
	Ingestion rate - child	mg/day	100	[3, c]	200	[1]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**4.68E-06**		**1.28E-05**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**2.57E-07**		**1.44E-06**	
Ingestion of Groundwater	Ingestion rate - adult	L/day	1.2	[4, d]	2.5	[1]
	Ingestion rate - child	L/day	0.45	[4, d]	0.78	[1]
	HIF_{child} (noncancer)	**L/kg-d**	**2.10E-02**		**4.99E-02**	
	HIF_{TWA} (cancer)	**L/kg-d**	**2.25E-03**		**1.28E-02**	
Dermal Exposure to Soil	Exposed Surface Area - adult	cm^2/event	6,032	[1]	6,032	[1]
	Exposed Surface Area - child	cm^2/event	2,373	[1]	2,373	[1]
	Adherence Factor - adult	mg/cm^2	0.01	[5]	0.07	[1]
	Adherence Factor - child	mg/cm^2	0.04	[5]	0.2	[1]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**4.44E-06**		**3.03E-05**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**2.58E-07**		**4.05E-06**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific; HIF = human intake factor;
HIF_{child} = human intake factor for the young child; HIF_{TWA} = time weighted average human intake factor (assumes exposure over a lifetime from childhood into adulthood).

Sources:

[1] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[2] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[3] USEPA 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

[4] USEPA 2011. Exposure Factors Handbook.

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] MDEQ 2016. Development of Montana-Specific Default Soil Exposure Frequencies. June.

[7] Professional judgment.

Notes:

[a] Estimated frequency based on the average percent of time spent at home (70%, see Table 16-16) and multiplying by 365 days/year.

[b] Average residential occupancy period =12 years (Table 16-5); delegation of years between adult and child based on professional judgment and consistent with other Regional risk assessments.

[c] CTE ingestion rate assumed to be half that of the RME receptor.

[d] Weighted mean of consumer-only ingestion of drinking water (Table 3-1).

Table 3-24. Exposure Parameters for a Hypothetical Future Commercial/Industrial Worker and Calculated Human Intake Factors (HIFs)

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight	kg	80	[1]	80	[1]
	Exposure frequency	days/yr	219	[3]	250	[1]
	Exposure duration	yr	9	[3]	25	[1]
	Averaging Time, Noncancer	days	3,285	[2]	9,125	[2]
	Averaging Time, Cancer	days	25,550	[2]	25,550	[2]
Incidental Ingestion of Soil	Ingestion rate - soil	mg/day	50	[5, c]	100	[1]
	Conversion factor - soil	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**3.75E-07**		**8.56E-07**	
	HIF (cancer)	**kg/kg-day**	**4.82E-08**		**3.06E-07**	
Ingestion of Groundwater	Ingestion rate - water	L/day	0.63	[5, c]	1.25	[4, a]
	HIF (noncancer)	**L/kg-d**	**4.69E-03**		**1.07E-02**	
	HIF (cancer)	**L/kg-d**	**6.03E-04**		**3.82E-03**	
Dermal Exposure to Soil	Exposed Surface Area (SA)	cm^2/event	3,527	[1]	3,527	[1]
	Adherence Factor (AF)	mg/cm^2	0.07	[1,3 b]	0.12	[1]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[3]	CS	[3]
	Event Frequency (EV)	events/day	1	[3]	1	[3]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**1.85E-06**		**3.62E-06**	
	HIF (cancer)	**kg/kg-day**	**2.38E-07**		**1.29E-06**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific; HIF = human intake factor.

Sources:

[1] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[2] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[3] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[4] USEPA 1991. OSWER Directive 9285.6-03.

[5] Professional judgment.

Notes:

[a] USEPA 1991 states that half of an individual's daily water intake is assumed to occur at work. Thus, the RME value is based on half of the default daily water intake is 2.5 L/day. This is consistent with the FAQs for OSWER Directive 9200.1-120.

[b] The CTE adherence factor is based on adherence factor for an RME adult resident (derived using the 50th percentile weighted AF for a high-end activity [gardening]).

[c] CTE ingestion rate assumed to be half that of the RME receptor.

Table 3-25. Exposure Parameters for a Hypothetical Future Construction Worker and Calculated Human Intake Factors (HIFs) and Time Weighting Factors (TWFs)

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight	kg	80	[1]	80	[1]
	Exposure frequency	days/yr	62	[6, a]	124	[5]
	Exposure duration	yr	0.5	[6, a]	1	[4]
	Averaging Time, Noncancer	days	183	[2]	365	[2]
	Averaging Time, Cancer	days	25,550	[2]	25,550	[2]
Incidental Ingestion of Soil	Ingestion rate	mg/day	165	[6, a]	330	[4, b]
	Conversion factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**3.50E-07**		**1.40E-06**	
	HIF (cancer)	**kg/kg-day**	**2.50E-09**		**2.00E-08**	
Inhalation of Particulates	Exposure time	hr/day	8	[4, c]	8	[4, c]
	Particulate Emission Factor (PEF)	m^3/kg	4.40E+08	[4, d]	4.40E+08	[4, d]
	TWF (noncancer)	**unitless**	**5.66E-02**		**1.13E-01**	
	TWF (cancer)	**unitless**	**4.04E-04**		**1.62E-03**	
Dermal Exposure to Soil	Exposed Surface Area (SA)	cm^2/event	3,527	[1, e]	3,527	[1, e]
	Adherence Factor (AF)	mg/cm^2	0.1	[3, f]	0.3	[3, f]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[3]	CS	[3]
	Event Frequency (EV)	events/day	1	[3]	1	[3]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**7.49E-07**		**4.49E-06**	
	HIF (cancer)	**kg/kg-day**	**5.35E-09**		**6.42E-08**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific; HIF = human intake factor.

Sources:

[1] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[2] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[3] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[4] USEPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.

[5] MDEQ 2016. Development of Montana-Specific Default Soil Exposure Frequencies. June.

[6] Professional judgment.

Notes:

[a] CTE value assumed to be half that of the RME receptor.

[b] RME value is based on the default value for construction scenario (Exhibit 5-1) is based on the 95th percentile value for adult soil intake rates reported in a soil ingestion mass-balance study.

[c] Assumes the entire 8-hour workday is outdoors.

[d] Particle emission factor is based on the value recommended for off-site residents of a construction site. This value normalizese the mass of fugitive dust over 30 years but accounts for the mass of dust emited by traffic on unpaved roads during construction and the mass of dust emitted by wind erosion.

[e] Construction workers are assumed to wear a short-sleeved shirt, long pants, and shoes. Assumes that the exposed surface area is equal to the USEPA default for a worker based on assumed exposure to the head, hands and forearms.

[f] Exhibit 3-3; based on the 95th percentile value (0.3) AF for the RME receptor and the geometric mean value (0.1) AF for the CTE receptor.

Table 3-26. Exposure Parameters for a Hiker and Calculated Human Intake Factors (HIFs)

Exposure Pathway	Exposure Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body weight as adult	kg	80	[1, a]	80	[1, a]
	Body weight as older child	kg	44	[2]	44	[2]
	Exposure frequency	days/yr	32	[4, b]	64	[4, b]
	Exposure duration as adult	yr	9	[4]	20	[2,4, d]
	Exposure duration as older child	yr	6	[4]	10	[4, c]
	Exposure duration (total)	yr	15	[4, b]	30	[1]
	Averaging Time, Cancer	yr	70	[3]	70	[3]
Incidental Ingestion Soil	Ingestion rate - adult	mg/day	50	[4, e]	100	[2,4, d]
	Ingestion rate - older child	mg/day	50	[4, e]	100	[2,4, d]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**7.27E-08**		**2.79E-07**	
	HIF (cancer)	**kg/kg-day**	**1.56E-08**		**1.20E-07**	
Dermal Exposure to Soil	Exposed Surface Area as adult - soil	cm^2/event	6,032	[2, f]	6,032	[2, f]
	Exposed Surface Area as older child -soil	cm^2/event	3,980	[1, g]	3,980	[1, g]
	Adherence Factor - adult	mg/cm^2	0.01	[5]	0.07	[5]
	Adherence Factor - older child	mg/cm^2	0.01	[5]	0.07	[5]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**7.14E-08**		**9.87E-07**	
	HIF (cancer)	**kg/kg-day**	**1.53E-08**		**4.23E-07**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific

Sources:

[1] USEPA 2011. Exposure Factors Handbook.

[2] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[3] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Part A.

[4] Professional judgement

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

Notes:

[a] Table 8-1. Age-weighted average based on body weights of children 6-<11 years old and 11-<16 years old.

[b] Assumes exposure occurs over the course of 16 weeks (roughly Memorial Day to Labor Day) at a frequency of 2 day/week for a CTE receptor and 4 days/week for an RME receptor.

[c] Accounts for an older child exposed from 6 to 16 years of age.

[d] Assumes a value similar to that of an adult resident.

[e] CTE value is assumed to be half that of the RME receptor.

[f] Assumes same surface area as a resident (head, hands, forearms, and lower legs for an adult; head, hands, forearms, lower legs, and feet for an older child).

[g] Weighted average surface area for an older child aged 6-16 years (Tables 7-1 and 7-2) assuming exposure to head, hands, forearms, and lower legs (similar to a resident).

Table 3-27. Exposure Parameters for a Camper and Calculated Human Intake Factors (HIFs)

Exposure Pathway	Exposure Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body weight as adult	kg	80	[1]	80	[1]
	Body weight as child	kg	15	[1]	15	[1]
	Exposure frequency	days/yr	32	[4, a]	48	[4, a]
	Exposure duration as adult	yr	9	[4, b]	20	[1,4, b]
	Exposure duration as child	yr	3	[4, b]	6	[1,4, b]
	Exposure duration (total)	yr	12		26	
	Averaging Time, Cancer	yr	70	[3]	70	[3]
Incidental Ingestion of Soil	Ingestion rate as adult - soil	mg/day	50	[4, c]	100	[1,4, b]
	Ingestion rate as child - soil	mg/day	100	[4, c]	200	[1,4, b]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**5.84E-07**		**1.75E-06**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**3.21E-08**		**1.97E-07**	
Incidental Ingestion of Sediment	Ingestion rate as adult - sediment	mg/day	25	[4, c]	50	[4]
	Ingestion rate as child - sediment	mg/day	50	[4, c]	100	[4]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**2.92E-07**		**8.77E-07**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**1.60E-08**		**9.86E-08**	
Incidential Ingestion of Surface Water	Ingestion rate as adult - water	mL/hour	21	[4, c]	71	[2, e]
	Ingestion rate as child - water	mL/hour	49	[4, c]	120	[2, e]
	Exposure time	hr/day	0.5	[4]	1	[4]
	Conversion Factor	L/mL	1.00E-03		1.00E-03	
	HIF_{child} (noncancer)	**L/kg-day**	**1.43E-04**		**1.05E-03**	
	HIF_{TWA} (cancer)	**L/kg-day**	**7.62E-06**		**1.24E-04**	
Ingestion of Surface Water (as drinking water)	Ingestion rate as adult - water	L/day	1.2	[4, d]	2.5	[1]
	Ingestion rate as child - water	L/day	0.45	[4, d]	0.78	[1]
	HIF_{child} (noncancer)	**L/kg-day**	**2.63E-03**		**6.84E-03**	
	HIF_{TWA} (cancer)	**L/kg-day**	**2.82E-04**		**8.12E-04**	
Dermal Exposure to Soil	Exposed Surface Area as adult	cm^2/event	6,032	[1, b]	6,032	[1, b]
	Exposed Surface Area as child	cm^2/event	2,373	[1, b]	2,373	[1, b]
	Adherence Factor as adult	mg/cm^2	0.01	[5]	0.07	[5]
	Adherence Factor as child	mg/cm^2	0.04	[5]	0.2	[5]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**5.55E-07**		**4.16E-06**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**3.23E-08**		**5.55E-07**	
Dermal Exposure to Sediment	Exposed Surface Area as adult	cm^2/event	19,652	[1, g]	19,652	[1, g]
	Exposed Surface Area as child	cm^2/event	6,365	[1, g]	6,365	[1, g]
	Adherence Factor as adult	mg/cm^2	0.01	[5]	0.07	[5]
	Adherence Factor as child	mg/cm^2	0.04	[5]	0.2	[5]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**1.49E-06**		**1.12E-05**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**9.15E-08**		**1.60E-06**	
Dermal Exposure to Surface Water	Exposed Surface Area as adult	cm^2/event	19,652	[1, g]	19,652	[1, g]
	Exposed Surface Area as child	cm^2/event	6,365	[1, g]	6,365	[1, g]
	Dermal Permeability Coefficient (Kp)	cm/hr	CS		CS	
	Event Frequency	events/day	1	[4]	1	[4]
	Event Duration (tevent)	hr/event	0.5	[4]	1	[4]
	HIF_{child} (noncancer)	**cm^2-hr/kg-d**	**1.86E+01**		**5.58E+01**	
	HIF_{TWA} (cancer)	**cm^2-hr/kg-d**	**2.18E+00**		**1.40E+01**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific; HIF = human intake factor;
HIF_{child} = human intake factor for the young child; HIF_{WA} = time weighted average human intake factor (assumes exposure over a lifetime from childhood into adulthood).

Sources:

[1] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[2] USEPA 2011. Exposure Factors Handbook.

[3] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Part A.

[4] Professional judgement

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

Notes:

[a] Assumes exposure occurs over the course of 16 weeks (roughly Memorial Day to Labor Day) at a frequency of 2 day/week for a CTE visitor and 3 days/week for an RME visitor.

[b] Assumes a value similar to that of a resident.

[c] CTE value is assumed to be half that of the RME receptor.

[d] Assumes half the soil value.

[e] Weighted mean of consumer-only ingestion of drinking water (Table 3-1).

[f] For soil, surface area value for an adult assumes exposure to head, hands, forearms, and lower legs as an adult; also to feet for sediment. For soil and sediment, surface area value for a child assumes exposure to head, hands, forearms, lower legs and feet.

[g] Assumes full body exposure to while swimming.

Table 3-28. Exposure Parameters for a Recreational Fisher and Calculated Human Intake Factors (HIFs)

Exposure Pathway	Exposure Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body weight as adult	kg	80	[2]	80	[2]
	Body weight as older child	kg	44	[1, a]	44	[1, a]
	Body weight as young child	kg	15	[1]	15	[1]
	Exposure frequency	days/yr	48	[4, b]	96	[4, b]
	Exposure duration as adult	yr	9	[4]	20	[2,4, d]
	Exposure duration as older child	yr	6	[4]	10	[4, c]
	Exposure duration as young child	yr	3	[4]	6	[2,4, d]
	Exposure duration (total)	yr	18		36	
	Averaging Time, Cancer	yr	70	[3]	70	[3]
Incidental Ingestion of Soil	Ingestion rate - adult	mg/day	50	[4, e]	100	[2,4, d]
	Ingestion rate - older child	mg/day	50	[4, e]	100	[2,4, d]
	Ingestion rate - young child	mg/day	100	[4, e]	200	[2,4, d]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**8.77E-07**		**3.51E-06**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**6.10E-08**		**4.80E-07**	
Incidental Ingestion of Sediment	Ingestion rate - adult	mg/day	25	[4, e]	50	[4, f]
	Ingestion rate - older child	mg/day	25	[4, e]	50	[4, f]
	Ingestion rate - young child		50	[4, e]	100	[4, f]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**4.38E-07**		**1.75E-06**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**3.05E-08**		**2.40E-07**	
Incidental Ingestion of Surface Water	Ingestion rate - adult	mL/hour	3.6	[1, g]	10.8	[1, g]
	Ingestion rate - older child	mL/hour	3.6	[1, g]	10.8	[1, g]
	Ingestion rate - young child	mL/hour	4.9	[4, h]	12	[4, h]
	Exposure Time	hr/day	0.5	[4]	1	[4]
	Conversion Factor	L/mL	1.00E-03		1.00E-03	
	HIF_{child} (noncancer)	**kg/kg-day**	**2.15E-05**		**2.10E-04**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**1.76E-06**		**3.74E-05**	
Ingestion of Fish - Recreational Fisher	Ingestion rate - adult	g/day	12	[6, i]	43	[6, i]
	Ingestion rate - older child	g/day	12	[6, i]	43	[6, i]
	Ingestion rate - young child	g/day	6	[4, j]	21.5	[4, j]
	Exposure frequency	days/yr	365	[3]	365	[3]
	Conversion Factor	kg/g	1.00E-03		1.00E-03	
	HIF_{child} (noncancer)	**kg/kg-day**	**4.00E-04**		**1.43E-03**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**5.98E-05**		**4.16E-04**	
Dermal Exposure to Soil/Sediment	Exposed Surface Area as adult	cm^2/event	3,945	[1,4, k]	3,945	[1,4, k]
	Exposed Surface Area as older child	cm^2/event	2,392	[1,4, k]	2,392	[1,4, k]
	Exposed Surface Area as young child	cm^2/event	2,624	[1,4, l]	2,624	[1,4, l]
	Adherence Factor	mg/cm^2	0.01	[5]	0.07	[5]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**2.30E-07**		**3.22E-06**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**2.43E-08**		**6.78E-07**	
Dermal Exposure to Surface Water	Exposed Surface Area as adult	cm^2/event	3,945	[1,4, k]	3,945	[1,4, k]
	Exposed Surface Area as older child	cm^2/event	2,392	[1,4, k]	2,392	[1,4, k]
	Exposed Surface Area as young child	cm^2/event	2,624	[1,4, l]	2,624	[1,4, l]
	Dermal Permeability Coefficient (Kp)	cm/hr	CS		CS	
	Event Frequency	events/day	1	[4]	1	[4]
	Event Duration (tevent)	hr/event	0.5	[4]	1	[4]
	HIF_{child} (noncancer)	**cm^2-hr/kg-d**	**1.15E+01**		**4.60E+01**	
	HIF_{TWA} (cancer)	**cm^2-hr/kg-d**	**1.22E+00**		**9.69E+00**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific; HIF = human intake factor;
HIF_{child} = human intake factor for the young child; HIF_{TWA} = time weighted average human intake factor (assumes exposure over a lifetime from childhood into adulthood).

Sources:

[1] USEPA 2011. Exposure Factors Handbook.

[2] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[3] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Part A.

[4] Professional judgement

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] USEPA 2014. Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010).

[7] USEPA 2016. A Fish Consumption Survey of the Shoshone-Bannock Tribes. December.

Notes:

[a] Table 8-1. Age-weighted average based on body weights of children 6-<11 years old and 11-<16 years old.

[b] Assumes exposure occurs over the course of 24 weeks (roughly April - September) at a frequency of 2 day/week for a CTE receptor and 4 days/week for an RME receptor.

[c] Accounts for an older child exposed from 6 to 16 years of age.

[d] Assumes a value similar to that of a resident.

[e] CTE value is assumed to be half that of the RME receptor.

[f] Assumes half the soil value.

[g] Based on the mean and upper confidence limit for estimated water ingestion while fishing (Table 3-93).

[h] Incidental ingestion from splashing or hand-to-face contact during fishing assumed to be 10% of the incidental ingestion rate while swimming assumed for the camper scenario.

[i] Based on long-term average mean and 95th percentile ingestion rates presented in EFH Table 10-5 for freshwater recreational fish intake by consuming anglers in North Dakota (nearest state to Montan

[j] Child fish ingestion rates were estiamted by multiplying the adult ingestion rate by a ratio of child-to-adult estimated energy requirements (0.5).

[k] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, and forearms. It is assumed that in general, people will remain on the banks while fishing and only en significant amounts of time if wearing protective clothing such as waders and waterproof shoes/boots.

[l] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, forearms, lower legs and feet. It is assumed that in general, children will remain on the banks while fis adult wearing short-sleeves and shorts.

Table 3-29. Exposure Parameters for a Tribal Fisher and Calculated Human Intake Factors (HIFs)

Exposure Pathway	Exposure Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body weight as adult	kg	80	[2]	80	[2]
	Body weight as older child	kg	44	[1, a]	44	[1, a]
	Body weight as young child	kg	15	[1]	15	[1]
	Exposure frequency	days/yr	48	[4, b]	96	[4, b]
	Exposure duration as adult	yr	9	[4]	20	[2,4, d]
	Exposure duration as older child	yr	6	[4]	10	[4, c]
	Exposure duration as young child	yr	3	[4]	6	[2,4, d]
	Exposure duration (total)	yr	18		36	
	Averaging Time, Cancer	yr	70	[3]	70	[3]
Incidental Ingestion of Soil	Ingestion rate - adult	mg/day	50	[4, e]	100	[2,4, d]
	Ingestion rate - older child	mg/day	50	[4, e]	100	[2,4, d]
	Ingestion rate - young child	mg/day	100	[4, e]	200	[2,4, d]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**8.77E-07**		**3.51E-06**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**6.10E-08**		**4.80E-07**	
Incidental Ingestion of Sediment	Ingestion rate - adult	mg/day	25	[4, e]	50	[4, f]
	Ingestion rate - older child	mg/day	25	[4, e]	50	[4, f]
	Ingestion rate - young child	mg/day	50	[4, e]	100	[4, f]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**4.38E-07**		**1.75E-06**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**3.05E-08**		**2.40E-07**	
Incidental Ingestion of Surface Water	Ingestion rate - adult	mL/hour	3.6	[1, g]	10.8	[1, g]
	Ingestion rate - older child	mL/hour	3.6	[1, g]	10.8	[1, g]
	Ingestion rate - young child	mL/hour	4.9	[4, h]	12	[4, h]
	Exposure Time	hr/day	1	[4]	1.5	[4]
	Conversion Factor	L/mL	1.00E-03		1.00E-03	
	HIF_{child} (noncancer)	**kg/kg-day**	**4.30E-05**		**3.16E-04**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**3.52E-06**		**5.61E-05**	
Ingestion of Fish - Tribal Fisher	Ingestion rate - adult	g/day	23	[6, i]	93	[6, i]
	Ingestion rate - older child	g/day	23	[6, i]	93	[6, i]
	Ingestion rate - young child	g/day	11.5	[4, j]	46.5	[4, j]
	Exposure frequency	days/yr	365	[3]	365	[3]
	Conversion Factor	kg/g	1.00E-03		1.00E-03	
	HIF_{child} (noncancer)	**kg/kg-day**	**7.67E-04**		**3.10E-03**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**1.15E-04**		**9.00E-04**	
Dermal Exposure to Soil/Sediment	Exposed Surface Area as adult	cm^2/event	3,945	[1,4, k]	3,945	[1,4, k]
	Exposed Surface Area as older child	cm^2/event	2,392	[1,4, k]	2,392	[1,4, k]
	Exposed Surface Area as young child	cm^2/event	2,624	[1,4, l]	2,624	[1,4, l]
	Adherence Factor	mg/cm^2	0.01	[5]	0.07	[5]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF_{child} (noncancer)	**kg/kg-day**	**2.30E-07**		**3.22E-06**	
	HIF_{TWA} (cancer)	**kg/kg-day**	**2.43E-08**		**6.78E-07**	
Dermal Exposure to Surface Water	Exposed Surface Area as adult	cm^2/event	3,945	[1,4, k]	3,945	[1,4, k]
	Exposed Surface Area as older child	cm^2/event	2,392	[1,4, k]	2,392	[1,4, k]
	Exposed Surface Area as young child	cm^2/event	2,624	[1,4, l]	2,624	[1,4, l]
	Dermal Permeability Coefficient (Kp)	cm/hr	CS		CS	
	Event Frequency	events/day	1	[4]	1	[4]
	Event Duration (tevent)	hr/event	1	[4]	1.5	[4]
	HIF_{child} (noncancer)	**cm^2-hr/kg-d**	**2.30E+01**		**6.90E+01**	
	HIF_{TWA} (cancer)	**cm^2-hr/kg-d**	**2.43E+00**		**1.45E+01**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific; HIF = human intake factor;
HIF_{child} = human intake factor for the young child; HIF_{TWA} = time weighted average human intake factor (assumes exposure over a lifetime from childhood into adulthood).

Sources:

[1] USEPA 2011. Exposure Factors Handbook.

[2] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[3] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Part A.

[4] Professional judgement

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] USEPA 2014. Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010).

[7] USEPA 2016. A Fish Consumption Survey of the Shoshone-Bannock Tribes. December.

Notes:

[a] Table 8-1. Age-weighted average based on body weights of children 6-<11 years old and 11-<16 years old.

[b] Assumes exposure occurs over the course of 24 weeks (roughly April - September) at a frequency of 2 day/week for a CTE receptor and 4 days/week for an RME receptor.

[c] Accounts for an older child exposed from 6 to 16 years of age.

[d] Assumes a value similar to that of a resident.

[e] CTE value is assumed to be half that of the RME receptor.

[f] Assumes half the soil value.

[g] Based on the mean and upper confidence limit for estimated water ingestion while fishing (Table 3-93).

[h] Incidental ingestion from splashing or hand-to-face contact during fishing assumed to be 10% of the incidental ingestion rate while swimming assumed for the camper scenario.

[i] RME value based on 95th percentile NCI value and CTE value based on mean NCI value for Group 2 adult consuming fishers of the Shoshone-Bannock Tribes (Table S2).

[j] Child fish ingestion rates were estiamted by multiplying the adult ingestion rate by a ratio of child-to-adult estimated energy requirements (0.5).

[k] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, and forearms. It is assumed that in general, people will remain on the banks while fishing and only en significant amounts of time if wearing protective clothing such as waders and waterproof shoes/boots.

[l] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, forearms, lower legs and feet. It is assumed that in general, children will remain on the banks while fis adult wearing short-sleeves and shorts.

Table 3-30. OU3 Upland Soil Sample Summary by Grid

Grid	Sample ID	Type	Dioxins/Furans	Metals	PCBs
26	HP18-1-SS_4/10/14_NM	5-pt comp.	X	X	X
	HP18-TP1-SS_4/1/14_NM	5-pt comp.	X		
	Grid 26-SB-(24-30in)_20171018_NM	SB (grab)	X	X	
	HP18-TP1-SB-8.0_4/1/14_NM	SB (grab)	X		
27	Grid 27-SSComp-01_20171019_NM	20-pt comp.	X	X	
28	Grid 28-SSComp-01_20171019_NM	20-pt comp.	X	X	
29	Grid 29-SSComp-01_20171019_NM	20-pt comp.	X	X	
	Grid 29-SB-(24-30in)_20171018_NM	SB (grab)	X	X	
30	Grid 30-SSComp-01_20171020_NM	20-pt comp.	X	X	
31	HP18-TP3-SS_4/1/14_NM	5-pt comp.	X	X	X
	SS1-HP18-(0-2)c	5-pt comp.	X		
	SS2-HP18-(5-7)c	5-pt comp.	X		
	HP18-TP3-SB-5.0_4/1/14_NM	SB (grab)	X	X	X
32	HP18-SSC-IB_4/10/14_NM	5-pt comp.	X	X	X
33	Grid 33-SSComp-01_20171020_NM	20-pt comp.	X	X	
	Grid 33-SB-(24-30in)_20171017_NM	SB (grab)	X	X	
34	Grid 34-SSComp-01_20171019_NM	20-pt comp.	X	X	
35	HP18-SSC-ditch_4/10/14_NM	5-pt comp.	X	X	X
36	HP16-1-SS_4/10/14_NM	5-pt comp.	X	X	X
37	Grid 37-SSComp-01_20171020_NM	20-pt comp.	X	X	
	SS3-HP16-(0-2)c	5-pt comp.	X		
	SS4-HP16-(5-7)c	5-pt comp.	X		
38	Grid 38-SB-(24-30in)_20171017_NM	SB (grab)	X	X	
39	Grid 39-SSComp-01_20171020_NM	20-pt comp.	X	X	
	HP16-TP2-SS_4/1/14_NM	5-pt comp.	X	X	X
	HP16-TP2-SB-3.5_4/1/14_NM	SB (grab)	X	X	X
40	SS5-IBJ-(0-2)c	5-pt comp.	X		
	SS6-IBJ-(5-7)c	5-pt comp.	X		
41	IBJ-TP1-SS_4/1/14_NM	5-pt comp.	X	X	X
	IBJ-TP1-SB-3.0_4/1/14_NM	SB (grab)	X	X	X
	IBJ-TP1-SB-5.5_4/1/14_NM	SB (grab)	X	X	X
42	SS7-HP13-(0-2)c	5-pt comp.	X		
	SS8-HP13-(5-7)c	5-pt comp.	X		
43	Grid 43-SSComp-01_20171023_NM	20-pt comp.	X	X	
44	Grid 44-SSComp-01_20171023_NM	20-pt comp.	X	X	
	CRP-1-SS_4/10/14_NM	5-pt comp.	X	X	X
45	Grid 45-SB-(24-30in)_20171017_NM	SB (grab)	X	X	
46	SS10-HP12-(5-7)c	5-pt comp.	X		
	SS9-HP12-(0-2)c	5-pt comp.	X		
	SB30-AB3-(0-10)c	SB (grab)	X		
47	Grid 47-SSComp-01_20171023_NM	20-pt comp.	X	X	
	SB31-AB3-(0-10)c	SB (grab)	X		
48	NPP-TP1-SS_4/1/14_NM	5-pt comp.	X	X	X
49	SS13-HP9-(0-2)c	5-pt comp.	X		
	SS14-HP9-(5-7)c	5-pt comp.	X		
50	AB II-SSComp-01_20171025_NM	30-pt comp.	X	X	
	P8-SSComp-01_20171025_NM	30-pt comp.	X	X	
	SB23-P8-(0-4)c	SB (grab)	X		X
51	SB29-AB2-(0-10)c	SB (grab)	X		
52	NPP-TP2-SB-4.0_4/2/14_NM	SB (grab)	X		
	SB27-AB1-(0-6)c	SB (grab)	X		
	SB28-AB2-(0-10)c	SB (grab)	X		
	SB32-NPP-(0-6)c	SB (grab)	X		

Table 3-30. OU3 Upland Soil Sample Summary by Grid

Grid	Sample ID	Type	Dioxins/Furans	Metals	PCBs
53	Grid 53-SSComp-01_20171020_NM	20-pt comp.	X	X	
	Grid 53-SB-(24-30in)_20171018_NM	SB (grab)	X	X	
54	P8-TP3-SS_4/4/14_NM	5-pt comp.	X	X	X
	P8-TP3-SB-2.5_4/4/14_NM	SB (grab)	X	X	X
	SB24-P8-(0-4)c	SB (grab)	X		X
55	SB19-TP3-SS_4/4/14_NM	5-pt comp.	X	X	X
	SB19-TP3-SB-8.0_4/4/14_NM	SB (grab)	X	X	X
	SB35-sb19-(0-6)c	SB (grab)	X		
56	SPP-SSComp-01_20171025_NM	30-pt comp.	X	X	
	AB1-TP3-SS_4/4/14_NM	5-pt comp.	X	X	X
	AB1-TP3-SB-2.2_4/4/14_NM	SB (grab)	X	X	X
	SB33-SPP-(0-12)c	SB (grab)	X		
58	HP9-1-SS_4/10/14_NM	5-pt comp.	X	X	X
	HP9-1-SB-1.0_5/29/14_NM	SB (grab)	X	X	X
59	P8dc-SSComp-01_20171024_NM	30-pt comp.	X	X	
	SS15-HP9-(0-2)c	5-pt comp.	X		
	SS16-HP9-(5-7)c	5-pt comp.	X		
	SB25-P8dc-(0-5)c	SB (grab)	X		
	SB26-P8dc-(0-6)c	SB (grab)	X		
60	Grid 60-SSComp-01_20171023_NM	20-pt comp.	X	X	
	SB36-sb20-(0-10)c	SB (grab)	X		
	SB37-sb20-(0-10)c	SB (grab)	X		
61	Grid 61-SSComp-01_20171023_NM	20-pt comp.	X	X	
62	SB34-SPP-(0-12)c	SB (grab)	X		
64	Grid 64-SSComp-01_20171024_NM	20-pt comp.	X	X	
	SB19-SWB6-(0-10)c	SB (grab)	X		
	SB21-SWB6-(0-10)c	SB (grab)	X		
65	SB13-P4-(2-10)c	SB (grab)	X		
66	SWBA-SSComp-01_20171024_NM	30-pt comp.	X	X	
	P4-BH1-SS_4/4/14_NM	5-pt comp.	X	X	X
	P4-BH1-SB-8-10_4/4/14_NM	SB (grab)	X	X	X
	SB11-P4-(0-10)c	SB (grab)	X		
	SB15-P5-(0-10)c	SB (grab)	X		
67	P3-SSComp-01_20171020_NM	20-pt comp.	X	X	
	SB7-P3-(2-10)c	SB (grab)	X		X
	SB9-SWBA-(0-10)c	SB (grab)	X		
70	P5S-BH1-SS_4/4/14_NM	5-pt comp.	X	X	X
	SB17-P5-(2-10)c	SB (grab)	X		
71	P5-BH2-SS_4/3/14_NM	5-pt comp.	X	X	X
	P5-BH2-SB-6-8_4/3/14_NM	SB (grab)	X	X	X
	SB5-P3-(0-10)c	SB (grab)	X		X
72	P3-BH1-SS_4/3/14_NM	5-pt comp.	X	X	X
74	Grid 74-SSComp-01_20171023_NM	20-pt comp.	X	X	
	P17-BH1-SS_4/3/14_NM	5-pt comp.	X	X	X
	SB1-P17-(0-10)c	SB (grab)	X		
	SB3-P17-(0-10)c	SB (grab)	X		
75	Grid 75,78-SSComp-01_20171023_NM	20-pt comp.	X	X	
	Grid 75,78-SB-(24-30in)_20171018_NM	SB (grab)	X	X	
76	Grid 76,77,79,80-SSComp-01_20171023_NM	20-pt comp.	X	X	
	IBK-1-SS_4/16/14_NM	5-pt comp.	X	X	X
	SS11-IBK-(0-2)c	5-pt comp.	X		
	SS12-IBK-(5-7)c	5-pt comp.	X		
	Grid 76,77,79,80-SB-(24-30in)_20171018_NM	SB (grab)	X	X	

PCB = polychlorinated biphenyl; SB = subsurface; pt = point; comp = composite.

Table 3-31. OU3 Floodplain Soil Sample Summary by Grid

Grid	Sample ID	Type	Dioxins/Furans	Metals	PCBs
81	Grid 81-SSComp-01_20171024_NM	20-pt comp.	X	X	
	Grid 81-SB-(24-30in)_20171018_NM	SB (grab)	X	X	
85	Grid 85-SB-(24-30in)_20171018_NM	SB (grab)	X	X	
86	HP13A-1-SS_4/10/14_NM	5-pt comp.	X	X	X
	HP13A-1-SB-1.0_5/29/14_NM	SB (grab)	X	X	X
87	SE16-HP13-(0-2)c	5-pt comp.	X	X	
	Grid 87-SB-(24-30in)_20171017_NM	SB (grab)	X	X	
88	SE15-HP13-(0-2)c	5-pt comp.	X	X	
89	Grid 89-SSComp-01_20171026_NM	20-pt comp.	X	X	
	SE14-HP13-(0-2)c	5-pt comp.	X	X	
	SE17-HP13a-(0-2)c	5-pt comp.	X	X	
	Grid 89-SB-(24-30in)_20171017_NM	SB (grab)	X	X	
90	SE11-HP11-(0-2)c	5-pt comp.	X	X	
	SE13-HP12-(0-2)c	5-pt comp.	X	X	
91	SE12-HP12-(0-2)c	5-pt comp.	X	X	
	SE9-HP10-(0-2)c	5-pt comp.	X	X	
93	SE10-HP11-(0-2)c	5-pt comp.	X	X	
	SE8-HP10-(0-2)c	5-pt comp.	X	X	
94	Grid 94-SSComp-01_20171026_NM	20-pt comp.	X	X	
	SE6-HP7-(0-2)c	5-pt comp.	X	X	
	SE7-HP7-(0-2)c	5-pt comp.		X	
	Grid 94-SB-(24-30in)_20171018_NM	SB (grab)	X	X	
95	SE3-HP1-(0-2)c	5-pt comp.	X	X	
	SE4-HP1-(0-2)c	5-pt comp.	X	X	
	SE5-HP2-(0-2)c	5-pt comp.	X	X	
97	HP2-TP3-SS_4/2/14_NM	5-pt comp.	X	X	X
	HP2-TP3-SB-5.5_4/2/14_NM	SB (grab)	X	X	X
98	SE1-HP1a-(0-2)c	5-pt comp.	X	X	
	SE2-HP1a-(0-2)c	5-pt comp.	X	X	
	Grid 98-SB-(24-30in)_20171018_NM	SB (grab)	X	X	

PCB = polychlorinated biphenyl; SB = subsurface; pt = point; comp = composite.

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	26	$TEQ_{D/F}$	3.70E-06
		Aluminum	18,900
		Antimony	1.50
		Arsenic	9.30
		Barium	1,040
		Cadmium	0.70
		Chromium	20
		Cobalt	5.30
		Iron	17,300
		Manganese	483
		Mercury	0.14
		Thallium	0.21
		Vanadium	42
Upland	27	$TEQ_{D/F}$	2.52E-06
		Aluminum	6,730
		Antimony	0.09
		Arsenic	1.00
		Barium	200
		Cadmium	0.06
		Chromium	8.70
		Cobalt	2.60
		Iron	8,080
		Manganese	109
		Mercury	0.01
		Thallium	0.09
		Vanadium	9.40
Upland	28	$TEQ_{D/F}$	6.55E-07
		Aluminum	6,360
		Antimony	0.09
		Arsenic	0.95
		Barium	200
		Cadmium	0.07
		Chromium	7.20
		Cobalt	2.40
		Iron	7,450
		Manganese	84
		Mercury	0.02
		Thallium	0.09
		Vanadium	8.70
Upland	29	$TEQ_{D/F}$	2.92E-06
		Aluminum	7,560
		Antimony	0.19
		Arsenic	1.70
		Barium	191
		Cadmium	0.14
		Chromium	11
		Cobalt	3.10
		Iron	8,480
		Manganese	154
		Mercury	0.03
		Thallium	0.11
		Vanadium	19
Upland	30	$TEQ_{D/F}$	1.71E-06
		Aluminum	8,210
		Antimony	0.20
		Arsenic	1.20
		Barium	357
		Cadmium	0.13
		Chromium	10
		Cobalt	2.60
		Iron	8,670
		Manganese	109
		Mercury	0.02
		Thallium	0.12
		Vanadium	12

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	31	$TEQ_{D/F}$	7.14E-07
		Aluminum	6,640
		Antimony	0.04
		Arsenic	1.85
		Barium	85
		Cadmium	0.04
		Chromium	10
		Cobalt	2.85
		Iron	7,925
		Manganese	125
		Mercury	0.003
		Thallium	0.11
		Vanadium	9.40
Upland	32	$TEQ_{D/F}$	5.30E-07
		Aluminum	4,840
		Antimony	0.15
		Arsenic	1.10
		Barium	121
		Cadmium	0.05
		Chromium	6.30
		Cobalt	2.20
		Iron	7,550
		Manganese	91
		Mercury	0.003
		Thallium	0.07
		Vanadium	8.30
Upland	33	$TEQ_{D/F}$	1.02E-06
		Aluminum	8,760
		Antimony	0.09
		Arsenic	4.00
		Barium	227
		Cadmium	0.13
		Chromium	11
		Cobalt	4.20
		Iron	11,500
		Manganese	389
		Mercury	0.02
		Thallium	0.13
		Vanadium	17
Upland	34	$TEQ_{D/F}$	8.33E-07
		Aluminum	7,170
		Antimony	0.09
		Arsenic	1.60
		Barium	199
		Cadmium	0.09
		Chromium	8.20
		Cobalt	3.20
		Iron	8,760
		Manganese	157
		Mercury	0.01
		Thallium	0.10
		Vanadium	11
Upland	35	$TEQ_{D/F}$	7.27E-07
		Aluminum	9,520
		Antimony	0.23
		Arsenic	2.10
		Barium	227
		Cadmium	0.19
		Chromium	8.90
		Cobalt	4.50
		Iron	11,300
		Manganese	486
		Mercury	0.02
		Thallium	0.12
		Vanadium	12

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	36	$TEQ_{D/F}$	9.15E-06
		Aluminum	12,500
		Antimony	0.80
		Arsenic	5.10
		Barium	492
		Cadmium	0.85
		Chromium	18
		Cobalt	4.90
		Iron	12,800
		Manganese	407
		Mercury	0.27
		Thallium	0.14
		Vanadium	31
Upland	37	$TEQ_{D/F}$	1.53E-06
		Aluminum	7,924
		Antimony	0.33
		Arsenic	2.52
		Barium	204
		Cadmium	0.26
		Chromium	10
		Cobalt	3.50
		Iron	9,916
		Manganese	264
		Mercury	0.04
		Thallium	0.09
		Vanadium	11
Upland	38	$TEQ_{D/F}$	2.10E-06
		Aluminum	2,700
		Antimony	0.09
		Arsenic	1.00
		Barium	44
		Cadmium	0.02
		Chromium	3.80
		Cobalt	1.50
		Iron	5,210
		Manganese	39
		Mercury	0.005
		Thallium	0.02
		Vanadium	5.30
Upland	39	$TEQ_{D/F}$	2.78E-06
		Aluminum	9,716
		Antimony	0.43
		Arsenic	2.16
		Barium	426
		Cadmium	0.33
		Chromium	12
		Cobalt	3.28
		Iron	9,888
		Manganese	133
		Mercury	0.07
		Thallium	0.13
		Vanadium	18
Upland	40	$TEQ_{D/F}$	3.55E-06
		Aluminum	5,950
		Arsenic	1.40
		Barium	205
		Cadmium	0.28
		Chromium	11
		Cobalt	2.20
		Iron	6,260
		Manganese	92
		Mercury	0.04
		Thallium	0.07
		Vanadium	7.60

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	41	$TEQ_{D/F}$	3.94E-06
		Aluminum	5,730
		Antimony	0.04
		Arsenic	1.30
		Barium	318
		Cadmium	0.28
		Chromium	8.30
		Cobalt	1.60
		Iron	4,740
		Manganese	127
		Mercury	0.06
		Thallium	0.01
		Vanadium	5.30
Upland	42	$TEQ_{D/F}$	7.48E-06
		Aluminum	12,900
		Arsenic	3.10
		Barium	298
		Cadmium	0.32
		Chromium	21
		Cobalt	4.90
		Iron	16,000
		Manganese	296
		Mercury	0.16
		Thallium	0.17
		Vanadium	18
Upland	43	$TEQ_{D/F}$	3.90E-06
		Aluminum	9,110
		Antimony	0.76
		Arsenic	2.80
		Barium	578
		Cadmium	0.47
		Chromium	13
		Cobalt	2.80
		Iron	7,790
		Manganese	148
		Mercury	0.12
		Thallium	0.10
		Vanadium	27
Upland	44	$TEQ_{D/F}$	2.15E-06
		Aluminum	9,904
		Antimony	1.16
		Arsenic	4.40
		Barium	292
		Cadmium	0.80
		Chromium	12
		Cobalt	3.02
		Iron	8,078
		Manganese	335
		Mercury	0.16
		Thallium	0.09
		Vanadium	34
Upland	45	$TEQ_{D/F}$	3.68E-07
		Aluminum	21,000
		Antimony	0.23
		Arsenic	3.10
		Barium	312
		Cadmium	0.08
		Chromium	18
		Cobalt	6.90
		Iron	20,300
		Manganese	176
		Mercury	0.02
		Thallium	0.21
		Vanadium	19

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	46	$TEQ_{D/F}$	3.01E-06
		Aluminum	11,700
		Arsenic	2.30
		Barium	418
		Cadmium	0.24
		Chromium	17
		Cobalt	4.90
		Iron	14,000
		Manganese	235
		Mercury	0.04
		Thallium	0.16
		Vanadium	18
Upland	47	$TEQ_{D/F}$	1.62E-05
		Aluminum	17,600
		Antimony	1.60
		Arsenic	13
		Barium	561
		Cadmium	5.20
		Chromium	22
		Cobalt	2.00
		Iron	2,930
		Manganese	1,140
		Mercury	0.81
		Thallium	0.21
		Vanadium	51
Upland	48	$TEQ_{D/F}$	4.92E-05
		Aluminum	18,700
		Antimony	2.40
		Arsenic	14
		Barium	798
		Cadmium	8.30
		Chromium	58
		Cobalt	2.00
		Iron	3,590
		Manganese	1,650
		Mercury	2.50
		Thallium	0.33
		Vanadium	71
Upland	49	$TEQ_{D/F}$	3.98E-05
		Aluminum	14,400
		Arsenic	3.60
		Barium	1,010
		Cadmium	2.00
		Chromium	29
		Cobalt	4.50
		Iron	14,900
		Manganese	575
		Mercury	8.00
		Thallium	0.16
		Vanadium	22
Upland	50	$TEQ_{D/F}$	2.43E-05
		Aluminum	11,560
		Antimony	1.15
		Arsenic	7.85
		Barium	520
		Cadmium	3.90
		Chromium	24
		Cobalt	2.20
		Iron	4,355
		Manganese	1,255
		Mercury	0.75
		Thallium	0.19
		Vanadium	29

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	51	$TEQ_{D/F}$	3.11E-06
		Aluminum	3,210
		Arsenic	2.20
		Barium	108
		Cadmium	0.52
		Chromium	9.00
		Cobalt	2.00
		Iron	5,160
		Manganese	221
		Mercury	0.16
		Thallium	0.05
		Vanadium	9.20
Upland	52	$TEQ_{D/F}$	2.16E-06
		Aluminum	4,903
		Arsenic	1.77
		Barium	96
		Cadmium	0.16
		Chromium	6.83
		Cobalt	2.67
		Iron	6,840
		Manganese	132
		Mercury	0.06
		Thallium	0.07
		Vanadium	7.73
Upland	53	$TEQ_{D/F}$	2.27E-05
		Aluminum	12,100
		Antimony	0.46
		Arsenic	2.60
		Barium	568
		Cadmium	1.20
		Chromium	22
		Cobalt	3.80
		Iron	12,000
		Manganese	438
		Mercury	4.30
		Thallium	0.15
		Vanadium	18
Upland	54	$TEQ_{D/F}$	1.44E-05
		Aluminum	10,700
		Antimony	1.90
		Arsenic	11
		Barium	705
		Cadmium	4.70
		Chromium	24
		Cobalt	2.30
		Iron	3,660
		Manganese	1,980
		Mercury	0.72
		Thallium	0.19
		Vanadium	14
Upland	55	$TEQ_{D/F}$	5.54E-05
		Aluminum	15,400
		Antimony	1.20
		Arsenic	14
		Barium	1,120
		Cadmium	5.60
		Chromium	42
		Cobalt	1.60
		Iron	2,710
		Manganese	2,700
		Mercury	1.10
		Thallium	0.27
		Vanadium	49

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	56	$TEQ_{D/F}$	5.87E-05
		Aluminum	15,943
		Antimony	1.71
		Arsenic	12
		Barium	777
		Cadmium	6.66
		Chromium	49
		Cobalt	2.41
		Iron	5,217
		Manganese	1,833
		Mercury	1.29
		Thallium	0.35
		Vanadium	58
Upland	58	$TEQ_{D/F}$	8.35E-05
		Aluminum	16,100
		Antimony	2.30
		Arsenic	12
		Barium	798
		Cadmium	4.80
		Chromium	40
		Cobalt	2.60
		Iron	8,030
		Manganese	1,530
		Mercury	1.20
		Thallium	0.20
		Vanadium	47
Upland	59	$TEQ_{D/F}$	1.58E-05
		Aluminum	8,626
		Antimony	0.82
		Arsenic	6.21
		Barium	745
		Cadmium	3.33
		Chromium	21
		Cobalt	2.13
		Iron	5,080
		Manganese	1,618
		Mercury	1.00
		Thallium	0.16
		Vanadium	15
Upland	60	$TEQ_{D/F}$	8.67E-06
		Aluminum	8,040
		Antimony	0.31
		Arsenic	4.60
		Barium	282
		Cadmium	1.70
		Chromium	15
		Cobalt	3.40
		Iron	8,350
		Manganese	852
		Mercury	0.19
		Thallium	0.11
		Vanadium	14
Upland	61	$TEQ_{D/F}$	5.80E-06
		Aluminum	8,190
		Antimony	0.20
		Arsenic	3.70
		Barium	195
		Cadmium	1.10
		Chromium	12
		Cobalt	3.80
		Iron	9,920
		Manganese	476
		Mercury	0.11
		Thallium	0.11
		Vanadium	13

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	62	$TEQ_{D/F}$	1.10E-06
		Aluminum	7,730
		Arsenic	2.60
		Barium	163
		Cadmium	0.37
		Chromium	11
		Cobalt	4.00
		Iron	10,600
		Manganese	274
		Mercury	0.10
		Thallium	0.12
		Vanadium	11
Upland	64	$TEQ_{D/F}$	1.64E-05
		Aluminum	7,600
		Antimony	0.11
		Arsenic	3.00
		Barium	266
		Cadmium	0.79
		Chromium	12
		Cobalt	3.40
		Iron	9,940
		Manganese	522
		Mercury	3.60
		Thallium	0.10
		Vanadium	12
Upland	65	$TEQ_{D/F}$	1.30E-05
		Aluminum	8,740
		Arsenic	4.30
		Barium	452
		Cadmium	2.50
		Chromium	27
		Cobalt	3.10
		Iron	9,580
		Manganese	1,350
		Mercury	0.30
		Thallium	0.12
		Vanadium	13
Upland	66	$TEQ_{D/F}$	1.54E-06
		Aluminum	4,634
		Antimony	0.22
		Arsenic	3.20
		Barium	262
		Cadmium	0.90
		Chromium	12
		Cobalt	2.43
		Iron	6,341
		Manganese	511
		Mercury	0.07
		Thallium	0.07
		Vanadium	7.54
Upland	67	$TEQ_{D/F}$	8.26E-05
		Aluminum	5,990
		Antimony	1.60
		Arsenic	15
		Barium	612
		Cadmium	4.80
		Chromium	19
		Cobalt	2.20
		Iron	3,520
		Manganese	2,040
		Mercury	0.01
		Thallium	0.38
		Vanadium	5.60

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	68	$TEQ_{D/F}$	8.26E-05
		Aluminum	5,990
		Antimony	1.60
		Arsenic	15
		Barium	612
		Cadmium	4.80
		Chromium	19
		Cobalt	2.20
		Iron	3,520
		Manganese	2,040
		Mercury	0.01
		Thallium	0.38
		Vanadium	5.60
Upland	70	$TEQ_{D/F}$	4.08E-06
		Aluminum	3,360
		Antimony	0.47
		Arsenic	6.00
		Barium	450
		Cadmium	1.80
		Chromium	14
		Cobalt	1.70
		Iron	3,750
		Manganese	995
		Mercury	0.11
		Thallium	0.14
		Vanadium	12
Upland	71	$TEQ_{D/F}$	2.39E-06
		Aluminum	1,090
		Antimony	0.08
		Arsenic	5.80
		Barium	499
		Cadmium	1.30
		Chromium	34
		Cobalt	2.50
		Iron	2,980
		Manganese	716
		Mercury	0.01
		Thallium	0.08
		Vanadium	3.50
Upland	72	$TEQ_{D/F}$	2.34E-05
		Aluminum	2,270
		Antimony	0.24
		Arsenic	7.00
		Barium	538
		Cadmium	2.20
		Chromium	19
		Cobalt	1.30
		Iron	1,260
		Manganese	2,250
		Mercury	0.005
		Thallium	0.07
		Vanadium	4.70
Upland	74	$TEQ_{D/F}$	3.07E-04
		Aluminum	18,200
		Antimony	2.38
		Arsenic	41
		Barium	831
		Cadmium	6.42
		Chromium	30
		Cobalt	7.26
		Iron	13,430
		Manganese	2,340
		Mercury	0.22
		Thallium	0.77
		Vanadium	22

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	75	$TEQ_{D/F}$	3.43E-07
		Aluminum	12,400
		Antimony	0.10
		Arsenic	4.30
		Barium	206
		Cadmium	0.15
		Chromium	13
		Cobalt	6.40
		Iron	15,700
		Manganese	372
		Mercury	0.01
		Thallium	0.18
		Vanadium	17
Upland	76	$TEQ_{D/F}$	2.03E-06
		Aluminum	6,822
		Antimony	0.12
		Arsenic	2.85
		Barium	148
		Cadmium	0.12
		Chromium	9.28
		Cobalt	3.33
		Iron	8,784
		Manganese	175
		Mercury	0.02
		Thallium	0.09
		Vanadium	10
Upland	77	$TEQ_{D/F}$	2.03E-06
		Aluminum	6,822
		Antimony	0.12
		Arsenic	2.85
		Barium	148
		Cadmium	0.12
		Chromium	9.28
		Cobalt	3.33
		Iron	8,784
		Manganese	175
		Mercury	0.02
		Thallium	0.09
		Vanadium	10
Upland	78	$TEQ_{D/F}$	3.43E-07
		Aluminum	12,400
		Antimony	0.10
		Arsenic	4.30
		Barium	206
		Cadmium	0.15
		Chromium	13
		Cobalt	6.40
		Iron	15,700
		Manganese	372
		Mercury	0.01
		Thallium	0.18
		Vanadium	17
Upland	79	$TEQ_{D/F}$	2.03E-06
		Aluminum	6,822
		Antimony	0.12
		Arsenic	2.85
		Barium	148
		Cadmium	0.12
		Chromium	9.28
		Cobalt	3.33
		Iron	8,784
		Manganese	175
		Mercury	0.02
		Thallium	0.09
		Vanadium	10

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	80	$TEQ_{D/F}$	2.03E-06
		Aluminum	6,822
		Antimony	0.12
		Arsenic	2.85
		Barium	148
		Cadmium	0.12
		Chromium	9.28
		Cobalt	3.33
		Iron	8,784
		Manganese	175
		Mercury	0.02
		Thallium	0.09
		Vanadium	10
Floodplain	81	$TEQ_{D/F}$	6.01E-07
		Aluminum	7,000
		Antimony	0.10
		Arsenic	4.50
		Barium	188
		Cadmium	0.32
		Chromium	8.40
		Cobalt	3.90
		Iron	9,600
		Manganese	283
		Mercury	0.03
		Thallium	0.11
		Vanadium	13
Floodplain	85	$TEQ_{D/F}$	4.02E-07
		Aluminum	2,940
		Antimony	0.09
		Arsenic	1.90
		Barium	29
		Cadmium	0.02
		Chromium	3.90
		Cobalt	1.80
		Iron	5,150
		Manganese	64
		Mercury	0.00
		Thallium	0.04
		Vanadium	5.10
Floodplain	86	$TEQ_{D/F}$	1.84E-05
		Aluminum	19,600
		Antimony	0.45
		Arsenic	4.60
		Barium	458
		Cadmium	0.54
		Chromium	20
		Cobalt	5.60
		Iron	22,900
		Manganese	557
		Mercury	0.53
		Thallium	0.20
		Vanadium	21
Floodplain	87	$TEQ_{D/F}$	6.82E-06
		Aluminum	10,800
		Antimony	--
		Arsenic	4.70
		Barium	773
		Cadmium	0.79
		Chromium	16
		Cobalt	4.00
		Iron	12,200
		Manganese	274
		Mercury	0.10
		Thallium	0.20
		Vanadium	21

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Floodplain	88	$TEQ_{D/F}$	5.57E-05
		Aluminum	11,800
		Antimony	--
		Arsenic	5.50
		Barium	1,450
		Cadmium	1.80
		Chromium	26
		Cobalt	2.60
		Iron	8,690
		Manganese	525
		Mercury	0.69
		Thallium	0.15
		Vanadium	14
Floodplain	89	$TEQ_{D/F}$	9.70E-06
		Aluminum	11,240
		Antimony	0.37
		Arsenic	4.76
		Barium	504
		Cadmium	0.55
		Chromium	17
		Cobalt	4.47
		Iron	12,620
		Manganese	367
		Mercury	0.18
		Thallium	0.16
		Vanadium	19
Floodplain	90	$TEQ_{D/F}$	5.54E-05
		Aluminum	11,145
		Antimony	--
		Arsenic	10
		Barium	764
		Cadmium	2.80
		Chromium	28
		Cobalt	3.10
		Iron	9,250
		Manganese	1,118
		Mercury	1.50
		Thallium	0.16
		Vanadium	31
Floodplain	91	$TEQ_{D/F}$	2.26E-05
		Aluminum	14,700
		Antimony	--
		Arsenic	6.30
		Barium	919
		Cadmium	1.70
		Chromium	26
		Cobalt	5.30
		Iron	14,200
		Manganese	400
		Mercury	0.83
		Thallium	0.19
		Vanadium	26
Floodplain	93	$TEQ_{D/F}$	4.61E-05
		Aluminum	15,130
		Antimony	--
		Arsenic	7.80
		Barium	429
		Cadmium	2.13
		Chromium	25
		Cobalt	3.20
		Iron	7,930
		Manganese	880
		Mercury	3.15
		Thallium	0.12
		Vanadium	29

Table 3-32. Surface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Floodplain	94	$TEQ_{D/F}$	2.24E-05
		Aluminum	10,370
		Antimony	0.47
		Arsenic	4.02
		Barium	414
		Cadmium	1.16
		Chromium	20
		Cobalt	3.19
		Iron	9,455
		Manganese	403
		Mercury	0.94
		Thallium	0.15
		Vanadium	18
Floodplain	95	$TEQ_{D/F}$	2.11E-05
		Aluminum	9,773
		Antimony	--
		Arsenic	5.60
		Barium	394
		Cadmium	1.24
		Chromium	18
		Cobalt	3.50
		Iron	9,707
		Manganese	742
		Mercury	1.04
		Thallium	0.12
		Vanadium	23
Floodplain	97	$TEQ_{D/F}$	2.78E-06
		Aluminum	6,930
		Antimony	0.05
		Arsenic	1.70
		Barium	239
		Cadmium	0.26
		Chromium	9.30
		Cobalt	1.70
		Iron	5,540
		Manganese	93
		Mercury	0.04
		Thallium	0.01
		Vanadium	8.70
Floodplain	98	$TEQ_{D/F}$	1.45E-05
		Aluminum	15,150
		Antimony	--
		Arsenic	4.85
		Barium	2,185
		Cadmium	1.22
		Chromium	19
		Cobalt	3.15
		Iron	10,500
		Manganese	290
		Mercury	0.31
		Thallium	0.13
		Vanadium	21

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	26	$TEQ_{D/F}$	3.14E-06
		Aluminum	16,277
		Antimony	1.26
		Arsenic	7.90
		Barium	875
		Cadmium	0.59
		Chromium	18
		Cobalt	4.85
		Iron	15,363
		Manganese	417
		Mercury	0.12
		Thallium	0.18
		Vanadium	35
Upland	27	$TEQ_{D/F}$	2.52E-06
		Aluminum	6,730
		Antimony	0.09
		Arsenic	1.00
		Barium	200
		Cadmium	0.06
		Chromium	8.70
		Cobalt	2.60
		Iron	8,080
		Manganese	109
		Mercury	0.01
		Thallium	0.09
		Vanadium	9.40
Upland	28	$TEQ_{D/F}$	6.55E-07
		Aluminum	6,360
		Antimony	0.09
		Arsenic	0.95
		Barium	200
		Cadmium	0.07
		Chromium	7.20
		Cobalt	2.40
		Iron	7,450
		Manganese	84
		Mercury	0.02
		Thallium	0.09
		Vanadium	8.70
Upland	29	$TEQ_{D/F}$	2.86E-06
		Aluminum	7,790
		Antimony	0.19
		Arsenic	1.73
		Barium	194
		Cadmium	0.14
		Chromium	11
		Cobalt	3.21
		Iron	8,810
		Manganese	157
		Mercury	0.03
		Thallium	0.11
		Vanadium	19
Upland	30	$TEQ_{D/F}$	1.71E-06
		Aluminum	8,210
		Antimony	0.20
		Arsenic	1.20
		Barium	357
		Cadmium	0.13
		Chromium	10
		Cobalt	2.60
		Iron	8,670
		Manganese	109
		Mercury	0.02
		Thallium	0.12
		Vanadium	12

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	31	$TEQ_{D/F}$	6.87E-07
		Aluminum	5,982
		Antimony	0.04
		Arsenic	1.74
		Barium	75
		Cadmium	0.04
		Chromium	9.18
		Cobalt	2.64
		Iron	7,214
		Manganese	111
		Mercury	0.003
		Thallium	0.09
		Vanadium	8.47
Upland	32	$TEQ_{D/F}$	5.30E-07
		Aluminum	4,840
		Antimony	0.15
		Arsenic	1.10
		Barium	121
		Cadmium	0.05
		Chromium	6.30
		Cobalt	2.20
		Iron	7,550
		Manganese	91
		Mercury	0.003
		Thallium	0.07
		Vanadium	8.30
Upland	33	$TEQ_{D/F}$	9.91E-07
		Aluminum	8,685
		Antimony	0.09
		Arsenic	4.00
		Barium	222
		Cadmium	0.13
		Chromium	11
		Cobalt	4.20
		Iron	11,452
		Manganese	382
		Mercury	0.02
		Thallium	0.13
		Vanadium	16
Upland	34	$TEQ_{D/F}$	8.33E-07
		Aluminum	7,170
		Antimony	0.09
		Arsenic	1.60
		Barium	199
		Cadmium	0.09
		Chromium	8.20
		Cobalt	3.20
		Iron	8,760
		Manganese	157
		Mercury	0.01
		Thallium	0.10
		Vanadium	11
Upland	35	$TEQ_{D/F}$	7.27E-07
		Aluminum	9,520
		Antimony	0.23
		Arsenic	2.10
		Barium	227
		Cadmium	0.19
		Chromium	8.90
		Cobalt	4.50
		Iron	11,300
		Manganese	486
		Mercury	0.02
		Thallium	0.12
		Vanadium	12

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	36	$TEQ_{D/F}$	9.15E-06
		Aluminum	12,500
		Antimony	0.80
		Arsenic	5.10
		Barium	492
		Cadmium	0.85
		Chromium	18
		Cobalt	4.90
		Iron	12,800
		Manganese	407
		Mercury	0.27
		Thallium	0.14
		Vanadium	31
Upland	37	$TEQ_{D/F}$	1.53E-06
		Aluminum	7,924
		Antimony	0.33
		Arsenic	2.52
		Barium	204
		Cadmium	0.26
		Chromium	10
		Cobalt	3.50
		Iron	9,916
		Manganese	264
		Mercury	0.04
		Thallium	0.09
		Vanadium	11
Upland	38	$TEQ_{D/F}$	2.10E-06
		Aluminum	2,700
		Antimony	0.09
		Arsenic	1.00
		Barium	44
		Cadmium	0.02
		Chromium	3.80
		Cobalt	1.50
		Iron	5,210
		Manganese	39
		Mercury	0.005
		Thallium	0.02
		Vanadium	5.30
Upland	39	$TEQ_{D/F}$	2.68E-06
		Aluminum	9,482
		Antimony	0.41
		Arsenic	2.13
		Barium	410
		Cadmium	0.32
		Chromium	12
		Cobalt	3.20
		Iron	9,683
		Manganese	130
		Mercury	0.07
		Thallium	0.13
		Vanadium	18
Upland	40	$TEQ_{D/F}$	3.55E-06
		Aluminum	5,950
		Arsenic	1.40
		Barium	205
		Cadmium	0.28
		Chromium	11
		Cobalt	2.20
		Iron	6,260
		Manganese	92
		Mercury	0.04
		Thallium	0.07
		Vanadium	7.60

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	41	$TEQ_{D/F}$	3.43E-06
		Aluminum	5,197
		Antimony	0.04
		Arsenic	1.28
		Barium	268
		Cadmium	0.24
		Chromium	7.49
		Cobalt	1.54
		Iron	4,552
		Manganese	112
		Mercury	0.05
		Thallium	0.01
		Vanadium	4.93
Upland	42	$TEQ_{D/F}$	7.48E-06
		Aluminum	12,900
		Arsenic	3.10
		Barium	298
		Cadmium	0.32
		Chromium	21
		Cobalt	4.90
		Iron	16,000
		Manganese	296
		Mercury	0.16
		Thallium	0.17
		Vanadium	18
Upland	43	$TEQ_{D/F}$	3.90E-06
		Aluminum	9,110
		Antimony	0.76
		Arsenic	2.80
		Barium	578
		Cadmium	0.47
		Chromium	13
		Cobalt	2.80
		Iron	7,790
		Manganese	148
		Mercury	0.12
		Thallium	0.10
		Vanadium	27
Upland	44	$TEQ_{D/F}$	2.15E-06
		Aluminum	9,904
		Antimony	1.16
		Arsenic	4.40
		Barium	292
		Cadmium	0.80
		Chromium	12
		Cobalt	3.02
		Iron	8,078
		Manganese	335
		Mercury	0.16
		Thallium	0.09
		Vanadium	34
Upland	45	$TEQ_{D/F}$	3.68E-07
		Aluminum	21,000
		Antimony	0.23
		Arsenic	3.10
		Barium	312
		Cadmium	0.08
		Chromium	18
		Cobalt	6.90
		Iron	20,300
		Manganese	176
		Mercury	0.02
		Thallium	0.21
		Vanadium	19

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	46	$TEQ_{D/F}$	2.80E-06
		Aluminum	10,310
		Arsenic	2.27
		Barium	357
		Cadmium	0.23
		Chromium	15
		Cobalt	4.52
		Iron	12,602
		Manganese	216
		Mercury	0.05
		Thallium	0.14
		Vanadium	16
Upland	47	$TEQ_{D/F}$	1.55E-05
		Aluminum	17,014
		Antimony	1.60
		Arsenic	12
		Barium	538
		Cadmium	4.96
		Chromium	21
		Cobalt	2.02
		Iron	3,080
		Manganese	1,092
		Mercury	0.77
		Thallium	0.20
		Vanadium	49
Upland	48	$TEQ_{D/F}$	4.92E-05
		Aluminum	18,700
		Antimony	2.40
		Arsenic	14
		Barium	798
		Cadmium	8.30
		Chromium	58
		Cobalt	2.00
		Iron	3,590
		Manganese	1,650
		Mercury	2.50
		Thallium	0.33
		Vanadium	71
Upland	49	$TEQ_{D/F}$	3.98E-05
		Aluminum	14,400
		Arsenic	3.60
		Barium	1,010
		Cadmium	2.00
		Chromium	29
		Cobalt	4.50
		Iron	14,900
		Manganese	575
		Mercury	8.00
		Thallium	0.16
		Vanadium	22
Upland	50	$TEQ_{D/F}$	2.36E-05
		Aluminum	11,597
		Antimony	1.15
		Arsenic	7.68
		Barium	509
		Cadmium	3.78
		Chromium	24
		Cobalt	2.30
		Iron	4,653
		Manganese	1,221
		Mercury	0.75
		Thallium	0.19
		Vanadium	28

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	51	$TEQ_{D/F}$	3.11E-06
		Aluminum	3,210
		Arsenic	2.20
		Barium	108
		Cadmium	0.52
		Chromium	9.00
		Cobalt	2.00
		Iron	5,160
		Manganese	221
		Mercury	0.16
		Thallium	0.05
		Vanadium	9.20
Upland	52	$TEQ_{D/F}$	2.16E-06
		Aluminum	4,903
		Arsenic	1.77
		Barium	96
		Cadmium	0.16
		Chromium	6.83
		Cobalt	2.67
		Iron	6,840
		Manganese	132
		Mercury	0.06
		Thallium	0.07
		Vanadium	7.73
Upland	53	$TEQ_{D/F}$	2.17E-05
		Aluminum	12,205
		Antimony	0.44
		Arsenic	2.56
		Barium	554
		Cadmium	1.15
		Chromium	21
		Cobalt	3.96
		Iron	12,233
		Manganese	424
		Mercury	4.10
		Thallium	0.15
		Vanadium	18
Upland	54	$TEQ_{D/F}$	1.22E-05
		Aluminum	10,220
		Antimony	1.59
		Arsenic	9.45
		Barium	616
		Cadmium	3.95
		Chromium	21
		Cobalt	2.63
		Iron	4,790
		Manganese	1,691
		Mercury	0.66
		Thallium	0.17
		Vanadium	13
Upland	55	$TEQ_{D/F}$	4.68E-05
		Aluminum	13,723
		Antimony	1.01
		Arsenic	12
		Barium	951
		Cadmium	4.70
		Chromium	36
		Cobalt	1.76
		Iron	3,238
		Manganese	2,276
		Mercury	0.92
		Thallium	0.23
		Vanadium	42

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	56	$TEQ_{D/F}$	5.71E-05
		Aluminum	15,750
		Antimony	1.67
		Arsenic	12
		Barium	759
		Cadmium	6.48
		Chromium	48
		Cobalt	2.47
		Iron	5,418
		Manganese	1,787
		Mercury	1.25
		Thallium	0.35
		Vanadium	56
Upland	58	$TEQ_{D/F}$	6.96E-05
		Aluminum	14,690
		Antimony	1.92
		Arsenic	10
		Barium	686
		Cadmium	4.00
		Chromium	35
		Cobalt	2.60
		Iron	8,575
		Manganese	1,287
		Mercury	1.01
		Thallium	0.19
		Vanadium	41
Upland	59	$TEQ_{D/F}$	1.54E-05
		Aluminum	8,674
		Antimony	0.82
		Arsenic	6.13
		Barium	730
		Cadmium	3.25
		Chromium	21
		Cobalt	2.22
		Iron	5,293
		Manganese	1,582
		Mercury	0.98
		Thallium	0.16
		Vanadium	15
Upland	60	$TEQ_{D/F}$	8.58E-06
		Aluminum	8,013
		Antimony	0.31
		Arsenic	4.56
		Barium	282
		Cadmium	1.66
		Chromium	15
		Cobalt	3.38
		Iron	8,367
		Manganese	848
		Mercury	0.19
		Thallium	0.11
		Vanadium	14
Upland	61	$TEQ_{D/F}$	5.80E-06
		Aluminum	8,190
		Antimony	0.20
		Arsenic	3.70
		Barium	195
		Cadmium	1.10
		Chromium	12
		Cobalt	3.80
		Iron	9,920
		Manganese	476
		Mercury	0.11
		Thallium	0.11
		Vanadium	13

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	62	$TEQ_{D/F}$	1.10E-06
		Aluminum	7,730
		Arsenic	2.60
		Barium	163
		Cadmium	0.37
		Chromium	11
		Cobalt	4.00
		Iron	10,600
		Manganese	274
		Mercury	0.10
		Thallium	0.12
		Vanadium	11
Upland	64	$TEQ_{D/F}$	1.58E-05
		Aluminum	7,606
		Antimony	0.11
		Arsenic	3.05
		Barium	270
		Cadmium	0.78
		Chromium	12
		Cobalt	3.41
		Iron	9,891
		Manganese	543
		Mercury	3.45
		Thallium	0.10
		Vanadium	12
Upland	65	$TEQ_{D/F}$	1.30E-05
		Aluminum	8,740
		Arsenic	4.30
		Barium	452
		Cadmium	2.50
		Chromium	27
		Cobalt	3.10
		Iron	9,580
		Manganese	1,350
		Mercury	0.30
		Thallium	0.12
		Vanadium	13
Upland	66	$TEQ_{D/F}$	1.87E-06
		Aluminum	4,671
		Antimony	0.21
		Arsenic	3.20
		Barium	265
		Cadmium	0.92
		Chromium	12
		Cobalt	2.42
		Iron	6,297
		Manganese	527
		Mercury	0.08
		Thallium	0.07
		Vanadium	7.55
Upland	67	$TEQ_{D/F}$	7.94E-05
		Aluminum	5,993
		Antimony	1.60
		Arsenic	14
		Barium	600
		Cadmium	4.61
		Chromium	19
		Cobalt	2.39
		Iron	3,739
		Manganese	1,973
		Mercury	0.03
		Thallium	0.37
		Vanadium	5.73

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	68	$TEQ_{D/F}$	7.94E-05
		Aluminum	5,993
		Antimony	1.60
		Arsenic	14
		Barium	600
		Cadmium	4.61
		Chromium	19
		Cobalt	2.39
		Iron	3,739
		Manganese	1,973
		Mercury	0.03
		Thallium	0.37
		Vanadium	5.73
Upland	70	$TEQ_{D/F}$	4.51E-06
		Aluminum	3,343
		Antimony	0.47
		Arsenic	5.97
		Barium	449
		Cadmium	1.90
		Chromium	15
		Cobalt	1.60
		Iron	3,487
		Manganese	1,046
		Mercury	0.10
		Thallium	0.12
		Vanadium	12
Upland	71	$TEQ_{D/F}$	5.46E-06
		Aluminum	1,571
		Antimony	0.13
		Arsenic	5.68
		Barium	497
		Cadmium	1.48
		Chromium	32
		Cobalt	2.33
		Iron	2,959
		Manganese	803
		Mercury	0.04
		Thallium	0.08
		Vanadium	3.69
Upland	72	$TEQ_{D/F}$	2.34E-05
		Aluminum	2,270
		Antimony	0.24
		Arsenic	7.00
		Barium	538
		Cadmium	2.20
		Chromium	19
		Cobalt	1.30
		Iron	1,260
		Manganese	2,250
		Mercury	0.005
		Thallium	0.07
		Vanadium	4.70
Upland	74	$TEQ_{D/F}$	2.96E-04
		Aluminum	17,728
		Antimony	2.38
		Arsenic	40
		Barium	821
		Cadmium	6.35
		Chromium	30
		Cobalt	7.08
		Iron	13,065
		Manganese	2,319
		Mercury	0.23
		Thallium	0.76
		Vanadium	22

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	75	$TEQ_{D/F}$	3.43E-07
		Aluminum	12,006
		Antimony	0.09
		Arsenic	4.20
		Barium	199
		Cadmium	0.14
		Chromium	13
		Cobalt	6.21
		Iron	15,294
		Manganese	362
		Mercury	0.01
		Thallium	0.17
		Vanadium	17
Upland	76	$TEQ_{D/F}$	1.98E-06
		Aluminum	6,680
		Antimony	0.13
		Arsenic	2.81
		Barium	144
		Cadmium	0.12
		Chromium	9.14
		Cobalt	3.26
		Iron	8,647
		Manganese	170
		Mercury	0.02
		Thallium	0.08
		Vanadium	10
Upland	77	$TEQ_{D/F}$	1.98E-06
		Aluminum	6,680
		Antimony	0.13
		Arsenic	2.81
		Barium	144
		Cadmium	0.12
		Chromium	9.14
		Cobalt	3.26
		Iron	8,647
		Manganese	170
		Mercury	0.02
		Thallium	0.08
		Vanadium	10
Upland	78	$TEQ_{D/F}$	3.43E-07
		Aluminum	12,006
		Antimony	0.09
		Arsenic	4.20
		Barium	199
		Cadmium	0.14
		Chromium	13
		Cobalt	6.21
		Iron	15,294
		Manganese	362
		Mercury	0.01
		Thallium	0.17
		Vanadium	17
Upland	79	$TEQ_{D/F}$	1.98E-06
		Aluminum	6,680
		Antimony	0.13
		Arsenic	2.81
		Barium	144
		Cadmium	0.12
		Chromium	9.14
		Cobalt	3.26
		Iron	8,647
		Manganese	170
		Mercury	0.02
		Thallium	0.08
		Vanadium	10

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Upland	80	$TEQ_{D/F}$	1.98E-06
		Aluminum	6,680
		Antimony	0.13
		Arsenic	2.81
		Barium	144
		Cadmium	0.12
		Chromium	9.14
		Cobalt	3.26
		Iron	8,647
		Manganese	170
		Mercury	0.02
		Thallium	0.08
		Vanadium	10
Floodplain	81	$TEQ_{D/F}$	5.97E-07
		Aluminum	6,784
		Antimony	0.10
		Arsenic	4.43
		Barium	180
		Cadmium	0.31
		Chromium	8.16
		Cobalt	3.80
		Iron	9,360
		Manganese	276
		Mercury	0.03
		Thallium	0.11
		Vanadium	12
Floodplain	85	$TEQ_{D/F}$	4.02E-07
		Aluminum	2,940
		Antimony	0.09
		Arsenic	1.90
		Barium	29
		Cadmium	0.02
		Chromium	3.90
		Cobalt	1.80
		Iron	5,150
		Manganese	64
		Mercury	0.00
		Thallium	0.04
		Vanadium	5.10
Floodplain	86	$TEQ_{D/F}$	1.61E-05
		Aluminum	16,985
		Antimony	0.38
		Arsenic	3.99
		Barium	396
		Cadmium	0.47
		Chromium	17
		Cobalt	4.97
		Iron	19,913
		Manganese	478
		Mercury	0.46
		Thallium	0.17
		Vanadium	19
Floodplain	87	$TEQ_{D/F}$	5.76E-06
		Aluminum	9,453
		Antimony	0.11
		Arsenic	4.01
		Barium	649
		Cadmium	0.67
		Chromium	13
		Cobalt	3.60
		Iron	10,925
		Manganese	239
		Mercury	0.09
		Thallium	0.18
		Vanadium	18

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Floodplain	88	$TEQ_{D/F}$	5.57E-05
		Aluminum	11,800
		Antimony	--
		Arsenic	5.50
		Barium	1,450
		Cadmium	1.80
		Chromium	26
		Cobalt	2.60
		Iron	8,690
		Manganese	525
		Mercury	0.69
		Thallium	0.15
		Vanadium	14
Floodplain	89	$TEQ_{D/F}$	9.34E-06
		Aluminum	11,010
		Antimony	0.36
		Arsenic	4.66
		Barium	487
		Cadmium	0.53
		Chromium	17
		Cobalt	4.41
		Iron	12,465
		Manganese	356
		Mercury	0.17
		Thallium	0.15
		Vanadium	19
Floodplain	90	$TEQ_{D/F}$	5.54E-05
		Aluminum	11,145
		Antimony	--
		Arsenic	10
		Barium	764
		Cadmium	2.80
		Chromium	28
		Cobalt	3.10
		Iron	9,250
		Manganese	1,118
		Mercury	1.50
		Thallium	0.16
		Vanadium	31
Floodplain	91	$TEQ_{D/F}$	2.26E-05
		Aluminum	14,700
		Antimony	--
		Arsenic	6.30
		Barium	919
		Cadmium	1.70
		Chromium	26
		Cobalt	5.30
		Iron	14,200
		Manganese	400
		Mercury	0.83
		Thallium	0.19
		Vanadium	26
Floodplain	93	$TEQ_{D/F}$	4.61E-05
		Aluminum	15,130
		Antimony	--
		Arsenic	7.80
		Barium	429
		Cadmium	2.13
		Chromium	25
		Cobalt	3.20
		Iron	7,930
		Manganese	880
		Mercury	3.15
		Thallium	0.12
		Vanadium	29

Table 3-33. Surface + Subsurface Soil Exposure Point Concentrations (EPCs)

OU3 Upland or Floodplain	Grid	COPC	EPC (mg/kg)
Floodplain	94	$TEQ_{D/F}$	2.16E-05
		Aluminum	10,093
		Antimony	0.45
		Arsenic	3.89
		Barium	400
		Cadmium	1.11
		Chromium	19
		Cobalt	3.12
		Iron	9,288
		Manganese	389
		Mercury	0.90
		Thallium	0.15
		Vanadium	17
Floodplain	95	$TEQ_{D/F}$	2.11E-05
		Aluminum	9,773
		Antimony	--
		Arsenic	5.60
		Barium	394
		Cadmium	1.24
		Chromium	18
		Cobalt	3.50
		Iron	9,707
		Manganese	742
		Mercury	1.04
		Thallium	0.12
		Vanadium	23
Floodplain	97	$TEQ_{D/F}$	2.38E-06
		Aluminum	6,730
		Antimony	0.05
		Arsenic	2.02
		Barium	208
		Cadmium	0.22
		Chromium	8.72
		Cobalt	1.87
		Iron	5,860
		Manganese	85
		Mercury	0.04
		Thallium	0.01
		Vanadium	8.82
Floodplain	98	$TEQ_{D/F}$	1.23E-05
		Aluminum	14,775
		Antimony	0.09
		Arsenic	4.24
		Barium	1,866
		Cadmium	1.03
		Chromium	19
		Cobalt	3.34
		Iron	11,200
		Manganese	264
		Mercury	0.26
		Thallium	0.13
		Vanadium	20

Table 3-34. OU3 Groundwater Sample Summary by Well

OU3 Well ID - Sample ID	Sample Collection Date	Total Metals	Dissolved Metals	PCBs - Aroclors	Dioxins/ Furans	Volatile Organics
UNIT 1 WELLS						
ATMW6						
ATMW-6_4/14/14_NM	4/14/2014	X	X	X	X	
ATMW6_20151215_NM	12/15/2015		X		X	
ATMW6_20160602_NM	6/2/2016		X			
ATMW6_20170707_NM	7/7/2017	X	X		X	
ATMW6_20171216_NM	12/16/2017	X	X		X	
ATMW6_20180621_NM	6/21/2018	X	X		X	
ATMW6_20181211_NM	12/11/2018	X	X		X	
ATMW6_20190613_NM	6/13/2019	X	X		X	
ATMW6_20191004_NM	10/4/2019	X	X		X	
ATMW6_20200608_NM	6/8/2020	X	X			
ATMW6_20200925_NM	9/25/2020	X	X			
NFMW10						
NFMW10_20151217_NM	12/17/2015		X		X	X
NFMW10_20160607_NM	6/7/2016		X	X	X	
NFMW10_20170710_NM	7/10/2017	X	X	X	X	X
NFMW10_20171216_NM	12/16/2017	X	X	X	X	
NFMW10_20180612_NM	6/12/2018	X	X	X	X	X
NFMW-10_20181205_NM	12/5/2018	X	X	X	X	X
NFMW10_20190619_NM	6/19/2019	X	X	X	X	X
NFMW10_20190924_NM	9/24/2019	X	X	X	X	X
NFMW10_20191008_NM	10/8/2019					X
NFMW10_20200616_NM	6/16/2020	X	X		X	X
NFMW10_20200930_NM	9/30/2020	X	X		X	X
NFMW11						
NFMW11_20151217_NM	12/17/2015		X		X	X
NFMW11_20160607_NM	6/7/2016		X		X	
NFMW11_20170712_NM	7/12/2017	X	X	X	X	X
NFMW11_20171220_NM	12/20/2017	X	X	X	X	
NFMW11_20180615_NM	6/15/2018	X	X		X	
NFMW-11_20181210_NM	12/10/2018	X	X		X	
NFMW11_20190614_NM	6/14/2019	X	X		X	
NFMW11_20190926_NM	9/26/2019	X	X		X	
NFMW11_20200611_NM	6/11/2020	X	X			
NFMW11_20200928_NM	9/28/2020	X	X			
NFMW12						
NFMW12_20151209_NM	12/9/2015		X		X	
NFMW12_20170711_NM	7/11/2017	X	X		X	
NFMW12_20171215_NM	12/15/2017	X	X		X	
NFMW12_20180627_NM	6/27/2018	X	X		X	
NFMW-12_20181215_NM	12/15/2018	X	X		X	
NFMW12_20190614_NM	6/14/2019	X	X		X	
NFMW12_20191007_NM	10/7/2019	X	X		X	
NFMW12_20200617_NM	6/17/2020	X	X			
NFMW12_20201005_NM	10/5/2020	X	X			
NFMW19						
NFMW19_20151217_NM	12/17/2015		X		X	X
NFMW19_20160607_NM	6/7/2016		X	X	X	
NFMW19_20170711_NM	7/11/2017	X	X	X	X	
NFMW19_20171218_NM	12/18/2017	X	X	X	X	
NFMW19_20180614_NM	6/14/2018	X	X		X	X
NFMW-19_20181205_NM	12/5/2018	X	X		X	X
NFMW19_20190621_NM	6/21/2019	X	X		X	X
NFMW19_20191004_NM	10/4/2019	X	X		X	
NFMW19_20200619_NM	6/19/2020	X	X			
NFMW19_20201002_NM	10/2/2020	X	X			

Table 3-34. OU3 Groundwater Sample Summary by Well

OU3 Well ID - Sample ID	**Sample Collection Date**	**Total Metals**	**Dissolved Metals**	**PCBs - Aroclors**	**Dioxins/ Furans**	**Volatile Organics**
NFMW1d						
NFMW1d_4/16/14_NM	4/16/2014	X	X	X	X	
NFMW1d_20151218_NM	12/18/2015		X		X	
NFMW1d_20160608_NM	6/8/2016		X		X	
NFMW1d_20170710_NM	7/10/2017	X	X	X	X	
NFMW1D_20171220_NM	12/20/2017	X	X	X	X	
NFMW1d_20180611_NM	6/11/2018	X	X	X	X	X
NFMW-1D_20181203_NM	12/3/2018	X	X	X	X	X
NFMW1D_20190618_NM	6/18/2019	X	X	X	X	X
NFMW1D_20190924_NM	9/24/2019	X	X	X	X	X
NFMW1D_20191008_NM	10/8/2019					X
NFMW1d_20200615_NM	6/15/2020	X	X		X	X
NFMW1D_20200929_NM	9/29/2020	X	X		X	X
NFMW1s						
NFMW1s_4/16/14_NM	4/16/2014	X	X	X	X	
NFMW1S_20180611_NM	6/11/2018	X	X	X	X	X
NFMW-1S_20181203_NM	12/3/2018	X	X	X	X	X
NFMW1S_20190618_NM	6/18/2019	X	X	X	X	X
NFMW1S_20190924_NM	9/24/2019	X	X	X	X	X
NFMW1S_20191008_NM	10/8/2019					X
NFMW1s_20200615_NM	6/15/2020	X	X		X	X
NFMW1S_20200929_NM	9/29/2020	X	X		X	X
NFMW2						
NFMW-2_4/15/14_NM	4/15/2014	X	X	X	X	
NFMW2_20151218_NM	12/18/2015		X		X	
NFMW2_20160608_NM	6/8/2016		X	X	X	
NFMW2_20170712_NM	7/12/2017	X	X	X	X	
NFMW2_20171218_NM	12/18/2017	X	X	X	X	
NFMW2_20180611_NM	6/11/2018	X	X	X	X	X
NFMW-2_20181203_NM	12/3/2018	X	X	X	X	X
NFMW2_20190619_NM	6/19/2019	X	X	X	X	X
NFMW2_20190926_NM	9/26/2019	X	X	X	X	X
NFMW2_20191008_NM	10/8/2019			X		X
NFMW2_20200615_NM	6/15/2020	X	X		X	X
NFMW2_20200929_NM	9/29/2020	X	X		X	X
NFMW20						
NFMW20_20151217_NM	12/17/2015		X		X	X
NFMW20_20160607_NM	6/7/2016		X	X	X	
NFMW20_20170711_NM	7/11/2017	X	X	X	X	
NFMW20_20171218_NM	12/18/2017	X	X	X	X	
NFMW20_20180614_NM	6/14/2018	X	X		X	X
NFMW-20_20181205_NM	12/5/2018	X	X		X	X
NFMW20_20190621_NM	6/21/2019	X	X		X	X
NFMW20_20191007_NM	10/7/2019	X	X		X	
NFMW20_20200619_NM	6/19/2020	X	X			
NFMW20_20201002_NM	10/2/2020	X	X			
NFMW22						
NFMW22_20190621_NM	6/21/2019	X	X		X	X
NFMW22_20191003_NM	10/3/2019	X	X		X	
NFMW22_20200618_NM	6/18/2020	X	X		X	
NFMW22_20200923_NM	9/23/2020	X	X		X	

Table 3-34. OU3 Groundwater Sample Summary by Well

OU3 Well ID - Sample ID	**Sample Collection Date**	**Total Metals**	**Dissolved Metals**	**PCBs - Aroclors**	**Dioxins/ Furans**	**Volatile Organics**
NFMW23						
NFMW23_20190621_NM	6/21/2019	X	X		X	X
NFMW23_20191003_NM	10/3/2019	X	X		X	
NFMW23_20200619_NM	6/19/2020	X	X		X	
NFMW23_20200923_NM	9/23/2020	X	X		X	
NFMW3						
NFMW-3_4/16/14_NM	4/16/2014	X	X	X	X	
NFMW3_20151218_NM	12/18/2015		X		X	
NFMW3_20160608_NM	6/8/2016		X		X	
NFMW3_20170710_NM	7/10/2017	X	X		X	
NFMW3_20171215_NM	12/15/2017	X	X		X	
NFMW3_20180614_NM	6/14/2018	X	X		X	
NFMW-3_20181210_NM	12/10/2018	X	X		X	
NFMW3_20190617_NM	6/17/2019	X	X		X	
NFMW3_20190925_NM	9/25/2019	X	X		X	
NFMW3_20200609_NM	6/9/2020	X	X			
NFMW3_20201005_NM	10/5/2020	X	X			
NFMW4						
NFMW-4_4/15/14_NM	4/15/2014	X	X	X	X	
NFMW4_20151216_NM	12/16/2015		X		X	
NFMW4_20160606_NM	6/6/2016		X		X	
NFMW4_20170705_NM	7/5/2017	X	X		X	
NFMW4_20171213_NM	12/13/2017	X	X		X	
NFMW4_20180619_NM	6/19/2018	X	X		X	
NFMW-4_20181215_NM	12/15/2018	X	X		X	
NFMW4_20190623_NM	6/23/2019	X	X		X	
NFMW4_20190925_NM	9/25/2019	X	X		X	
NFMW4_20200617_NM	6/17/2020	X	X			
NFMW4_20201005_NM	10/5/2020	X	X			
NFMW7						
NFMW7_20151209_NM	12/9/2015		X	X	X	X
NFMW7_20160608_NM	6/8/2016		X		X	
NFMW7_20170710_NM	7/10/2017	X	X		X	X
NFMW7_20171215_NM	12/15/2017	X	X		X	
NFMW7_20180620_NM	6/20/2018	X	X		X	
NFMW7_20181218_NM	12/18/2018	X	X		X	
NFMW7_20190614_NM	6/14/2019	X	X		X	
NFMW7_20191004_NM	10/4/2019	X	X		X	
NFMW7_20200609_NM	6/9/2020	X	X			
NFMW7_20201005_NM	10/5/2020	X	X			
NFMW8						
NFMW8_20151217_NM	12/17/2015		X		X	X
NFMW8_20160608_NM	6/8/2016		X		X	
NFMW8_20170706_NM	7/6/2017	X	X		X	X
NFMW8_20171220_NM	12/20/2017	X	X	X	X	
NFMW8_20180612_NM	6/12/2018	X	X	X	X	X
NFMW-8_20181204_NM	12/4/2018	X	X	X	X	X
NFMW8_20190618_NM	6/18/2019	X	X	X	X	X
NFMW8_20191004_NM	10/4/2019	X	X		X	
NFMW8_20200609_NM	6/9/2020	X	X			
NFMW8_20201001_NM	10/1/2020	X	X			

Table 3-34. OU3 Groundwater Sample Summary by Well

OU3 Well ID - Sample ID	**Sample Collection Date**	**Total Metals**	**Dissolved Metals**	**PCBs - Aroclors**	**Dioxins/ Furans**	**Volatile Organics**
NFMW9						
NFMW9_20151221_NM	12/21/2015		X		X	X
NFMW9_20160608_NM	6/8/2016		X		X	
NFMW9_20170710_NM	7/10/2017	X	X	X	X	X
NFMW9_20171216_NM	12/16/2017	X	X	X	X	
NFMW9_20180612_NM	6/12/2018	X	X	X	X	X
NFMW-9_20181204_NM	12/4/2018	X	X	X	X	X
NFMW9_20190619_NM	6/19/2019	X	X	X	X	X
NFMW9_20190925_NM	9/25/2019	X	X	X	X	X
NFMW9_20191008_NM	10/8/2019					X
NFMW9_20200615_NM	6/15/2020	X	X		X	X
NFMW9_20200929_NM	9/29/2020	X	X		X	X
SMW10						
SMW10_20151214_NM	12/14/2015		X		X	
SMW10_20160603_NM	6/3/2016		X		X	
SMW10_20170628_NM	6/28/2017	X	X		X	
SMW10_20171214_NM	12/14/2017	X	X		X	
SMW10_20180619_NM	6/19/2018	X	X		X	
SMW-10_20181215_NM	12/15/2018	X	X		X	
SMW10_20190611_NM	6/11/2019	X	X		X	
SMW10_20191001_NM	10/1/2019	X	X		X	
SMW10_20200612_NM	6/12/2020	X	X			
SMW10_20200922_NM	9/22/2020	X	X			
SMW11						
SMW11_20151214_NM	12/14/2015		X		X	
SMW11_20160603_NM	6/3/2016		X		X	
SMW11_20170629_NM	6/29/2017	X	X		X	
SMW11_20171214_NM	12/14/2017	X	X		X	
SMW11_20180523_NM	5/23/2018	X	X		X	
SMW11_20180615_NM	6/15/2018	X	X		X	
SMW-11_20181210_NM	12/10/2018	X	X		X	
SMW11_20190612_NM	6/12/2019	X	X		X	
SMW11_20191002_NM	10/2/2019	X	X		X	
SMW11_20200612_NM	6/12/2020	X	X		X	
SMW11_20200922_NM	9/22/2020	X	X		X	
SMW12						
SMW12_20151214_NM	12/14/2015		X		X	
SMW12_20160606_NM	6/6/2016		X		X	
SMW12_20170629_NM	6/29/2017	X	X		X	
SMW12_20171214_NM	12/14/2017	X	X		X	
SMW12_20180615_NM	6/15/2018	X	X		X	
SMW-12_20181207_NM	12/7/2018	X	X		X	
SMW12_20190612_NM	6/12/2019	X	X		X	
SMW12_20191002_NM	10/2/2019	X	X		X	
SMW12_20200617_NM	6/17/2020	X	X			
SMW12_20200922_NM	9/22/2020	X	X			

Table 3-34. OU3 Groundwater Sample Summary by Well

OU3 Well ID - Sample ID	**Sample Collection Date**	**Total Metals**	**Dissolved Metals**	**PCBs - Aroclors**	**Dioxins/ Furans**	**Volatile Organics**
SMW13						
SMW13_20151215_NM	12/15/2015		X		X	
SMW13_20160606_NM	6/6/2016		X		X	
SMW13_20170629_NM	6/29/2017	X	X		X	
SMW13_20171215_NM	12/15/2017	X	X		X	
SMW13_20180626_NM	6/26/2018	X	X		X	
SMW-13_20181213_NM	12/13/2018	X	X		X	
SMW13_20190612_NM	6/12/2019	X	X		X	
SMW13_20191002_NM	10/2/2019	X	X		X	
SMW13_20200618_NM	6/18/2020	X	X		X	
SMW13_20200923_NM	9/23/2020				X	
SWM13_20200923_NM	9/23/2020	X	X			
SMW14						
SMW14_20151215_NM	12/15/2015		X		X	
SMW14_20160606_NM	6/6/2016		X		X	
SMW14_20170706_NM	7/6/2017	X	X		X	
SMW14_20171216_NM	12/16/2017	X	X		X	
SMW14_20180626_NM	6/26/2018	X	X		X	
SMW-14_20181213_NM	12/13/2018	X	X		X	
SMW14_20190612_NM	6/12/2019	X	X		X	
SMW14_20191003_NM	10/3/2019	X	X		X	
SMW14_20200618_NM	6/18/2020	X	X			
SWM14_20200923_NM	9/23/2020	X	X			
SMW15						
SMW-15_4/16/14_NM	4/16/2014	X	X	X	X	
SMW15_20151215_NM	12/15/2015		X		X	
SMW15_20160606_NM	6/6/2016		X		X	
SMW15_20170710_NM	7/10/2017	X	X		X	
SMW15_20171215_NM	12/15/2017	X	X		X	
SMW15_20180626_NM	6/26/2018	X	X		X	
SMW-15_20181211_NM	12/11/2018	X	X		X	
SMW15_20190612_NM	6/12/2019	X	X		X	
SMW15_20191003_NM	10/3/2019	X	X		X	
SMW15_20200609_NM	6/9/2020	X	X			
SMW15_20200925_NM	9/25/2020	X	X			
SMW16						
SMW-16_4/15/14_NM	4/15/2014	X	X	X	X	
SMW16_20151216_NM	12/16/2015		X		X	
SMW16_20160607_NM	6/7/2016		X		X	
SMW16_20170327_NM	3/27/2017		X	X	X	X
SMW16_20170706_NM	7/6/2017	X	X		X	X
SMW16_20171212_NM	12/12/2017	X	X		X	
SMW16_20180612_NM	6/12/2018	X	X		X	X
SMW-16_20181206_NM	12/6/2018	X	X		X	X
SMW16_20190617_NM	6/17/2019	X	X		X	X
SMW16_20190927_NM	9/27/2019	X	X		X	X
SMW16_20191008_NM	10/8/2019					X
SMW16_20200616_NM	6/16/2020	X	X		X	X
SMW16_20200930_NM	9/30/2020	X	X		X	X

Table 3-34. OU3 Groundwater Sample Summary by Well

OU3 Well ID - Sample ID	**Sample Collection Date**	**Total Metals**	**Dissolved Metals**	**PCBs - Aroclors**	**Dioxins/ Furans**	**Volatile Organics**
SMW17						
SMW17_20151216_NM	12/16/2015		X		X	
SMW17_20160606_NM	6/6/2016		X		X	
SMW17_20170327_NM	3/27/2017		X	X	X	X
SMW17_20170630_NM	6/30/2017	X	X	X	X	X
SMW17_20171213_NM	12/13/2017	X	X		X	
SMW17_20180613_NM	6/13/2018	X	X		X	X
SMW-17_20181212_NM	12/12/2018	X	X		X	X
SMW17_20190620_NM	6/20/2019	X	X		X	X
SMW17_20190930_NM	9/30/2019	X	X		X	
SMW17_20200618_NM	6/18/2020	X	X		X	
SMW17_20201002_NM	10/2/2020	X	X		X	
SMW18						
SMW18_20151216_NM	12/16/2015		X		X	
SMW18_20170329_NM	3/29/2017		X	X	X	X
SMW18_20170705_NM	7/5/2017	X	X		X	X
SMW18_20171213_NM	12/13/2017	X	X		X	
SMW18_20180613_NM	6/13/2018	X	X		X	X
SMW-18_20181213_NM	12/13/2018	X	X		X	X
SMW18_20190620_NM	6/20/2019	X	X		X	X
SMW18_20190930_NM	9/30/2019	X	X		X	
SMW18_20200617_NM	6/17/2020	X	X		X	
SMW18_20201001_NM	10/1/2020	X	X		X	
SMW19						
SMW19_20151216_NM	12/16/2015		X		X	
SMW19_20160607_NM	6/7/2016		X		X	
SMW19_20170705_NM	7/5/2017	X	X		X	
SMW19_20171215_NM	12/15/2017	X	X		X	
SMW19_20180615_NM	6/15/2018	X	X		X	
SMW19_20181218_NM	12/18/2018	X	X		X	
SMW19_20190614_NM	6/14/2019	X	X		X	
SMW19_20191007_NM	10/7/2019	X	X		X	
SMW19_20200611_NM	6/11/2020	X	X			
SMW19_20201002_NM	10/2/2020	X	X			
SMW7						
SMW7_20151208_NM	12/8/2015		X		X	
SMW7_20160601_NM	6/1/2016		X		X	
SMW7_20170628_NM	6/28/2017	X	X		X	
SMW7_20171210_NM	12/10/2017	X	X		X	
SMW7_20180618_NM	6/18/2018	X	X			
SMW-7_20181214_NM	12/14/2018	X	X			
SMW7_20190610_NM	6/10/2019	X	X			
SMW7_20191001_NM	10/1/2019	X	X			
SMW7_20200611_NM	6/11/2020	X	X			
SMW7_20200921_NM	9/21/2020	X	X			

Table 3-34. OU3 Groundwater Sample Summary by Well

OU3 Well ID - Sample ID	**Sample Collection Date**	**Total Metals**	**Dissolved Metals**	**PCBs - Aroclors**	**Dioxins/ Furans**	**Volatile Organics**
SMW8						
SMW8_20151209_NM	12/9/2015		X		X	
SMW8_20170628_NM	6/28/2017	X	X		X	
SMW8_20171214_NM	12/14/2017	X	X		X	
SMW8_20180618_NM	6/18/2018	X	X			
SMW-8_20181214_NM	12/14/2018	X	X			
SMW8_20190611_NM	6/11/2019	X	X			
SMW8_20191001_NM	10/1/2019	X	X			
SMW8_20200611_NM	6/11/2020	X	X		X	
SMW8_20200921_NM	9/21/2020	X	X		X	
SMW9						
SMW-9_4/15/14_NM	4/15/2014	X	X	X	X	
SMW9_20151209_NM	12/9/2015		X		X	
SMW9_20160602_NM	6/2/2016		X		X	
SMW9_20170628_NM	6/28/2017	X	X		X	
SMW9_20171214_NM	12/14/2017	X	X		X	
SMW9_20180618_NM	6/18/2018	X	X		X	
SMW-9_20181214_NM	12/14/2018	X	X		X	
SMW9_20190611_NM	6/11/2019	X	X		X	
SMW9_20191001_NM	10/1/2019	X	X		X	
SMW9_20200612_NM	6/12/2020	X	X			
SMW9_20200922_NM	9/22/2020	X	X			
TW2R						
TW-2R_4/15/14_NM	4/15/2014	X	X	X	X	
TW2R_20151215_NM	12/15/2015		X		X	
TW2R_20160606_NM	6/6/2016		X		X	
TW2R_20170629_NM	6/29/2017	X	X		X	
TW2R_20171215_NM	12/15/2017	X	X		X	
TW2R_20180626_NM	6/26/2018	X	X		X	
TW2R_20181213_NM	12/13/2018	X	X		X	
TW2R_20190612_NM	6/12/2019	X	X		X	
TW2R_20191002_NM	10/2/2019	X	X		X	
TW2R_20200618_NM	6/18/2020	X	X			
TW2R_20200923_NM	9/23/2020	X	X			
TW5R						
TW5R_20151214_NM	12/14/2015		X		X	
TW5R_20170628_NM	6/28/2017	X	X		X	
TW5R_20171214_NM	12/14/2017	X	X		X	
TW5R_20180619_NM	6/19/2018	X	X			
TW5R_20181214_NM	12/14/2018	X	X			
TW5R_20190611_NM	6/11/2019	X	X			
TW5R_20191001_NM	10/1/2019	X	X			
TW5R_20200612_NM	6/12/2020	X	X		X	
TW5R_20200922_NM	9/22/2020	X	X		X	

Table 3-34. OU3 Groundwater Sample Summary by Well

OU3 Well ID - Sample ID	**Sample Collection Date**	**Total Metals**	**Dissolved Metals**	**PCBs - Aroclors**	**Dioxins/ Furans**	**Volatile Organics**
UNIT 3 WELLS						
SMW16D						
SMW16D_20170327_NM	3/27/2017		X	X	X	X
SMW16D_20170706_NM	7/6/2017	X	X	X	X	X
SMW16D_20171212_NM	12/12/2017	X	X	X	X	
SMW16d_20180613_NM	6/13/2018	X	X		X	X
SMW-16D_20181212_NM	12/12/2018	X	X		X	X
SMW16D_20190620_NM	6/20/2019	X	X		X	X
SMW16D_20190930_NM	9/30/2019	X	X		X	
SMW16D_20200623_NM	6/23/2020	X	X		X	
SMW16D_20201001_NM	10/1/2020	X	X		X	
SMW17D						
SMW17D_20170328_NM	3/28/2017		X	X	X	X
SMW17D_20170630_NM	6/30/2017	X	X	X	X	X
SMW17D_20171213_NM	12/13/2017	X	X	X	X	
SMW17d_20180613_NM	6/13/2018	X	X		X	X
SMW-17D_20181212_NM	12/12/2018	X	X		X	X
SMW17D_20190620_NM	6/20/2019	X	X		X	X
SMW17D_20190930_NM	9/30/2019	X	X		X	
SMW17D_20200622_NM	6/22/2020	X	X		X	
SMW17D_20201002_NM	10/2/2020	X	X		X	
SMW18D						
SMW18D_20170329_NM	3/29/2017		X	X	X	X
SMW18D_20170706_NM	7/6/2017	X	X	X	X	X
SMW18D_20171213_NM	12/13/2017	X	X	X	X	
SMW18d_20180613_NM	6/13/2018	X	X		X	X
SMW-18D_20181213_NM	12/13/2018	X	X		X	X
SMW18D_20190620_NM	6/20/2019	X	X		X	X
SMW18D_20190930_NM	9/30/2019	X	X		X	
SMW18D_20200622_NM	6/22/2020	X	X		X	
SMW18D_20201001_NM	10/1/2020	X	X		X	
Waste Water Clarifier Well						
WASTE CLARIFIER WELL_20190626_NM	6/26/2019	X	X		X	

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
UNIT 1 WELLS						
ATMW6	8	$TEQ_{D/F}$	2.8E-06	2.2E-06	2.2E-06	95% Student's-t UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	480	305	305	95% Student's-t UCL
	9	Antimony	0.46	0.27	0.27	95% KM (t) UCL
	9	Arsenic	11	8.2	8.2	95% Student's-t UCL
	9	Barium	113	91	91	95% Student's-t UCL
	8	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Cadmium	7.4E-02	5.1E-02	5.1E-02	95% KM (t) UCL
	9	Chromium	3.2	2.4	2.4	95% KM (t) UCL
	9	Cobalt	0.21	0.17	0.17	95% KM (t) UCL
	9	Copper	11	6.6	6.6	95% Student's-t UCL
	9	Iron	4,920	3,734	3,734	95% Modified-t UCL
	9	Manganese	4,100	3,167	3,167	95% Student's-t UCL
	9	Nickel	1.5	1.2	1.2	95% Student's-t UCL
	9	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Vanadium	17	12	12	95% Student's-t UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
NFMW1d	11	$TEQ_{D/F}$	2.7E-06	2.0E-06	2.0E-06	95% Student's-t UCL
	7	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	156	126	126	95% Student's-t UCL
	9	Antimony	0.50	0.42	0.42	95% KM (t) UCL
	9	Arsenic	23	21	21	95% Student's-t UCL
	9	Barium	667	536	536	95% Student's-t UCL
	8	Beryllium	0.12	0.11	0.11	95% KM (t) UCL
	9	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Chromium	8.5	7.6	7.6	95% Student's-t UCL
	9	Cobalt	0.60	0.52	0.52	95% KM (t) UCL
	9	Copper	37	47	47	99% KM (Chebyshev) UCL; suggested 95UCL > max detect and sample size < *n*
	9	Iron	1,820	1,697	1,697	95% Student's-t UCL
	9	Manganese	5,250	4,113	4,113	95% Student's-t UCL
	9	Nickel	14	11	11	95% Student's-t UCL
	9	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Vanadium	36	33	33	95% Student's-t UCL
	7	1,4-Dichlorobenzene	1.0	0.86	0.86	95% KM (t) UCL
	6	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	6	Chlorobenzene	0.29	0.31	0.29	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
NFMW1s	7	$TEQ_{D/F}$	4.1E-06	3.4E-06	3.4E-06	95% Student's-t UCL
	5	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	7	Aluminum	8,860	7,874	7,874	95% Adjusted Gamma UCL
	7	Antimony	7.7	6.2	6.2	95% Student's-t UCL
	7	Arsenic	26	21	21	95% Adjusted Gamma UCL
	7	Barium	368	304	304	95% Chebyshev (Mean, Sd) UCL
	7	Beryllium	7.3E-02	NC	7.3E-02	Max detect; too few samples to calculate a 95UCL
	7	Cadmium	0.16	0.15	0.15	95% KM Adjusted Gamma UCL
	7	Chromium	157	177	177	95% Adjusted Gamma UCL; suggested 95UCL > max detect and sample size < *n*
	7	Cobalt	4.7	3.8	3.8	95% Adjusted Gamma UCL
	7	Copper	51	108	108	95% KM Bootstrap t UCL; suggested 95UCL > max detect and sample size < *n*
	7	Iron	2,010	1,160	1,160	95% Student's-t UCL
	7	Manganese	200	134	134	95% Student's-t UCL
	7	Nickel	67	52	52	95% Adjusted Gamma UCL
	7	Thallium	0.22	NC	0.22	Max detect; too few samples to calculate a 95UCL
	7	Vanadium	178	124	124	95% Student's-t UCL
	7	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	6	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	6	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
NFMW2	11	$TEQ_{D/F}$	2.4E-06	1.6E-06	1.6E-06	95% KM (t) UCL
	9	Aroclor-1260	0.31	0.14	0.14	95% KM (t) UCL
	9	Aluminum	348	235	235	95% KM (Chebyshev) UCL
	9	Antimony	0.17	0.20	0.20	95% KM (Chebyshev) UCL; suggested 95UCL > max detect and sample size < *n*
	9	Arsenic	17	12	12	95% Student's-t UCL
	9	Barium	268	205	205	95% Student's-t UCL
	8	Beryllium	7.5E-02	NC	7.5E-02	Max detect; too few samples to calculate a 95UCL
	9	Cadmium	5.2E-02	NC	5.2E-02	Max detect; too few samples to calculate a 95UCL
	9	Chromium	0.88	0.55	0.55	95% KM (t) UCL
	9	Cobalt	0.32	0.26	0.26	95% KM (t) UCL
	9	Copper	4.0	2.2	2.2	KM H-UCL
	9	Iron	8,410	6,903	6,903	95% Student's-t UCL
	9	Manganese	6,330	4,997	4,997	95% Student's-t UCL
	9	Nickel	2.8	2.1	2.1	95% KM (t) UCL
	9	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Vanadium	7.2	4.8	4.8	95% KM (Chebyshev) UCL
	7	1,4-Dichlorobenzene	36	28	28	95% Student's-t UCL
	6	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	6	Chlorobenzene	0.42	0.38	0.38	95% KM (t) UCL

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
NFMW3	9	$TEQ_{D/F}$	1.7E-06	1.5E-06	1.5E-06	95% KM (t) UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	78	63	63	95% KM (t) UCL
	9	Antimony	0.18	0.17	0.17	95% KM (t) UCL
	9	Arsenic	9.4	5.9	5.9	95% Student's-t UCL
	9	Barium	1,200	1,056	1,056	95% Student's-t UCL
	8	Beryllium	0.15	0.13	0.13	95% KM (t) UCL
	9	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Chromium	5.8	5.0	5.0	95% KM (t) UCL
	9	Cobalt	1.4	1.1	1.1	95% KM (t) UCL
	9	Copper	0.68	0.55	0.55	95% KM (t) UCL
	9	Iron	9,980	7,539	7,539	95% Adjusted Gamma UCL
	9	Manganese	7,660	6,853	6,853	95% Student's-t UCL
	9	Nickel	6.5	5.3	5.3	95% Student's-t UCL
	9	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Vanadium	17	13	13	95% Student's-t UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
NFMW4	9	$TEQ_{D/F}$	2.2E-06	1.6E-06	1.6E-06	95% KM (t) UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	45	29	29	95% KM (t) UCL
	9	Antimony	0.23	0.21	0.21	95% KM (t) UCL
	9	Arsenic	5.1	3.7	3.7	95% KM (t) UCL
	9	Barium	183	137	137	95% Student's-t UCL
	8	Beryllium	7.3E-02	NC	7.3E-02	Max detect; too few samples to calculate a 95UCL
	9	Cadmium	4.0E-02	3.1E-02	3.1E-02	95% KM (t) UCL
	9	Chromium	1.4	1.0	1.0	95% KM (t) UCL
	9	Cobalt	0.39	0.27	0.27	95% KM (t) UCL
	9	Copper	3.0	1.8	1.8	95% KM (t) UCL
	9	Iron	21,000	13,901	13,901	95% Student's-t UCL
	9	Manganese	10,900	7,396	7,396	95% Student's-t UCL
	9	Nickel	0.84	0.60	0.60	95% KM (t) UCL
	9	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Vanadium	1.8	1.4	1.4	95% KM (t) UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
NFMW7	8	$TEQ_{D/F}$	2.0E-06	1.6E-06	1.6E-06	95% KM (t) UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	345	171	171	95% KM (t) UCL
	9	Antimony	2.5	1.5	1.5	95% Modified-t UCL
	9	Arsenic	11	6.8	6.8	95% Adjusted Gamma UCL
	9	Barium	148	120	120	95% Student's-t UCL
	8	Beryllium	7.2E-02	6.5E-02	6.5E-02	95% KM (t) UCL
	9	Cadmium	0.14	8.7E-02	8.7E-02	95% KM (t) UCL
	9	Chromium	3.5	5.7	3.5	Max detect; suggested 95UCL > max detect and sample size $\geq n$
	9	Cobalt	1.8	1.5	1.5	95% Student's-t UCL
	9	Copper	10	8.8	8.8	95% Student's-t UCL
	9	Iron	1,300	818	818	95% Student's-t UCL
	9	Manganese	539	343	343	95% Modified-t UCL
	9	Nickel	4.0	3.2	3.2	95% Student's-t UCL
	9	Thallium	0.19	NC	0.19	Max detect; too few samples to calculate a 95UCL
	9	Vanadium	32	20	20	95% Adjusted Gamma UCL
	2	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	2	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	2	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
NFMW8	8	$TEQ_{D/F}$	1.7E-06	1.5E-06	1.5E-06	95% KM (t) UCL
	4	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	118	90	90	95% KM (Chebyshev) UCL
	8	Antimony	8.9E-02	8.6E-02	8.6E-02	95% KM (t) UCL
	8	Arsenic	5.2	4.5	4.5	95% Student's-t UCL
	8	Barium	1,200	1,174	1,174	95% Student's-t UCL
	7	Beryllium	9.0E-02	8.4E-02	8.4E-02	95% KM (t) UCL
	8	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Chromium	4.1	3.2	3.2	95% KM (t) UCL
	8	Cobalt	0.83	0.79	0.79	95% KM (t) UCL
	8	Copper	5.6	2.6	2.6	95% KM (t) UCL
	8	Iron	5,450	3,919	3,919	95% Student's-t UCL
	8	Manganese	11,400	9,747	9,747	95% Student's-t UCL
	8	Nickel	5.9	4.9	4.9	95% Student's-t UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	9.0	7.5	7.5	95% KM (t) UCL
	5	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
NFMW9	10	$TEQ_{D/F}$	1.7E-05	1.0E-05	1.0E-05	95% Student's-t UCL
	6	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	243	183	183	95% Student's-t UCL
	8	Antimony	1.1	0.79	0.79	95% KM (t) UCL
	8	Arsenic	32	27	27	95% Student's-t UCL
	8	Barium	804	546	546	95% Student's-t UCL
	7	Beryllium	0.37	0.31	0.31	95% KM (t) UCL
	8	Cadmium	0.24	0.18	0.18	95% KM (t) UCL
	8	Chromium	14	11	11	95% Student's-t UCL
	8	Cobalt	22	38	38	95% KM Bootstrap t UCL; suggested 95UCL > max detect and sample size < *n*
	8	Copper	61	32	32	95% KM (t) UCL
	8	Iron	45,700	34,855	34,855	95% Student's-t UCL
	8	Manganese	14,300	8,800	8,800	95% Student's-t UCL
	8	Nickel	22	16	16	95% Student's-t UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	33	27	27	95% Student's-t UCL
	9	1,4-Dichlorobenzene	2.1	1.3	1.3	95% KM (t) UCL
	8	Benzene	0.64	0.51	0.51	95% KM (t) UCL
	8	Chlorobenzene	149	104	104	95% Student's-t UCL
NFMW10	10	$TEQ_{D/F}$	3.1E-06	2.4E-06	2.4E-06	95% Student's-t UCL
	7	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	224	157	157	95% Student's-t UCL
	8	Antimony	0.61	0.52	0.52	95% KM (t) UCL
	8	Arsenic	22	17	17	95% Student's-t UCL
	8	Barium	320	294	294	95% Student's-t UCL
	7	Beryllium	0.13	NC	0.13	Max detect; too few samples to calculate a 95UCL
	8	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Chromium	8.2	6.1	6.1	95% Student's-t UCL
	8	Cobalt	0.85	0.67	0.67	95% KM (t) UCL
	8	Copper	5.9	3.3	3.3	95% KM (t) UCL
	8	Iron	2,700	2,565	2,565	95% H-UCL; standard deviation of logged data <1.5
	8	Manganese	8,510	7,563	7,563	95% Student's-t UCL
	8	Nickel	6.5	5.6	5.6	95% Student's-t UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	45	34	34	95% Student's-t UCL
	9	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
NFMW11	8	$TEQ_{D/F}$	2.4E-06	2.0E-06	2.0E-06	95% KM (t) UCL
	2	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	36	28	28	95% KM (t) UCL
	8	Antimony	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Arsenic	4.2	3.7	3.7	95% Student's-t UCL
	8	Barium	287	190	190	95% Adjusted Gamma UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Chromium	1.3	0.92	0.92	95% KM (t) UCL
	8	Cobalt	0.36	0.32	0.32	95% KM (t) UCL
	8	Copper	0.23	NC	0.23	Max detect; too few samples to calculate a 95UCL
	8	Iron	568	516	516	95% Student's-t UCL
	8	Manganese	4,570	4,242	4,242	95% Student's-t UCL
	8	Nickel	3.5	2.4	2.4	95% Student's-t UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	4.7	3.0	3.0	95% KM (t) UCL
	2	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	2	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	2	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
NFMW12	7	$TEQ_{D/F}$	1.1E-06	1.2E-06	1.2E-06	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	278	196	196	95% Chebyshev (Mean, Sd) UCL
	8	Antimony	0.13	0.10	0.10	95% KM (t) UCL
	8	Arsenic	3.1	1.8	1.8	95% Student's-t UCL
	8	Barium	130	88	88	95% Student's-t UCL
	7	Beryllium	5.8E-02	NC	5.8E-02	Max detect; too few samples to calculate a 95UCL
	8	Cadmium	0.27	NC	0.27	Max detect; too few samples to calculate a 95UCL
	8	Chromium	0.35	0.32	0.32	95% KM (t) UCL
	8	Cobalt	5.0	2.1	2.1	95% KM (t) UCL
	8	Copper	1.5	1.3	1.3	95% KM (Chebyshev) UCL
	8	Iron	27,200	14,163	14,163	95% Student's-t UCL
	8	Manganese	8,100	6,294	6,294	95% Student's-t UCL
	8	Nickel	8.1	12	12	99% KM (Chebyshev) UCL; suggested 95UCL > max detect and sample size < *n*
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	0.88	0.67	0.67	95% KM (t) UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
NFMW19	8	$TEQ_{D/F}$	1.4E-06	NC	1.4E-06	Max detect; too few samples to calculate a 95UCL
	3	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	12,800	14,849	12,800	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
	8	Antimony	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Arsenic	6.7	4.6	4.6	95% Student's-t UCL
	8	Barium	41	37	37	95% Student's-t UCL
	7	Beryllium	4.7	3.0	3.0	95% KM (t) UCL
	8	Cadmium	1.8	1.0	1.0	95% KM (t) UCL
	8	Chromium	2.0	1.5	1.5	95% KM (t) UCL
	8	Cobalt	98	87	87	95% Adjusted Gamma UCL
	8	Copper	42	22	22	95% KM (t) UCL
	8	Iron	57,300	44,329	44,329	95% Student's-t UCL
	8	Manganese	51,500	46,657	46,657	95% Student's-t UCL
	8	Nickel	91	43	43	95% Student's-t UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	4.0	2.5	2.5	95% KM (t) UCL
	4	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	4	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	4	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
NFMW20	8	$TEQ_{D/F}$	2.9E-06	2.0E-06	2.0E-06	95% KM (t) UCL
	3	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	63	50	50	95% KM (t) UCL
	8	Antimony	0.23	0.23	0.23	95% KM (t) UCL
	8	Arsenic	6.1	4.7	4.7	95% Student's-t UCL
	8	Barium	65	58	58	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Chromium	2.4	2.2	2.2	95% KM (t) UCL
	8	Cobalt	1.1	0.74	0.74	95% KM (t) UCL
	8	Copper	1.7	1.6	1.6	95% KM (t) UCL
	8	Iron	9,210	6,699	6,699	95% Student's-t UCL
	8	Manganese	15,200	14,331	14,331	95% Student's-t UCL
	8	Nickel	4.4	3.6	3.6	95% Student's-t UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	6.8	5.7	5.7	95% Student's-t UCL
	4	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	4	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	4	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
NFMW22	4	$TEQ_{D/F}$	2.3E-06	2.3E-06	2.3E-06	95% Student's-t UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	4	Aluminum	174	170	170	95% Student's-t UCL
	4	Antimony	0.68	0.68	0.68	95% Student's-t UCL
	4	Arsenic	14	14	14	95% Student's-t UCL; suggested 95UCL > max detect and sample size < *n*
	4	Barium	46	46	46	95% Student's-t UCL
	4	Beryllium	0.11	0.13	0.13	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	4	Cadmium	5.1E-02	5.6E-02	5.6E-02	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	4	Chromium	4.2	4.4	4.2	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
	4	Cobalt	0.45	0.45	0.45	95% KM (t) UCL
	4	Copper	5.0	5.0	5.0	95% Student's-t UCL
	4	Iron	1,350	1,341	1,341	95% Student's-t UCL
	4	Manganese	2,960	2,972	2,972	95% Student's-t UCL; suggested 95UCL > max detect and sample size < *n*
	4	Nickel	6.9	6.9	6.9	95% Student's-t UCL; suggested 95UCL > max detect and sample size < *n*
	4	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	4	Vanadium	36	35	35	95% Student's-t UCL
	1	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
NFMW23	4	$TEQ_{D/F}$	2.1E-06	2.2E-06	2.2E-06	95% Student's-t UCL; suggested 95UCL > max detect and sample size < *n*
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	4	Aluminum	176	172	172	95% Student's-t UCL
	4	Antimony	1.1	1.1	1.1	95% Modified-t UCL
	4	Arsenic	74	72	72	95% Student's-t UCL
	4	Barium	127	124	124	95% Student's-t UCL
	4	Beryllium	6.3E-02	6.4E-02	6.4E-02	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	4	Cadmium	0.16	0.15	0.15	95% KM (t) UCL
	4	Chromium	3.9	4.0	3.9	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
	4	Cobalt	0.73	0.73	0.73	95% Student's-t UCL; suggested 95UCL > max detect and sample size < *n*
	4	Copper	16	16	16	95% Student's-t UCL; suggested 95UCL > max detect and sample size < *n*
	4	Iron	10,600	10,599	10,599	95% Student's-t UCL
	4	Manganese	4,680	4,836	4,836	95% Student's-t UCL; suggested 95UCL > max detect and sample size < *n*
	4	Nickel	6.8	6.9	6.8	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
	4	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	4	Vanadium	55	55	55	95% Student's-t UCL; suggested 95UCL > max detect and sample size < *n*
	1	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
SMW7	4	$TEQ_{D/F}$	1.6E-06	NC	1.6E-06	Max detect; too few samples to calculate a 95UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	5.1	6.0	6.0	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	8	Antimony	0.17	NC	0.17	Max detect; too few samples to calculate a 95UCL
	8	Arsenic	3.6	3.4	3.4	95% KM (t) UCL
	8	Barium	133	114	114	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	9.4E-02	6.7E-02	6.7E-02	95% KM (t) UCL
	8	Chromium	0.53	0.34	0.34	95% KM (t) UCL
	8	Cobalt	4.2	2.7	2.7	95% KM (t) UCL
	8	Copper	6.7	5.3	5.3	95% KM (t) UCL
	8	Iron	47	NC	47	Max detect; too few samples to calculate a 95UCL
	8	Manganese	1,300	957	957	95% Student's-t UCL
	8	Nickel	1.7	1.5	1.5	95% KM (t) UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	2.7	2.2	2.2	95% KM (t) UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
SMW8	5	$TEQ_{D/F}$	2.1E-06	1.8E-06	1.8E-06	95% KM (t) UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	273	429	429	Gamma Adjusted KM-UCL; suggested 95UCL > max detect and sample size < *n*
	8	Antimony	9.3E-02	NC	9.3E-02	Max detect; too few samples to calculate a 95UCL
	8	Arsenic	7.5	6.3	6.3	95% Student's-t UCL
	8	Barium	108	103	103	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Chromium	0.28	0.25	0.25	95% KM (t) UCL
	8	Cobalt	9.7E-02	9.2E-02	9.2E-02	95% KM (t) UCL
	8	Copper	18	13	13	95% KM (Chebyshev) UCL
	8	Iron	1,640	1,476	1,476	95% Student's-t UCL
	8	Manganese	1,230	1,076	1,076	95% Student's-t UCL
	8	Nickel	0.46	0.35	0.35	95% KM (t) UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	0.62	0.55	0.55	95% KM (t) UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
SMW9	9	$TEQ_{D/F}$	2.7E-06	1.9E-06	1.9E-06	95% KM (t) UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	35	30	30	95% KM (t) UCL
	9	Antimony	0.64	0.52	0.52	95% KM (t) UCL
	9	Arsenic	12	10	10	95% Student's-t UCL
	9	Barium	71	53	53	95% Student's-t UCL
	8	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Cadmium	6.0E-02	4.7E-02	4.7E-02	95% KM (t) UCL
	9	Chromium	0.72	0.64	0.64	95% KM (t) UCL
	9	Cobalt	0.30	0.26	0.26	95% KM (t) UCL
	9	Copper	16	10	10	95% Adjusted Gamma UCL
	9	Iron	69	47	47	95% KM (t) UCL
	9	Manganese	504	209	209	95% KM (t) UCL
	9	Nickel	5.0	4.1	4.1	95% KM (t) UCL
	9	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Vanadium	11	7.6	7.6	95% Student's-t UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
SMW10	8	$TEQ_{D/F}$	3.1E-06	2.3E-06	2.3E-06	95% Modified-t UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	94	78	78	95% KM (t) UCL
	8	Antimony	0.57	0.53	0.53	95% KM (t) UCL
	8	Arsenic	37	34	34	95% Student's-t UCL
	8	Barium	129	104	104	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	1.8E-02	NC	1.8E-02	Max detect; too few samples to calculate a 95UCL
	8	Chromium	2.3	2.0	2.0	95% KM (t) UCL
	8	Cobalt	0.39	0.37	0.37	95% KM (t) UCL
	8	Copper	4.8	3.3	3.3	95% Student's-t UCL
	8	Iron	3,050	2,435	2,435	95% Student's-t UCL
	8	Manganese	3,220	2,560	2,560	95% Student's-t UCL
	8	Nickel	5.6	5.1	5.1	95% KM (t) UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	16	15	15	95% Student's-t UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
SMW11	11	$TEQ_{D/F}$	5.1E-06	3.0E-06	3.0E-06	95% KM (t) UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	9	Aluminum	175	206	206	95% KM (Chebyshev) UCL; suggested 95UCL > max detect and sample size < *n*
	9	Antimony	0.87	0.78	0.78	95% KM (t) UCL
	9	Arsenic	45	40	40	95% Student's-t UCL
	9	Barium	200	151	151	95% Student's-t UCL
	8	Beryllium	0.11	0.11	0.11	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	9	Cadmium	2.0E-02	NC	2.0E-02	Max detect; too few samples to calculate a 95UCL
	9	Chromium	4.3	5.5	4.3	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
	9	Cobalt	16	10	10	95% KM (Chebyshev) UCL
	9	Copper	12	10	10	95% KM Bootstrap t UCL
	9	Iron	6,190	3,555	3,555	95% Modified-t UCL
	9	Manganese	18,100	10,242	10,242	95% Modified-t UCL
	9	Nickel	10	7.0	7.0	95% Student's-t UCL
	9	Thallium	4.4E-02	NC	4.4E-02	Max detect; too few samples to calculate a 95UCL
	9	Vanadium	24	29	24	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
SMW12	8	$TEQ_{D/F}$	4.2E-06	3.2E-06	3.2E-06	95% Student's-t UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	506	327	327	95% Student's-t UCL
	8	Antimony	0.53	0.47	0.47	95% KM (t) UCL
	8	Arsenic	22	15	15	95% Student's-t UCL
	8	Barium	115	111	111	95% Student's-t UCL
	7	Beryllium	6.0E-02	NC	6.0E-02	Max detect; too few samples to calculate a 95UCL
	8	Cadmium	0.10	NC	0.10	Max detect; too few samples to calculate a 95UCL
	8	Chromium	7.3	5.4	5.4	95% Student's-t UCL
	8	Cobalt	0.52	0.47	0.47	95% KM (t) UCL
	8	Copper	6.0	4.0	4.0	95% KM (t) UCL
	8	Iron	112	81	81	95% KM (t) UCL
	8	Manganese	4,870	3,956	3,956	95% Student's-t UCL
	8	Nickel	14	7.6	7.6	KM H-UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	27	19	19	95% Student's-t UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
SMW13	10	$TEQ_{D/F}$	3.8E-06	2.4E-06	2.4E-06	95% KM (t) UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	161	119	119	95% KM (t) UCL
	8	Antimony	0.42	0.41	0.41	95% KM (t) UCL
	8	Arsenic	13	12	12	95% Adjusted Gamma UCL
	8	Barium	203	141	141	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	9.4E-02	9.6E-02	9.6E-02	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	8	Chromium	2.7	1.7	1.7	95% KM (t) UCL
	8	Cobalt	7.9	9.0	9.0	Gamma Adjusted KM-UCL; suggested 95UCL > max detect and sample size < *n*
	8	Copper	4.5	3.7	3.7	95% KM (t) UCL
	8	Iron	6,210	5,129	5,129	95% Adjusted Gamma UCL
	8	Manganese	6,690	4,882	4,882	95% Student's-t UCL
	8	Nickel	8.5	5.7	5.7	95% Student's-t UCL
	8	Thallium	1.2E-02	NC	1.2E-02	Max detect; too few samples to calculate a 95UCL
	8	Vanadium	18	18	18	95% Chebyshev (Mean, Sd) UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
SMW14	8	$TEQ_{D/F}$	2.9E-06	2.2E-06	2.2E-06	95% KM (t) UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	357	254	254	95% KM (Chebyshev) UCL
	8	Antimony	0.82	0.70	0.70	95% KM (t) UCL
	8	Arsenic	25	22	22	95% Student's-t UCL
	8	Barium	169	126	126	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	0.13	0.12	0.12	95% KM (t) UCL
	8	Chromium	1.4	1.2	1.2	95% KM (t) UCL
	8	Cobalt	1.1	0.75	0.75	95% KM (t) UCL
	8	Copper	9.6	6.9	6.9	95% KM (t) UCL
	8	Iron	1,760	1,279	1,279	95% Student's-t UCL
	8	Manganese	4,240	3,184	3,184	95% Student's-t UCL
	8	Nickel	4.8	4.0	4.0	95% Student's-t UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	15	13	13	95% Student's-t UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
SMW15	9	$TEQ_{D/F}$	2.0E-06	1.6E-06	1.6E-06	95% KM (t) UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	1,720	1,101	1,101	95% Student's-t UCL
	9	Antimony	0.67	0.46	0.46	95% KM (t) UCL
	9	Arsenic	9.9	7.7	7.7	95% Adjusted Gamma UCL
	9	Barium	59	39	39	95% Student's-t UCL
	8	Beryllium	3.5	2.8	2.8	95% Student's-t UCL
	9	Cadmium	6.1	3.7	3.7	95% KM (t) UCL
	9	Chromium	5.3	4.5	4.5	95% KM (Chebyshev) UCL
	9	Cobalt	264	247	247	95% Adjusted Gamma UCL
	9	Copper	97	53	53	95% Student's-t UCL
	9	Iron	20,800	11,193	11,193	95% Student's-t UCL
	9	Manganese	15,500	10,824	10,824	95% Student's-t UCL
	9	Nickel	260	239	239	95% Adjusted Gamma UCL
	9	Thallium	0.15	0.11	0.11	95% KM (t) UCL
	9	Vanadium	26	56	56	95% KM Bootstrap t UCL; suggested 95UCL > max detect and sample size < *n*
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
SMW16	12	$TEQ_{D/F}$	2.6E-06	2.1E-06	2.1E-06	95% Student's-t UCL
	2	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	384	264	264	95% Student's-t UCL
	9	Antimony	1.4	1.2	1.2	95% KM (t) UCL
	9	Arsenic	37	31	31	95% Student's-t UCL
	9	Barium	191	159	159	95% Student's-t UCL
	8	Beryllium	0.17	0.18	0.18	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	9	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Chromium	24	16	16	95% Student's-t UCL
	9	Cobalt	1.8	1.3	1.3	95% KM (t) UCL
	9	Copper	1.5	1.1	1.1	95% KM (t) UCL
	9	Iron	7,750	6,721	6,721	95% Student's-t UCL
	9	Manganese	5,410	4,783	4,783	95% Student's-t UCL
	9	Nickel	18	13	13	95% Student's-t UCL
	9	Thallium	1.4E-02	NC	1.4E-02	Max detect; too few samples to calculate a 95UCL
	9	Vanadium	84	58	58	95% Student's-t UCL
	9	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
SMW17	11	$TEQ_{D/F}$	1.2E-05	6.9E-06	6.9E-06	95% Student's-t UCL
	2	Aroclor-1260	8.7E-02	NC	8.7E-02	Max detect; too few samples to calculate a 95UCL
	8	Aluminum	537	499	499	95% Student's-t UCL
	8	Antimony	1.5	1.3	1.3	95% KM (t) UCL
	8	Arsenic	54	50	50	95% Student's-t UCL
	8	Barium	168	140	140	95% Student's-t UCL
	7	Beryllium	1.2	0.62	0.62	95% KM (t) UCL
	8	Cadmium	2.2E-02	NC	2.2E-02	Max detect; too few samples to calculate a 95UCL
	8	Chromium	16	18	16	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
	8	Cobalt	1.7	1.5	1.5	95% KM (t) UCL
	8	Copper	1.2	1.2	1.2	Max detect; suggested 95UCL > max detect and sample size ≥ *n*
	8	Iron	15,400	20,984	20,984	99% Chebyshev (Mean, Sd) UCL; suggested 95UCL > max detect and sample size < *n*
	8	Manganese	16,500	8,921	8,921	95% Modified-t UCL
	8	Nickel	12	12	12	95% Student's-t UCL
	8	Thallium	1.0E-02	NC	1.0E-02	Max detect; too few samples to calculate a 95UCL
	8	Vanadium	75	66	66	95% Student's-t UCL
	5	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
SMW18	10	$TEQ_{D/F}$	2.4E-06	2.1E-06	2.1E-06	95% Student's-t UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	388	300	300	95% Student's-t UCL
	8	Antimony	0.69	0.62	0.62	95% KM (t) UCL
	8	Arsenic	14	10	10	95% Student's-t UCL
	8	Barium	119	80	80	95% Student's-t UCL
	7	Beryllium	8.1E-02	8.3E-02	8.3E-02	95% KM (t) UCL; suggested 95UCL > max detect and sample size < *n*
	8	Cadmium	4.8E-02	NC	4.8E-02	Max detect; too few samples to calculate a 95UCL
	8	Chromium	6.8	5.1	5.1	95% KM (t) UCL
	8	Cobalt	1.5	1.1	1.1	95% KM (t) UCL
	8	Copper	6.4	5.0	5.0	95% KM (t) UCL
	8	Iron	3,140	1,772	1,772	95% Student's-t UCL
	8	Manganese	7,060	5,435	5,435	95% Adjusted Gamma UCL
	8	Nickel	35	17	17	KM H-UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	32	23	23	95% Student's-t UCL
	5	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
SMW19	8	$TEQ_{D/F}$	2.6E-06	2.0E-06	2.0E-06	95% KM (t) UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	78	66	66	95% KM (t) UCL
	8	Antimony	0.72	0.39	0.39	95% KM (t) UCL
	8	Arsenic	4.2	3.2	3.2	95% KM (t) UCL
	8	Barium	194	172	172	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	7.5E-02	NC	7.5E-02	Max detect; too few samples to calculate a 95UCL
	8	Chromium	1.4	1.3	1.3	95% KM (t) UCL
	8	Cobalt	8.0	5.7	5.7	95% KM (Chebyshev) UCL
	8	Copper	5.0	2.5	2.5	95% KM (t) UCL
	8	Iron	24,500	31,069	31,069	95% Adjusted Gamma UCL; suggested 95UCL > max detect and sample size < *n*
	8	Manganese	8,770	7,321	7,321	95% Student's-t UCL
	8	Nickel	8.3	7.8	7.8	95% GROS Adjusted Gamma UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	6.7	4.3	4.3	95% KM (t) UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
TW2R	9	$TEQ_{D/F}$	3.0E-06	1.9E-06	1.9E-06	95% Student's-t UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Aluminum	200	80	80	95% KM (t) UCL
	9	Antimony	0.15	0.15	0.15	Max detect; suggested 95UCL > max detect and sample size $\geq n$
	9	Arsenic	8.3	7.0	7.0	95% KM Bootstrap t UCL
	9	Barium	99	67	67	95% Student's-t UCL
	8	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Cadmium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Chromium	2.5	1.9	1.9	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
	9	Cobalt	0.55	0.40	0.40	95% KM (t) UCL
	9	Copper	4.6	2.0	2.0	95% KM (t) UCL
	9	Iron	32,800	18,011	18,011	95% Adjusted Gamma UCL
	9	Manganese	2,110	1,602	1,602	95% Student's-t UCL
	9	Nickel	2.4	1.6	1.6	95% KM (t) UCL
	9	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Vanadium	14	18	18	95% KM Bootstrap t UCL; suggested 95UCL > max detect and sample size < *n*
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
TW5R	5	$TEQ_{D/F}$	1.6E-06	1.5E-06	1.5E-06	95% KM (t) UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	8	Aluminum	1,050	457	457	95% KM (t) UCL
	8	Antimony	0.39	0.30	0.30	95% KM (t) UCL
	8	Arsenic	8.1	4.6	4.6	95% KM (t) UCL
	8	Barium	153	104	104	95% Student's-t UCL
	7	Beryllium	5.8E-02	NC	5.8E-02	Max detect; too few samples to calculate a 95UCL
	8	Cadmium	3.4E-02	3.0E-02	3.0E-02	95% KM (t) UCL
	8	Chromium	0.99	0.65	0.65	95% KM (t) UCL
	8	Cobalt	0.85	0.60	0.60	95% KM (t) UCL
	8	Copper	6.0	4.6	4.6	95% KM Adjusted Gamma UCL
	8	Iron	4,050	3,622	3,622	95% Student's-t UCL
	8	Manganese	1,220	690	690	95% Student's-t UCL
	8	Nickel	2.2	2.0	2.0	95% KM (t) UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	3.0	2.9	2.9	95% GROS Adjusted Gamma UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
UNIT 3 WELLS						
SMW16d	9	$TEQ_{D/F}$	1.1E-06	NC	1.1E-06	Max detect; too few samples to calculate a 95UCL
	3	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	99	126	126	Gamma Adjusted KM-UCL; suggested 95UCL > max detect and sample size < *n*
	8	Antimony	0.29	0.26	0.26	95% KM (t) UCL
	8	Arsenic	2.0	1.9	1.9	95% KM (t) UCL
	8	Barium	62	50	50	95% Modified-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	6.3E-02	5.4E-02	5.4E-02	95% KM (t) UCL
	8	Chromium	0.40	0.36	0.36	95% KM (t) UCL
	8	Cobalt	0.45	0.41	0.41	95% KM (t) UCL
	8	Copper	3.2	2.3	2.3	95% KM (t) UCL
	8	Iron	594	510	510	95% KM (Chebyshev) UCL
	8	Manganese	417	391	391	95% Student's-t UCL
	8	Nickel	1.7	1.6	1.6	95% KM (t) UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	1.4	1.3	1.3	95% KM (t) UCL
	5	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively

Table 3-35. OU3 Groundwater Exposure Point Concentrations (EPCs)						
Well ID	**N Samples**	**COPC**	**Maximum Detected Concentration (µg/L)**	**95UCL Concentration Value (µg/L)**	**Exposure Point Concentration (µg/L)**	**Basis for Exposure Point Concentration[a]**
SMW17d	9	$TEQ_{D/F}$	2.2E-06	1.5E-06	1.5E-06	95% Modified-t UCL
	3	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	23	18	18	95% KM (t) UCL
	8	Antimony	9.1E-02	8.6E-02	8.6E-02	95% KM (t) UCL
	8	Arsenic	3.8	3.2	3.2	95% Student's-t UCL
	8	Barium	66	63	63	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	7.5E-02	5.8E-02	5.8E-02	95% KM (t) UCL
	8	Chromium	0.29	NC	0.29	Max detect; too few samples to calculate a 95UCL
	8	Cobalt	0.46	0.41	0.41	95% KM (t) UCL
	8	Copper	4.5	2.5	2.5	KM H-UCL
	8	Iron	25	20	20	95% KM (t) UCL
	8	Manganese	788	691	691	95% Student's-t UCL
	8	Nickel	4.2	3.8	3.8	95% KM (Chebyshev) UCL
	8	Thallium	1.2E-02	NC	1.2E-02	Max detect; too few samples to calculate a 95UCL
	8	Vanadium	3.7	3.0	3.0	95% KM (t) UCL
	5	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
SMW18d	9	$TEQ_{D/F}$	2.7E-06	1.8E-06	1.8E-06	95% Modified-t UCL
	3	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Aluminum	110	79	79	95% KM (t) UCL
	8	Antimony	0.24	0.23	0.23	95% KM (t) UCL
	8	Arsenic	5.0	4.4	4.4	95% Student's-t UCL
	8	Barium	59	51	51	95% Student's-t UCL
	7	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Cadmium	0.12	0.11	0.11	95% KM (t) UCL
	8	Chromium	0.78	0.63	0.63	95% KM (t) UCL
	8	Cobalt	1.2	1.2	1.2	95% KM (t) UCL
	8	Copper	21	19	19	95% Student's-t UCL
	8	Iron	132	95	95	95% KM (t) UCL
	8	Manganese	1,420	1,016	1,016	95% Modified-t UCL
	8	Nickel	4.3	3.4	3.4	95% KM (t) UCL
	8	Thallium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Vanadium	8.4	7.1	7.1	95% Student's-t UCL
	5	1,4-Dichlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Benzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
	5	Chlorobenzene	ND	NC	ND	COPC not detected; not evaluated quantitatively
Waste Water Clarifier Well	1	$TEQ_{D/F}$	1.4E-06	NC	1.4E-06	Max detect; too few samples to calculate a 95UCL
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	1	Aluminum	65	NC	65	Max detect; too few samples to calculate a 95UCL
	1	Antimony	0.82	NC	0.82	Max detect; too few samples to calculate a 95UCL
	1	Arsenic	28	NC	28	Max detect; too few samples to calculate a 95UCL
	1	Barium	291	NC	291	Max detect; too few samples to calculate a 95UCL
	1	Beryllium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Cadmium	0.58	NC	0.58	Max detect; too few samples to calculate a 95UCL
	1	Chromium	2.3	NC	2.3	Max detect; too few samples to calculate a 95UCL
	1	Cobalt	13	NC	13	Max detect; too few samples to calculate a 95UCL
	1	Copper	16	NC	16	Max detect; too few samples to calculate a 95UCL
	1	Iron	11,200	NC	11,200	Max detect; too few samples to calculate a 95UCL
	1	Manganese	1,980	NC	1,980	Max detect; too few samples to calculate a 95UCL
	1	Nickel	8.8	NC	8.8	Max detect; too few samples to calculate a 95UCL
	1	Thallium	0.17	NC	0.17	Max detect; too few samples to calculate a 95UCL
	1	Vanadium	16	NC	16	Max detect; too few samples to calculate a 95UCL
	0	1,4-Dichlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Benzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chlorobenzene	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively

COPC = Contaminant of potential concern; NA = not analyzed; NC = not calculated; ND = not detected; UCL = upper confidence limit.

[a]Rationale provided in SRC (2021) was used to select the EPC.

Table 3-36. Summary of Fish Tissue Exposure Point Concentrations (EPCs)

Fish	Tissue Type	COPC	Maximum Concentration (pg/g-ww)	95UCL Concentration (pg/g-ww)	Exposure Point Concentration (pg/g-ww)	Basis for Exposure Point Concentration
Northern Pike	Fillet	$TEQ_{D/F}$	0.636	0.64	0.636	Maximum concentration
		TEQ_{PCB}	3.685	3.606	3.606	95% Student's-t UCL
		$TEQ_{D/F/PCB}$	4.11	4.055	4.055	95% Student's-t UCL
		Total PCBs	68,200	65,140	65,140	95% Student's-t UCL
	Whole-Body	$TEQ_{D/F}$	0.949	0.928	0.928	95% Student's-t UCL
		TEQ_{PCB}	8.598	9.134	8.598	Maximum concentration
		$TEQ_{D/F/PCB}$	9.361	9.757	9.361	Maximum concentration
		Total PCBs	187,089	172,756	172,756	95% Student's-t UCL
Rainbow Trout	Fillet	$TEQ_{D/F}$	0.86	0.628	0.628	95% KM (t) UCL
		TEQ_{PCB}	2.478	1.994	1.994	95% Student's-t UCL
		$TEQ_{D/F/PCB}$	3.338	2.56	2.56	95% Student's-t UCL
		Total PCBs	29,100	22,749	22,749	95% Student's-t UCL
	Whole-Body	$TEQ_{D/F}$	0.965	0.697	0.697	95% Student's-t UCL
		TEQ_{PCB}	3.578	2.855	2.855	95% Hall's Bootstrap UCL
		$TEQ_{D/F/PCB}$	4.408	3.832	3.832	95% Student's-t UCL
		Total PCBs	34,760	31,719	31,719	95% Student's-t UCL

COPC = contaminant of potential concern; TEQD/F = toxicity equivalent for dioxins/furans; 95UCL = 95% upper confidence level

Table 4-1. Chronic Human Health Toxicity Values for COPCs

Contaminant	CAS No.	Oral					Dermal				Oral/Dermal Target Organ/System	Inhalation					Inhalation Target Organ/System
		RfD (mg/kg-day)	Source	CSF $(mg/kg\text{-}day)^{-1}$	Source	Note	Absorption Fraction (ABS_{GI})	RfD_{ABS} (mg/kg-day) [1]	CSF_{ABS} $(mg/kg\text{-}day)^{-1}$ [2]			RfC (mg/m^3)	Source	UR $(\mu g/m^3)^{-1}$	Source	Note	
2,3,7,8-TCDD	1746-01-6	7.0E-10	I	1.3E+05	C		1	7.0E-10	1.3E+05	Reproductive		4.0E-08	C	3.8E+01	C	[3]	Systemic, Hematologic, Biochemical, Liver, Respiratory
Aroclor-1260	11096-82-5			2.0E+00	G		1		2.0E+00					5.7E-04	G		
Aluminum	7429-90-5	1.0E+00	P				1	1.0E+00		Nervous		5.0E-03	P				Nervous
Antimony	7440-36-0	4.0E-04	I				0.15	6.0E-05		Systemic		3.0E-04	A				Respiratory
Arsenic	7440-38-2	3.0E-04	I	1.5E+00	I		1	3.0E-04	1.5E+00	Dermal		1.5E-05	C	4.3E-03	I		Nervous
Barium	7440-39-3	2.0E-01	I				0.07	1.4E-02		Kidney		5.0E-04	H				Developmental
Cadmium	7440-43-9	5.0E-04	I				0.05	2.5E-05		Kidney		1.0E-05	A	1.8E-03	I		Kidney
Chromium	18540-29-9	3.0E-03	I	5.0E-01	C	[4]	0.025	7.5E-05	2.0E+01	None		1.0E-04	I	8.4E-02	G	[4]	Respiratory
Cobalt	7440-48-4	3.0E-04	P				1	3.0E-04		Thyroid		6.0E-06	P	9.0E-03	P		Respiratory
Copper	7440-50-8	4.0E-02	H			[5]	1	4.0E-02		--							--
Iron	7439-89-6	7.0E-01	P				1	7.0E-01		Gastrointestinal							--
Manganese	7439-96-5	2.4E-02	G			[6]	0.04	9.6E-04		Nervous		5.0E-05	I				Nervous
Mercury	7487-94-7	3.0E-04	I				0.07	2.1E-05		Immune		3.0E-04	G				Nervous
Nickel	7440-02-0	2.0E-02	I				0.04	8.0E-04		Systemic		9.0E-05	A	2.6E-04	C		Respiratory
Thallium	7440-28-0	1.0E-05	S				1	1.0E-05		Dermal							
Vanadium	7440-62-2	5.0E-03	G			[7]	0.026	1.3E-04		Dermal		1.0E-04	A				Respiratory
1,4-Dichlorobenzene	106-46-7	7.0E-02	A	5.4E-03	C		1	7.0E-02	5.4E-03	Liver		8.0E-01	I	1.1E-05	C		Liver
Benzene	71-43-2	4.0E-03	I	5.5E-02	I		1	4.0E-03	5.5E-02	Immune		3.0E-02	I	7.8E-06	I		Immune
Chlorobenzene	108-90-7	2.0E-02	I				1	2.0E-02		Liver		5.0E-02	P				Kidney

Key: I = IRIS; P = PPRTV; S = PPRTV Screening Level; G = USEPA RSL User's Guide; H = HEAST; C = CalEPA; A = ATSDR.

Notes:

[1] Absorbed Reference Doses for Dermal were derived using the Oral Reference Dose as follows: $RFD_{ABS} = RfD_o * ABS_{GI}$ (Equation 4.3 from USEPA 2004).

[2] Absorbed Cancer Slope Factors for Dermal were derived using the Oral Cancer Slope Factors as follows: $SF_{ABS} = SF_o / ABS_{GI}$ (Equation 4.2 from USEPA 2004).

[3] USEPA (2013) noted that the contribution of the inhalation pathway to total risk is well below 1%.

[4] Toxicity values are for hexavalent chromium [Cr(VI)].

[5] The oral RfD is based on the maximum contaminant level goal of 1.3 mg/L.

[6] The IRIS RfD (0.14 mg/kg-day) is adjusted by subtracting the dietary exposure (default assumption of 5 mg) and applying a modifying factor of 3.

[7] Based on factoring out the molecular weight of the oxide ion from the RfD for vanadium pentoxide.

Table 4-2. Sub-Chronic Human Health Toxicity Values for COPCs

Contaminant	CAS No.	Oral					Dermal			Oral/Dermal Target Organ/System	Inhalation					Inhalation Target Organ/System
		RfD (mg/kg-day)	Source	CSF $(mg/kg\text{-}day)^{-1}$	Source	Note	Absorption Fraction	RfD_{ABS} (mg/kg-day) [1]	CSF_{ABS} $(mg/kg\text{-}day)^{-1}$ [2]		RfC (mg/m^3)	Source	UR $(\mu g/m^3)^{-1}$	Source	Note	
2,3,7,8-TCDD	1746-01-6	2.0E-08	A	1.3E+05	C		1	2.0E-08	1.3E+05	Reproductive	4.0E-08	C	3.8E+01	C	[3] [5]	Systemic, Hematologic, Biochemical, Liver, Respiratory
Aluminum	7429-90-5	1.0E+00	A				1	1.0E+00		Nervous	5.0E-03	P			[5]	Nervous
Antimony	7440-36-0	4.0E-04	P			[5]	0.15	6.0E-05		Systemic	1.0E-03	A				Respiratory
Arsenic	7440-38-2	3.0E-04	I	1.5E+00	I	[5]	1	3.0E-04	1.5E+00	Dermal	1.5E-05	C	4.3E-03	I	[5]	Nervous
Barium	7440-39-3	2.0E-01	A				0.07	1.4E-02		Kidney	5.0E-03	H				Developmental
Cadmium	7440-43-9	5.0E-04	A				0.025	1.3E-05		Kidney	1.0E-05	A	1.8E-03	I	[5]	Kidney
Chromium	18540-29-9	5.0E-03	A	5.0E-01	C	[4]	0.025	1.3E-04	2.0E+01	None	3.0E-04	A	8.4E-02	G	[4]	Respiratory
Cobalt	7440-48-4	3.0E-03	P				1	3.0E-03		Thyroid	2.0E-05	P	9.0E-03	P		Respiratory
Iron	7439-89-6	7.0E-01	P			[5]	1	7.0E-01		Gastrointestinal						--
Manganese	7439-96-5	2.4E-02	G			[5]	0.04	9.6E-04		Nervous	5.0E-05	I			[5]	Nervous
Mercury	7487-94-7	2.0E-03	A				0.07	1.4E-04		Immune	3.0E-04	G			[5]	Nervous
Thallium	7440-28-0	4.0E-05	S				1	4.0E-05		Dermal						
Vanadium	7440-62-2	1.0E-02	A			[7]	0.026	2.6E-04		Dermal	1.0E-04	A			[5]	Respiratory

Key: A = ATSDR; C = CalEPA; I = IRIS; P = PPRTV; G = USEPA RSL User's Guide; H = HEAST; S = PPRTV Screening Value.

Notes:

[1] Absorbed Reference Doses for Dermal were derived using the Oral Reference Dose as follows: $RFD_{ABS} = RfD_o * ABS_{GI}$ (Equation 4.3 from USEPA 2004).

[2] Absorbed Cancer Slope Factors for Dermal were derived using the Oral Cancer Slope Factors as follows: $SF_{ABS} = SF_o / ABS_{GI}$ (Equation 4.2 from USEPA 2004).

[3] USEPA (2013) noted that the contribution of the inhalation pathway to total risk is well below 1%.

[4] Toxicity values are for hexavalent chromium [Cr(VI)].

[5] Sub-chronic RfD is not available. Chronic RfD is used in its place.

Table 4-3. Exposure Parameters for Hypothetical Future Residents Exposed to Carcinogenic Contaminants with a Mutagenic Mode of Action

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight$_{0-<2}$	kg	10	[2, 3, a]	10	[2, 3, a]
	Body Weight$_{2-<6}$	kg	17	[2, 3, a]	17	[2, 3, a]
	Body Weight$_{6-<16}$	kg	43	[2, 3, a]	43	[2, 3, a]
	Body Weight$_{>16}$	kg	79	[2, 3, a]	79	[2, 3, a]
	Exposure frequency	days/yr	256	[3, b]	350	[6]
	Exposure duration$_{0-<2}$	yr	2	[2]	2	[2]
	Exposure duration$_{2-<6}$	yr	4	[2]	4	[2]
	Exposure duration$_{6-<16}$	yr	10	[2]	10	[2]
	Exposure duration$_{>16}$	yr	54	[2]	54	[2]
	Averaging Time, Cancer	days	25,550	[1, c]	25,550	[1, c]
	ADAF$_{0-<2}$	unitless	10	[2]	10	[2]
	ADAF$_{2-<6}$	unitless	3	[2]	3	[2]
	ADAF$_{6-<16}$	unitless	3	[2]	3	[2]
	ADAF$_{>16}$	unitless	1	[2]	1	[2]
Ingestion of Soil	Ingestion rate$_{0-<2}$	mg/day	100	[7, d]	200	[6]
	Ingestion rate$_{2-<6}$	mg/day	100	[7, d]	200	[6]
	Ingestion rate$_{6-<16}$	mg/day	50	[7, d]	100	[6]
	Ingestion rate$_{>16}$	mg/day	50	[7, d]	100	[6]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**2.08E-06**		**5.69E-06**	
	HIF$_{2-<6}$	**kg/kg-d**	**6.91E-07**		**1.89E-06**	
	HIF$_{6-<16}$	**kg/kg-d**	**3.50E-07**		**9.58E-07**	
	HIF$_{<16}$	**kg/kg-d**	**3.41E-07**		**9.34E-07**	
	HIF$_{Total}$	**kg/kg-d**	**3.46E-06**		**9.47E-06**	
Ingestion of Water	Ingestion rate$_{0-<2}$	L/day	0.45	[3, e]	0.78	[6]
	Ingestion rate$_{2-<6}$	L/day	0.45	[3, e]	0.78	[6]
	Ingestion rate$_{6-<16}$	L/day	1.2	[3, e]	2.5	[6]
	Ingestion rate$_{>16}$	L/day	1.2	[3, e]	2.5	[6]
	HIF$_{0-<2}$	**kg/kg-d**	**9.36E-03**		**2.22E-02**	
	HIF$_{2-<6}$	**kg/kg-d**	**3.11E-03**		**7.37E-03**	
	HIF$_{6-<16}$	**kg/kg-d**	**8.41E-03**		**2.39E-02**	
	HIF$_{<16}$	**kg/kg-d**	**8.20E-03**		**2.33E-02**	
	HIF$_{Total}$	**kg/kg-d**	**2.91E-02**		**7.68E-02**	
Dermal Exposure to Soil	Exposed Surface Area (SA)$_{0-<2}$	cm^2/event	2,989	[2, 3, 4, f]	2,989	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2/event	4,258	[2, 3, 4, f]	4,258	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2/event	8,060	[2, 3, 4, f]	8,060	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{>16}$	cm^2/event	12,508	[2, 3, 4, f]	12,508	[2, 3, 4, f]
	Adherence Factor (AF)	mg/cm^2	0.04	[4, 5, g]	0.2	[4, 5, g]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[5]	1	[5]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**2.49E-06**		**1.70E-05**	
	HIF$_{2-<6}$	**kg/kg-d**	**1.18E-06**		**8.05E-06**	
	HIF$_{6-<16}$	**kg/kg-d**	**2.26E-06**		**1.54E-05**	
	HIF$_{<16}$	**kg/kg-d**	**3.42E-06**		**2.34E-05**	
	HIF$_{Total}$	**kg/kg-d**	**9.34E-06**		**6.38E-05**	

CTE = Central Tendency Exposure; RME = Reasonable Maximum Exposure; CS = chemical-specific; kg = kilograms; yr = year; mg = milligrams; mL = millilters; L=liters; g=grams; m=meters; cm=centimeters; hr=hours

Sources:

[1] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[2] USEPA 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. March.

[3] USEPA 2011. Exposure Factors Handbook. EPA/600/R-090/052F. September.

[4] Professional judgment.

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] USEPA 2014a. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[7] USEPA 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

Notes:

[a] Table 8-1. Age-weighted average for the following age ranges: 0 to <2 years old, 2 to <6 years old, 6 to <16 years old, and≥16 years old.

[b] Exposure frequencies assumed for a resident.

[c] Averaging time expressed as days. Noncancer averaging time calculated by multiplying the exposure duration by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.

[d] Assumes CTE value is half of the RME value.

[e] Weighted mean of consumer-only ingestion of drinking water (USEPA 2011, Table 3-1).

[f] Assumes exposure to head, arms, hands, legs, and feet. Calculated as time-weighted average surface area based on age (USEPA 2011, Table 7-2).

[g] Assumes adherence factor equal to the soil adherence factor for a resident (USEPA 2004, Exhibit 3-3).

Table 4-4. Exposure Parameters for Campers
Exposed to Carcinogenic Contaminants with a Mutagenic Mode of Action

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight$_{0-<2}$	kg	10	[2, 3, a]	10	[2, 3, a]
	Body Weight$_{2-<6}$	kg	17	[2, 3, a]	17	[2, 3, a]
	Body Weight$_{6-<16}$	kg	44	[2, 3, a]	44	[2, 3, a]
	Body Weight$_{>16}$	kg	79	[2, 3, a]	79	[2, 3, a]
	Exposure frequency	days/yr	32	[4]	48	[4]
	Exposure duration$_{0-<2}$	yr	2	[2]	2	[2]
	Exposure duration$_{2-<6}$	yr	4	[2]	4	[2]
	Exposure duration$_{6-<16}$	yr	10	[2]	10	[2]
	Exposure duration$_{>16}$	yr	54	[2]	54	[2]
	Averaging Time, Cancer	days	25,550	[1, b]	25,550	[1, b]
	ADAF$_{0-<2}$	unitless	10	[2]	10	[2]
	ADAF$_{2-<6}$	unitless	3	[2]	3	[2]
	ADAF$_{6-<16}$	unitless	3	[2]	3	[2]
	ADAF$_{>16}$	unitless	1	[2]	1	[2]
Incidental Ingestion of Soil	Ingestion rate$_{0-<2}$	mg/day	100	[7, c]	200	[6]
	Ingestion rate$_{2-<6}$	mg/day	100	[7, c]	200	[6]
	Ingestion rate$_{6-<16}$	mg/day	50	[7, c]	100	[6]
	Ingestion rate$_{>16}$	mg/day	50	[7, c]	100	[6]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**2.60E-07**		**7.80E-07**	
	HIF$_{2-<6}$	**kg/kg-d**	**8.64E-08**		**2.59E-07**	
	HIF$_{6-<16}$	**kg/kg-d**	**4.24E-08**		**1.27E-07**	
	HIF$_{>16}$	**kg/kg-d**	**4.27E-08**		**1.28E-07**	
	HIF$_{Total}$	**kg/kg-d**	**4.31E-07**		**1.29E-06**	
Incidental Ingestion of Sediment	Ingestion rate$_{0-<2}$	mg/day	50	[4, c]	100	[4]
	Ingestion rate$_{2-<6}$	mg/day	50	[4, c]	100	[4]
	Ingestion rate$_{6-<16}$	mg/day	25	[4, c]	50	[4]
	Ingestion rate$_{>16}$	mg/day	25	[4, c]	50	[4]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**1.30E-07**		**3.90E-07**	
	HIF$_{2-<6}$	**kg/kg-d**	**4.32E-08**		**1.30E-07**	
	HIF$_{6-<16}$	**kg/kg-d**	**2.12E-08**		**6.36E-08**	
	HIF$_{>16}$	**kg/kg-d**	**2.13E-08**		**6.40E-08**	
	HIF$_{Total}$	**kg/kg-d**	**2.16E-07**		**6.47E-07**	
Ingestion of Surface Water (as drinking water)	Ingestion rate$_{0-<2}$	L/day	0.45	[3, d]	0.78	[6]
	Ingestion rate$_{2-<6}$	L/day	0.45	[3, d]	0.78	[6]
	Ingestion rate$_{6-<16}$	L/day	1.2	[3, d]	2.5	[6]
	Ingestion rate$_{>16}$	L/day	1.2	[3, d]	2.5	[6]
	HIF$_{0-<2}$	**kg/kg-d**	**1.17E-03**		**3.04E-03**	
	HIF$_{2-<6}$	**kg/kg-d**	**3.89E-04**		**1.01E-03**	
	HIF$_{6-<16}$	**kg/kg-d**	**1.02E-03**		**3.18E-03**	
	HIF$_{>16}$	**kg/kg-d**	**1.02E-03**		**3.20E-03**	
	HIF$_{Total}$	**kg/kg-d**	**3.60E-03**		**1.04E-02**	
Incidental Ingestion of Surface Water (while swimming)	Ingestion rate$_{0-<2}$	mL/hour	49	[3, h]	120	[3, g]
	Ingestion rate$_{2-<6}$	mL/hour	49	[3, h]	120	[3, g]
	Ingestion rate$_{6-<16}$	mL/hour	21	[3, h]	71	[3, g]
	Ingestion rate$_{>16}$	mL/hour	21	[3, h]	71	[3, g]
	Exposure Time	hr/day	0.5	[4]	1	[4]
	Conversion factor	L/mL	1E-03	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**6.37E-05**		**4.68E-07**	
	HIF$_{2-<6}$	**kg/kg-d**	**2.12E-05**		**1.55E-07**	
	HIF$_{6-<16}$	**kg/kg-d**	**8.91E-06**		**9.03E-08**	
	HIF$_{>16}$	**kg/kg-d**	**8.96E-06**		**9.09E-08**	
	HIF$_{Total}$	**kg/kg-d**	**1.03E-04**		**8.05E-07**	
Dermal Exposure to Soil	Exposed Surface Area (SA)$_{0-<2}$	cm^2/event	2,989	[2, 3, 4, e]	2,989	[2, 3, 4, e]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2/event	4,258	[2, 3, 4, e]	4,258	[2, 3, 4, e]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2/event	8,060	[2, 3, 4, e]	8,060	[2, 3, 4, e]
	Exposed Surface Area (SA)$_{>16}$	cm^2/event	12,508	[2, 3, 4, e]	12,508	[2, 3, 4, e]
	Adherence Factor (AF)$_{0-<2}$	mg/cm^2	0.04	[4, 5, f]	0.2	[4, 5, f]
	Adherence Factor (AF)$_{2-<6}$	mg/cm^2	0.04	[4, 5, f]	0.2	[4, 5, f]
	Adherence Factor (AF)$_{6-<16}$	mg/cm^2	0.01	[4, 5, f]	0.07	[4, 5, f]
	Adherence Factor (AF)$_{>16}$	mg/cm^2	0.01	[4, 5, f]	0.07	[4, 5, f]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[5]	1	[5]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**3.11E-07**		**2.33E-06**	
	HIF$_{2-<6}$	**kg/kg-d**	**1.47E-07**		**1.10E-06**	
	HIF$_{6-<16}$	**kg/kg-d**	**6.84E-08**		**7.18E-07**	
	HIF$_{>16}$	**kg/kg-d**	**1.07E-07**		**1.12E-06**	
	HIF$_{Total}$	**kg/kg-d**	**6.33E-07**		**5.27E-06**	
Dermal Exposure to Sediment	Exposed Surface Area (SA)$_{0-<2}$	cm^2/event	4,646	[2, 3, 4,i]	4,646	[2, 3, 4,i]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2/event	7,225	[2, 3, 4, i]	7,225	[2, 3, 4, i]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2/event	13,350	[2, 3, 4, i]	13,350	[2, 3, 4, i]
	Exposed Surface Area (SA)$_{>16}$	cm^2/event	19,661	[2, 3, 4, i]	19,661	[2, 3, 4, i]
	Adherence Factor (AF)$_{0-<2}$	mg/cm^2	0.04	[4, 5, f]	0.2	[4, 5, f]
	Adherence Factor (AF)$_{2-<6}$	mg/cm^2	0.04	[4, 5, f]	0.2	[4, 5, f]
	Adherence Factor (AF)$_{6-<16}$	mg/cm^2	0.01	[4, 5, f]	0.07	[4, 5, f]
	Adherence Factor (AF)$_{>16}$	mg/cm^2	0.01	[4, 5, f]	0.07	[4, 5, f]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[5]	1	[5]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**4.83E-07**		**3.62E-06**	
	HIF$_{2-<6}$	**kg/kg-d**	**2.50E-07**		**1.87E-06**	
	HIF$_{6-<16}$	**kg/kg-d**	**1.13E-07**		**1.19E-06**	
	HIF$_{>16}$	**kg/kg-d**	**1.68E-07**		**1.76E-06**	
	HIF$_{Total}$	**kg/kg-d**	**1.01E-06**		**8.45E-06**	
Dermal Exposure to Surface Water	Exposed Surface Area (SA)$_{0-<2}$	cm^2	4,646	[2, 3, 4, i]	4,646	[2, 3, 4, i]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2	7,225	[2, 3, 4, i]	7,225	[2, 3, 4, i]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2	13,350	[2, 3, 4, i]	13,350	[2, 3, 4, i]
	Exposed Surface Area (SA)$_{>16}$	cm^2	19,661	[2, 3, 4, i]	19,661	[2, 3, 4, i]
	Dermal Permeability Coefficient (Kp)	cm/hr	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[4]	1	[4]
	Event Duration (tevent)	hr/event	0.5	[4]	1	[4]
	HIF$_{0-<2}$	**cm^2-hr/kg-d**	**6.04E+00**		**1.81E+01**	
	HIF$_{2-<6}$	**cm^2-hr/kg-d**	**3.12E+00**		**9.36E+00**	
	HIF$_{6-<16}$	**cm^2-hr/kg-d**	**5.66E+00**		**1.70E+01**	
	HIF$_{>16}$	**cm^2-hr/kg-d**	**8.39E+00**		**2.52E+01**	
	HIF$_{Total}$	**cm2-hr/kg-d**	**2.32E+01**		**2.75E+01**	

CTE = Central Tendency Exposure; RME = Reasonable Maximum Exposure; CS = chemical-specific; kg = kilograms; yr = year; mg = milligrams; mL = milliliters; L=liters; g=grams; m=meters; cm=centimeters; hr=hours

Sources:

[1] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[2] USEPA 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. March.

[3] USEPA 2011. Exposure Factors Handbook. EPA/600/R-090/052F. September.

[4] Professional judgment.

[6] USEPA 2014a. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[7] USEPA 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

Notes:

[a] Table 8-1. Age-weighted average for the following age ranges: 0 to <2 years old, 2 to <6 years old, 6 to <16 years old, and 16 years old.

[b] Averaging time expressed as days. Noncancer averaging time calculated by multiplying the exposure duration by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.

[c] Assumes CTE value is half of the RME value.

[d] Weighted mean of consumer-only ingestion of drinking water (EFH 2011 Table 3-1).

[e] Assumes exposure to head, arms, hands, legs, and feet. Calculated as time-weighted average surface area based on age (U.S. EPA 2011, Table 7-2).

[f] Assumes adherence factor equal to the soil adherence factor for a resident (USEPA 2004, Exhibit 3-3).

[g] Values based on the upper percentile recommended values for water ingestion while swimming presented in USEPA (2011) Table 3-5.

[h] Values based on the mean recommended values for water ingestion while swimming presented in USEPA (2011) Table 3-5.

[i] Calculated as a weighted average of mean values for total body surface area (U.S. EPA 2011, Table 7-1).

Table 4-5. Exposure Parameters for Recreational Fishers
Exposed to Carcinogenic Contaminants with a Mutagenic Mode of Action

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight$_{0-<2}$	kg	10	[2, 3, a]	10	[2, 3, a]
	Body Weight$_{2-<6}$	kg	17	[2, 3, a]	17	[2, 3, a]
	Body Weight$_{6-<16}$	kg	44	[2, 3, a]	44	[2, 3, a]
	Body Weight$_{>16}$	kg	79	[2, 3, a]	79	[2, 3, a]
	Exposure frequency	days/yr	48	[4]	96	[4]
	Exposure duration$_{0-<2}$	yr	2	[2]	2	[2]
	Exposure duration$_{2-<6}$	yr	4	[2]	4	[2]
	Exposure duration$_{6-<16}$	yr	10	[2]	10	[2]
	Exposure duration$_{>16}$	yr	54	[2]	54	[2]
	Averaging Time, Cancer	days	25,550	[1, b]	25,550	[1, b]
	ADAF$_{0-<2}$	unitless	10	[2]	10	[2]
	ADAF$_{2-<6}$	unitless	3	[2]	3	[2]
	ADAF$_{6-<16}$	unitless	3	[2]	3	[2]
	ADAF$_{>16}$	unitless	1	[2]	1	[2]
Incidental Ingestion of Soil	Ingestion rate$_{0-<2}$	mg/day	100	[7, c]	200	[6]
	Ingestion rate$_{2-<6}$	mg/day	100	[7, c]	200	[6]
	Ingestion rate$_{6-<16}$	mg/day	50	[7, c]	100	[6]
	Ingestion rate$_{>16}$	mg/day	50	[7, c]	100	[6]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**3.90E-07**		**1.56E-06**	
	HIF$_{2-<6}$	**kg/kg-d**	**1.30E-07**		**5.18E-07**	
	HIF$_{6-<16}$	**kg/kg-d**	**6.36E-08**		**2.54E-07**	
	HIF$_{<16}$	**kg/kg-d**	**6.40E-08**		**2.56E-07**	
	HIF$_{Total}$	**kg/kg-d**	**6.47E-07**		**2.59E-06**	
Incidental Ingestion of Sediment	Ingestion rate$_{0-<2}$	mg/day	50	[4, c]	100	[4]
	Ingestion rate$_{2-<6}$	mg/day	50	[4, c]	100	[4]
	Ingestion rate$_{6-<16}$	mg/day	25	[4, c]	50	[4]
	Ingestion rate$_{>16}$	mg/day	25	[4, c]	50	[4]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**1.95E-07**		**7.80E-07**	
	HIF$_{2-<6}$	**kg/kg-d**	**6.48E-08**		**2.59E-07**	
	HIF$_{6-<16}$	**kg/kg-d**	**3.18E-08**		**1.27E-07**	
	HIF$_{<16}$	**kg/kg-d**	**3.20E-08**		**1.28E-07**	
	HIF$_{Total}$	**kg/kg-d**	**3.24E-07**		**1.29E-06**	
Incidental Ingestion of Surface Water	Ingestion rate$_{0-<2}$	mL/hour	4.9	[3, d]	12	[3, d]
	Ingestion rate$_{2-<6}$	mL/hour	4.9	[3, d]	12	[3, d]
	Ingestion rate$_{6-<16}$	mL/hour	3.6	[3, e]	10.8	[3, e]
	Ingestion rate$_{>16}$	mL/hour	3.6	[3, e]	10.8	[3, e]
	Exposure Time	hr/day	0.5	[4]	1	[4]
	Conversion factor	L/mL	1E-03	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**9.55E-06**		**9.36E-08**	
	HIF$_{2-<6}$	**kg/kg-d**	**3.17E-06**		**3.11E-08**	
	HIF$_{6-<16}$	**kg/kg-d**	**2.29E-06**		**2.75E-08**	
	HIF$_{<16}$	**kg/kg-d**	**2.30E-06**		**2.77E-08**	
	HIF$_{Total}$	**kg/kg-d**	**1.73E-05**		**1.80E-07**	
Dermal Exposure to Soil/Sediment	Exposed Surface Area (SA)$_{0-<2}$	cm^2/event	2,301	[2, 3, 4, f]	2,301	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2/event	2,786	[2, 3, 4, f]	2,786	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2/event	2,392	[2, 3, 4, g]	2,392	[2, 3, 4, g]
	Exposed Surface Area (SA)$_{>16}$	cm^2/event	3,945	[2, 3, 4, g]	3,945	[2, 3, 4, g]
	Adherence Factor (AF)$_{0-<2}$	mg/cm^2	0.04	[4, 5, h]	0.2	[4, 5, h]
	Adherence Factor (AF)$_{2-<6}$	mg/cm^2	0.04	[4, 5, h]	0.2	[4, 5, h]
	Adherence Factor (AF)$_{6-<16}$	mg/cm^2	0.01	[4, 5, h]	0.07	[4, 5, h]
	Adherence Factor (AF)$_{>16}$	mg/cm^2	0.01	[4, 5, h]	0.07	[4, 5, h]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[5]	1	[5]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**3.59E-07**		**3.59E-06**	
	HIF$_{2-<6}$	**kg/kg-d**	**1.44E-07**		**1.44E-06**	
	HIF$_{6-<16}$	**kg/kg-d**	**3.04E-08**		**4.26E-07**	
	HIF$_{<16}$	**kg/kg-d**	**5.05E-08**		**7.07E-07**	
	HIF$_{Total}$	**kg/kg-d**	**5.84E-07**		**6.17E-06**	
Dermal Exposure to Surface Water	Exposed Surface Area (SA)$_{0-<2}$	cm^2	2,301	[2, 3, 4, f]	2,301	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2	2,786	[2, 3, 4, f]	2,786	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2	2,392	[2, 3, 4, f]	2,392	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{>16}$	cm^2	3,945	[2, 3, 4, f]	3,945	[2, 3, 4, f]
	Dermal Permeability Coefficient (Kp)	cm/hr	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[4]	1	[4]
	Event Duration (tevent)	hr/event	0.5	[4]	1	[4]
	HIF$_{0-<2}$	**cm^2-hr/kg-d**	**4.49E+00**		**1.79E+01**	
	HIF$_{2-<6}$	**cm^2-hr/kg-d**	**1.80E+00**		**7.22E+00**	
	HIF$_{6-<16}$	**cm^2-hr/kg-d**	**1.52E+00**		**6.09E+00**	
	HIF$_{<16}$	**cm^2-hr/kg-d**	**2.53E+00**		**1.01E+01**	
	HIF$_{Total}$	**cm2-hr/kg-d**	**1.03E+01**		**2.52E+01**	

CTE = Central Tendency Exposure; RME = Reasonable Maximum Exposure; CS = chemical-specific; kg = kilograms; yr = year; mg = milligrams; mL = millilters; L=liters; g=grams; m=meters; cm=centimeters; hr=hours

Sources:

[1] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[2] USEPA 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. March.

[3] USEPA 2011. Exposure Factors Handbook. EPA/600/R-090/052F. September.

[4] Professional judgment.

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] USEPA 2014a. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[7] USEPA 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

Notes:

[a] Table 8-1. Age-weighted average for the following age ranges: 0 to <2 years old, 2 to <6 years old, 6 to <16 years old, and ≥16 years old.

[b] Averaging time expressed as days. Noncancer averaging time calculated by multiplying the exposure duration by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.

[c] Assumes CTE value is half of the RME value.

[d] Incidental ingestion from splashing or hand-to-face contact during fishing assumed to be 10% of the incidental ingestion rate while swimming assumed for the camper scenario.

[e] Based on the mean and upper confidence limit for estimated water ingestion while fishing (Table 3-93).

[f] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, forearms, lower legs and feet. It is assumed that in general, children will remain on the banks while fishing with an adult wearing short-sleeves and shorts.

[g] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, and forearms. It is assumed that in general, people will remain on the banks while fishing and only enter the water for significant amounts of time if wearing protective clothing such as waders and waterproof shoes/boots.

[h] Assumes adherence factor equal to the soil adherence factor for a resident (USEPA 2004, Exhibit 3-3).

Table 4-6. Exposure Parameters for Tribal Fishers
Exposed to Carcinogenic Contaminants with a Mutagenic Mode of Action

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight$_{0-<2}$	kg	10	[2, 3, a]	10	[2, 3, a]
	Body Weight$_{2-<6}$	kg	17	[2, 3, a]	17	[2, 3, a]
	Body Weight$_{6-<16}$	kg	44	[2, 3, a]	44	[2, 3, a]
	Body Weight$_{>16}$	kg	79	[2, 3, a]	79	[2, 3, a]
	Exposure frequency	days/yr	48	[4]	96	[4]
	Exposure duration$_{0-<2}$	yr	2	[2]	2	[2]
	Exposure duration$_{2-<6}$	yr	4	[2]	4	[2]
	Exposure duration$_{6-<16}$	yr	10	[2]	10	[2]
	Exposure duration$_{>16}$	yr	54	[2]	54	[2]
	Averaging Time, Cancer	days	25,550	[1, b]	25,550	[1, b]
	ADAF$_{0-<2}$	unitless	10	[2]	10	[2]
	ADAF$_{2-<6}$	unitless	3	[2]	3	[2]
	ADAF$_{6-<16}$	unitless	3	[2]	3	[2]
	ADAF$_{>16}$	unitless	1	[2]	1	[2]
Incidental Ingestion of Soil	Ingestion rate$_{0-<2}$	mg/day	100	[7, c]	200	[6]
	Ingestion rate$_{2-<6}$	mg/day	100	[7, c]	200	[6]
	Ingestion rate$_{6-<16}$	mg/day	50	[7, c]	100	[6]
	Ingestion rate$_{>16}$	mg/day	50	[7, c]	100	[6]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**3.90E-07**		**1.56E-06**	
	HIF$_{2-<6}$	**kg/kg-d**	**1.30E-07**		**5.18E-07**	
	HIF$_{6-<16}$	**kg/kg-d**	**6.36E-08**		**2.54E-07**	
	HIF$_{<16}$	**kg/kg-d**	**6.40E-08**		**2.56E-07**	
	HIF$_{Total}$	**kg/kg-d**	**6.47E-07**		**2.59E-06**	
Incidental Ingestion of Sediment	Ingestion rate$_{0-<2}$	mg/day	50	[4, c]	100	[4]
	Ingestion rate$_{2-<6}$	mg/day	50	[4, c]	100	[4]
	Ingestion rate$_{6-<16}$	mg/day	25	[4, c]	50	[4]
	Ingestion rate$_{>16}$	mg/day	25	[4, c]	50	[4]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**1.95E-07**		**7.80E-07**	
	HIF$_{2-<6}$	**kg/kg-d**	**6.48E-08**		**2.59E-07**	
	HIF$_{6-<16}$	**kg/kg-d**	**3.18E-08**		**1.27E-07**	
	HIF$_{<16}$	**kg/kg-d**	**3.20E-08**		**1.28E-07**	
	HIF$_{Total}$	**kg/kg-d**	**3.24E-07**		**1.29E-06**	
Incidental Ingestion of Surface Water	Ingestion rate$_{0-<2}$	mL/hour	4.9	[3, d]	12	[3, d]
	Ingestion rate$_{2-<6}$	mL/hour	4.9	[3, d]	12	[3, d]
	Ingestion rate$_{6-<16}$	mL/hour	3.6	[3, e]	10.8	[3, e]
	Ingestion rate$_{>16}$	mL/hour	3.6	[3, e]	10.8	[3, e]
	Exposure Time	hr/day	1.0	[4]	1.5	[4]
	Conversion factor	L/mL	1E-03	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**1.91E-05**		**1.40E-07**	
	HIF$_{2-<6}$	**kg/kg-d**	**6.35E-06**		**4.66E-08**	
	HIF$_{6-<16}$	**kg/kg-d**	**4.58E-06**		**4.12E-08**	
	HIF$_{<16}$	**kg/kg-d**	**4.61E-06**		**4.15E-08**	
	HIF$_{Total}$	**kg/kg-d**	**3.46E-05**		**2.70E-07**	
Dermal Exposure to Soil/Sediment	Exposed Surface Area (SA)$_{0-<2}$	cm^2/event	2,301	[2, 3, 4, f]	2,301	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2/event	2,786	[2, 3, 4, f]	2,786	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2/event	2,392	[2, 3, 4, g]	2,392	[2, 3, 4, g]
	Exposed Surface Area (SA)$_{>16}$	cm^2/event	3,945	[2, 3, 4, g]	3,945	[2, 3, 4, g]
	Adherence Factor (AF)$_{0-<2}$	mg/cm^2	0.04	[4, 5, h]	0.2	[4, 5, h]
	Adherence Factor (AF)$_{2-<6}$	mg/cm^2	0.04	[4, 5, h]	0.2	[4, 5, h]
	Adherence Factor (AF)$_{6-<16}$	mg/cm^2	0.01	[4, 5, h]	0.07	[4, 5, h]
	Adherence Factor (AF)$_{>16}$	mg/cm^2	0.01	[4, 5, h]	0.07	[4, 5, h]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[5]	1	[5]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**3.59E-07**		**3.59E-06**	
	HIF$_{2-<6}$	**kg/kg-d**	**1.44E-07**		**1.44E-06**	
	HIF$_{6-<16}$	**kg/kg-d**	**3.04E-08**		**4.26E-07**	
	HIF$_{<16}$	**kg/kg-d**	**5.05E-08**		**7.07E-07**	
	HIF$_{Total}$	**kg/kg-d**	**5.84E-07**		**6.17E-06**	
Dermal Exposure to Surface Water	Exposed Surface Area (SA)$_{0-<2}$	cm^2	2,301	[2, 3, 4, f]	2,301	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2	2,786	[2, 3, 4, f]	2,786	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2	2,392	[2, 3, 4, f]	2,392	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{>16}$	cm^2	3,945	[2, 3, 4, f]	3,945	[2, 3, 4, f]
	Dermal Permeability Coefficient (Kp)	cm/hr	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[4]	1	[4]
	Event Duration (tevent)	hr/event	1	[4]	1.5	[4]
	HIF$_{0-<2}$	**cm^2-hr/kg-d**	**8.97E+00**		**2.69E+01**	
	HIF$_{2-<6}$	**cm^2-hr/kg-d**	**3.61E+00**		**1.08E+01**	
	HIF$_{6-<16}$	**cm^2-hr/kg-d**	**3.04E+00**		**9.13E+00**	
	HIF$_{<16}$	**cm^2-hr/kg-d**	**5.05E+00**		**1.52E+01**	
	HIF$_{Total}$	**cm2-hr/kg-d**	**2.07E+01**		**3.77E+01**	

CTE = Central Tendency Exposure; RME = Reasonable Maximum Exposure; CS = chemical-specific; kg = kilograms; yr = year; mg = milligrams; mL = millilters; L=liters; g=grams; m=meters; cm=centimeters; hr=hours

Sources:

[1] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[2] USEPA 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. March.

[3] USEPA 2011. Exposure Factors Handbook. EPA/600/R-090/052F. September.

[4] Professional judgment.

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] USEPA 2014a. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[7] USEPA 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

Notes:

[a] Table 8-1. Age-weighted average for the following age ranges: 0 to <2 years old, 2 to <6 years old, 6 to <16 years old, and ≥16 years old.

[b] Averaging time expressed as days. Noncancer averaging time calculated by multiplying the exposure duration by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.

[c] Assumes CTE value is half of the RME value.

[d] Incidental ingestion from splashing or hand-to-face contact during fishing assumed to be 10% of the incidental ingestion rate while swimming assumed for the camper scenario.

[e] Based on the mean and upper confidence limit for estimated water ingestion while fishing (Table 3-93).

[f] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, forearms, lower legs and feet. It is assumed that in general, children will remain on the banks while fishing with an adult wearing short-sleeves and shorts.

[g] Weighted average surface areas (Tables 7-1 and 7-2) calculated assuming exposure to head, hands, and forearms. It is assumed that in general, people will remain on the banks while fishing and only enter the water for significant amounts of time if wearing protective clothing such as waders and waterproof shoes/boots.

[h] Assumes adherence factor equal to the soil adherence factor for a resident (USEPA 2004, Exhibit 3-3).

Table 5-1. Risk Estimates for Hypothetical Future Residents Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 26	Incidental Ingestion	7E-01	2E+00	4E-05	1E-04
	Dermal Contact	5E-03	3E-02	1E-07	2E-06
	Total	7E-01	2E+00	4E-05	1E-04
Grid 27	Incidental Ingestion	2E-01	7E-01	2E-05	4E-05
	Dermal Contact	9E-04	6E-03	1E-08	2E-07
	Total	2E-01	7E-01	2E-05	4E-05
Grid 28	Incidental Ingestion	2E-01	6E-01	1E-05	4E-05
	Dermal Contact	6E-04	4E-03	1E-08	2E-07
	Total	2E-01	6E-01	1E-05	4E-05
Grid 29	Incidental Ingestion	3E-01	8E-01	2E-05	5E-05
	Dermal Contact	1E-03	9E-03	2E-08	4E-07
	Total	3E-01	8E-01	2E-05	5E-05
Grid 30	Incidental Ingestion	3E-01	8E-01	2E-05	5E-05
	Dermal Contact	9E-04	6E-03	2E-08	2E-07
	Total	3E-01	8E-01	2E-05	5E-05
Grid 31	Incidental Ingestion	3E-01	7E-01	2E-05	5E-05
	Dermal Contact	1E-03	7E-03	2E-08	3E-07
	Total	3E-01	7E-01	2E-05	5E-05
Grid 32	Incidental Ingestion	2E-01	5E-01	1E-05	3E-05
	Dermal Contact	6E-04	4E-03	1E-08	2E-07
	Total	2E-01	5E-01	1E-05	3E-05
Grid 33	Incidental Ingestion	4E-01	1E+00	2E-05	6E-05
	Dermal Contact	2E-03	1E-02	5E-08	7E-07
	Total	4E-01	1E+00	2E-05	6E-05
Grid 34	Incidental Ingestion	3E-01	7E-01	1E-05	4E-05
	Dermal Contact	9E-04	6E-03	2E-08	3E-07
	Total	3E-01	7E-01	1E-05	4E-05
Grid 35	Incidental Ingestion	4E-01	1E+00	2E-05	4E-05
	Dermal Contact	1E-03	8E-03	3E-08	4E-07
	Total	4E-01	1E+00	2E-05	5E-05
Grid 36	Incidental Ingestion	6E-01	2E+00	3E-05	9E-05
	Dermal Contact	4E-03	3E-02	7E-08	1E-06
	Total	6E-01	2E+00	3E-05	9E-05
Grid 37	Incidental Ingestion	3E-01	9E-01	2E-05	5E-05
	Dermal Contact	1E-03	1E-02	3E-08	5E-07
	Total	3E-01	9E-01	2E-05	5E-05
Grid 38[b]	Incidental Ingestion	1E-01	3E-01	7E-06	2E-05
	Dermal Contact	8E-04	6E-03	1E-08	2E-07
	Total	1E-01	3E-01	7E-06	2E-05
Grid 39	Incidental Ingestion	3E-01	9E-01	2E-05	6E-05
	Dermal Contact	2E-03	1E-02	3E-08	4E-07
	Total	3E-01	9E-01	2E-05	6E-05
Grid 40	Incidental Ingestion	2E-01	6E-01	2E-05	5E-05
	Dermal Contact	1E-03	9E-03	2E-08	3E-07
	Total	2E-01	6E-01	2E-05	6E-05

Table 5-1. Risk Estimates for Hypothetical Future Residents Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 41	Incidental Ingestion	2E-01	5E-01	1E-05	4E-05
	Dermal Contact	1E-03	9E-03	2E-08	3E-07
	Total	2E-01	5E-01	1E-05	4E-05
Grid 42	Incidental Ingestion	5E-01	1E+00	4E-05	1E-04
	Dermal Contact	3E-03	2E-02	4E-08	7E-07
	Total	5E-01	1E+00	4E-05	1E-04
Grid 43	Incidental Ingestion	3E-01	9E-01	2E-05	7E-05
	Dermal Contact	2E-03	1E-02	4E-08	6E-07
	Total	3E-01	9E-01	2E-05	7E-05
Grid 44	Incidental Ingestion	4E-01	1E+00	2E-05	6E-05
	Dermal Contact	3E-03	2E-02	5E-08	8E-07
	Total	4E-01	1E+00	2E-05	6E-05
Grid 45[b]	Incidental Ingestion	6E-01	2E+00	3E-05	9E-05
	Dermal Contact	1E-03	1E-02	4E-08	6E-07
	Total	6E-01	2E+00	3E-05	9E-05
Grid 46	Incidental Ingestion	4E-01	1E+00	3E-05	9E-05
	Dermal Contact	2E-03	1E-02	3E-08	5E-07
	Total	4E-01	1E+00	3E-05	9E-05
Grid 47	Incidental Ingestion	8E-01	2E+00	4E-05	1E-04
	Dermal Contact	1E-02	7E-02	2E-07	3E-06
	Total	8E-01	2E+00	4E-05	1E-04
Grid 48	Incidental Ingestion	1E+00	4E+00	1E-04	3E-04
	Dermal Contact	2E-02	1E-01	2E-07	3E-06
	Total	1E+00	4E+00	1E-04	3E-04
Grid 49	Incidental Ingestion	9E-01	3E+00	5E-05	1E-04
	Dermal Contact	1E-02	7E-02	8E-08	1E-06
	Total	1E+00	3E+00	5E-05	1E-04
Grid 50	Incidental Ingestion	8E-01	2E+00	4E-05	1E-04
	Dermal Contact	9E-03	6E-02	1E-07	2E-06
	Total	8E-01	2E+00	4E-05	1E-04
Grid 51	Incidental Ingestion	2E-01	6E-01	2E-05	5E-05
	Dermal Contact	2E-03	1E-02	3E-08	4E-07
	Total	2E-01	6E-01	2E-05	5E-05
Grid 52	Incidental Ingestion	2E-01	6E-01	1E-05	3E-05
	Dermal Contact	1E-03	8E-03	2E-08	4E-07
	Total	2E-01	6E-01	1E-05	4E-05
Grid 53	Incidental Ingestion	7E-01	2E+00	4E-05	1E-04
	Dermal Contact	6E-03	4E-02	5E-08	8E-07
	Total	7E-01	2E+00	4E-05	1E-04
Grid 54	Incidental Ingestion	9E-01	2E+00	4E-05	1E-04
	Dermal Contact	8E-03	6E-02	1E-07	2E-06
	Total	9E-01	3E+00	4E-05	1E-04
Grid 55	Incidental Ingestion	1E+00	4E+00	8E-05	2E-04
	Dermal Contact	2E-02	1E-01	2E-07	3E-06
	Total	1E+00	4E+00	8E-05	2E-04
Grid 56	Incidental Ingestion	1E+00	4E+00	9E-05	3E-04
	Dermal Contact	2E-02	1E-01	2E-07	3E-06
	Total	1E+00	4E+00	9E-05	3E-04

Table 5-1. Risk Estimates for Hypothetical Future Residents Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 58	Incidental Ingestion	1E+00	4E+00	7E-05	2E-04
	Dermal Contact	2E-02	2E-01	2E-07	3E-06
	Total	1E+00	4E+00	7E-05	2E-04
Grid 59	Incidental Ingestion	8E-01	2E+00	4E-05	1E-04
	Dermal Contact	6E-03	4E-02	9E-08	1E-06
	Total	8E-01	2E+00	4E-05	1E-04
Grid 60	Incidental Ingestion	5E-01	1E+00	3E-05	8E-05
	Dermal Contact	4E-03	3E-02	6E-08	1E-06
	Total	5E-01	1E+00	3E-05	8E-05
Grid 61	Incidental Ingestion	4E-01	1E+00	2E-05	6E-05
	Dermal Contact	3E-03	2E-02	5E-08	8E-07
	Total	4E-01	1E+00	2E-05	7E-05
Grid 62	Incidental Ingestion	3E-01	9E-01	2E-05	5E-05
	Dermal Contact	1E-03	1E-02	3E-08	5E-07
	Total	3E-01	1E+00	2E-05	6E-05
Grid 64	Incidental Ingestion	5E-01	1E+00	2E-05	6E-05
	Dermal Contact	5E-03	3E-02	5E-08	8E-07
	Total	5E-01	2E+00	2E-05	6E-05
Grid 65[b]	Incidental Ingestion	7E-01	2E+00	5E-05	1E-04
	Dermal Contact	5E-03	3E-02	6E-08	1E-06
	Total	7E-01	2E+00	5E-05	1E-04
Grid 66	Incidental Ingestion	3E-01	9E-01	2E-05	6E-05
	Dermal Contact	2E-03	1E-02	4E-08	6E-07
	Total	3E-01	9E-01	2E-05	6E-05
Grid 67	Incidental Ingestion	1E+00	4E+00	4E-05	1E-04
	Dermal Contact	2E-02	2E-01	3E-07	4E-06
	Total	1E+00	4E+00	4E-05	1E-04
Grid 68	Incidental Ingestion	1E+00	4E+00	4E-05	1E-04
	Dermal Contact	2E-02	2E-01	3E-07	4E-06
	Total	1E+00	4E+00	4E-05	1E-04
Grid 70	Incidental Ingestion	5E-01	1E+00	3E-05	8E-05
	Dermal Contact	4E-03	3E-02	7E-08	1E-06
	Total	5E-01	1E+00	3E-05	8E-05
Grid 71	Incidental Ingestion	4E-01	1E+00	6E-05	2E-04
	Dermal Contact	3E-03	2E-02	7E-08	1E-06
	Total	4E-01	1E+00	6E-05	2E-04
Grid 72	Incidental Ingestion	8E-01	2E+00	4E-05	1E-04
	Dermal Contact	8E-03	5E-02	1E-07	2E-06
	Total	8E-01	2E+00	4E-05	1E-04
Grid 74	Incidental Ingestion	4E+00	1E+01	7E-05	3E-04
	Dermal Contact	8E-02	5E-01	8E-07	1E-05
	Total	4E+00	1E+01	7E-05	3E-04
Grid 75	Incidental Ingestion	5E-01	1E+00	2E-05	7E-05
	Dermal Contact	2E-03	1E-02	5E-08	8E-07
	Total	5E-01	1E+00	2E-05	7E-05
Grid 76	Incidental Ingestion	3E-01	8E-01	2E-05	5E-05
	Dermal Contact	2E-03	1E-02	4E-08	6E-07
	Total	3E-01	8E-01	2E-05	5E-05

Table 5-1. Risk Estimates for Hypothetical Future Residents Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 77	Incidental Ingestion	3E-01	8E-01	2E-05	5E-05
	Dermal Contact	2E-03	1E-02	4E-08	6E-07
	Total	3E-01	8E-01	2E-05	5E-05
Grid 78	Incidental Ingestion	5E-01	1E+00	2E-05	7E-05
	Dermal Contact	2E-03	1E-02	5E-08	8E-07
	Total	5E-01	1E+00	2E-05	7E-05
Grid 79	Incidental Ingestion	3E-01	8E-01	2E-05	5E-05
	Dermal Contact	2E-03	1E-02	4E-08	6E-07
	Total	3E-01	8E-01	2E-05	5E-05
Grid 80	Incidental Ingestion	3E-01	8E-01	2E-05	5E-05
	Dermal Contact	2E-03	1E-02	4E-08	6E-07
	Total	3E-01	8E-01	2E-05	5E-05
Grid 81	Incidental Ingestion	3E-01	9E-01	2E-05	5E-05
	Dermal Contact	2E-03	1E-02	5E-08	8E-07
	Total	3E-01	1E+00	2E-05	5E-05
Grid 85[b]	Incidental Ingestion	1E-01	4E-01	7E-06	2E-05
	Dermal Contact	9E-04	6E-03	2E-08	4E-07
	Total	1E-01	4E-01	7E-06	2E-05
Grid 86	Incidental Ingestion	8E-01	2E+00	4E-05	1E-04
	Dermal Contact	6E-03	4E-02	7E-08	1E-06
	Total	8E-01	2E+00	4E-05	1E-04
Grid 87	Incidental Ingestion	5E-01	1E+00	3E-05	8E-05
	Dermal Contact	4E-03	2E-02	6E-08	1E-06
	Total	5E-01	1E+00	3E-05	8E-05
Grid 88	Incidental Ingestion	9E-01	2E+00	5E-05	1E-04
	Dermal Contact	1E-02	9E-02	1E-07	2E-06
	Total	9E-01	2E+00	5E-05	1E-04
Grid 89	Incidental Ingestion	5E-01	1E+00	3E-05	9E-05
	Dermal Contact	4E-03	3E-02	7E-08	1E-06
	Total	5E-01	1E+00	3E-05	9E-05
Grid 90	Incidental Ingestion	1E+00	3E+00	5E-05	2E-04
	Dermal Contact	2E-02	1E-01	2E-07	3E-06
	Total	1E+00	3E+00	5E-05	2E-04
Grid 91	Incidental Ingestion	7E-01	2E+00	5E-05	1E-04
	Dermal Contact	7E-03	5E-02	1E-07	2E-06
	Total	7E-01	2E+00	5E-05	1E-04
Grid 93	Incidental Ingestion	9E-01	3E+00	5E-05	1E-04
	Dermal Contact	1E-02	9E-02	1E-07	2E-06
	Total	9E-01	3E+00	5E-05	1E-04
Grid 94	Incidental Ingestion	6E-01	2E+00	4E-05	1E-04
	Dermal Contact	6E-03	4E-02	7E-08	1E-06
	Total	6E-01	2E+00	4E-05	1E-04
Grid 95	Incidental Ingestion	6E-01	2E+00	3E-05	1E-04
	Dermal Contact	7E-03	5E-02	9E-08	1E-06
	Total	6E-01	2E+00	3E-05	1E-04
Grid 97	Incidental Ingestion	2E-01	5E-01	2E-05	5E-05
	Dermal Contact	1E-03	9E-03	2E-08	4E-07
	Total	2E-01	5E-01	2E-05	5E-05
Grid 98	Incidental Ingestion	6E-01	2E+00	3E-05	1E-04
	Dermal Contact	5E-03	4E-02	7E-08	1E-06
	Total	6E-01	2E+00	4E-05	1E-04

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.
Non-cancer hazards are based on the young child (assumed protective of an adult).

[a]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks ≥ 1E-04. Blue highlight flags cancer risks≥ 1E-05.

[b]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

Table 5-2. Summary of Non-Cancer Hazards for Hypothetical Future Residents in Grid 74 from Incidental Ingestion of OU3 Upland Surface Soils

Grid	COPC	Non-Cancer Hazard Quotient		Non-Cancer Target System	Non-Cancer Hazard Quotient	
		CTE	RME		CTE	RME
74	Arsenic	4E-01	1E+00	Dermal	8E-01	2E+00
	Thallium	4E-01	1E+00			
	Vanadium	2E-02	6E-02			
	Iron	9E-02	2E-01	Gastrointestinal	9E-02	2E-01
	Mercury	3E-03	1E-02	Immune	3E-03	1E-02
	Barium	2E-02	5E-02	Kidney	5E-02	1E-01
	Cadmium	3E-02	8E-02			
	Aluminum	9E-02	2E-01	Nervous	5E-01	1E+00
	Manganese	5E-01	1E+00			
	$TEQ_{D/F}$	2E+00	6E+00	Reproduction	2E+00	6E+00
	Antimony	3E-02	8E-02	Systemic	3E-02	8E-02
	Cobalt	1E-01	3E-01	Thyroid	1E-01	3E-01
	Chromium	5E-02	1E-01			
	Total	4E+00	1E+01			

COPC = Contaminant of potential concern; CTE = central tendence estimate; RME = reasonable maximum exposure; $TEQ_{D/F}$ = toxicity equivalence for dioxins and furans.

Orange highlight flags non-cancer hazards > 1E+00.

Table 5-3. Cancer Risks for Hypothetical Future Residents from Exposure to OU3 Surface Soil in Grid 48

Grid	COPC	Risk	
		CTE	RME
48	$TEQ_{D/F}$	2E-06	9E-06
	Arsenic	3E-06	2E-05
	Chromium	1E-04	3E-04
	Total	1E-04	3E-04

COPC = contaminant of potential concern; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; CTE = central tendency estimate; RME = reasonable maximum exposure.

Orange highlight flags cancer risks≥ 1E-04.
Blue highlight flags cancer risks ≥ 1E-05.

Chromium was evaluated as hexavalent chromium.

Table 5-4. Summary of Non-Cancer Hazards and Cancer Risks for Hypothetical Future Residents from Ingesting Groundwater

Well ID	Non-Cancer Hazard Index			Cancer Risk		
	CTE	RME	Risk Driver(s)	CTE	RME	Risk Driver(s)
Unit 1 Wells						
ATMW6	4E+00	9E+00	Mn	6E-05	3E-04	As
NFMW1d	6E+00	1E+01	As, Mn	2E-04	7E-04	As, Cr
NFMW1s	5E+00	1E+01	As, Cr	3E-03	7E-03	As, Cr
NFMW2	6E+00	1E+01	As*, Mn	5E-05	3E-04	As
NFMW3	7E+00	2E+01	Mn	9E-05	3E-04	Cr
NFMW4	7E+00	2E+01	Mn	3E-05	1E-04	As*
NFMW7	2E+00	4E+00	As*, Tl*	7E-05	3E-04	As*, Cr*
NFMW8	9E+00	2E+01	Mn	6E-05	2E-04	As*, Cr*
NFMW9	1E+01	3E+01	As, Co, Fe, Mn	2E-04	9E-04	As, Cr
NFMW10	8E+00	2E+01	As, Mn	1E-04	6E-04	As, Cr
NFMW11	4E+00	1E+01	Mn	3E-05	1E-04	As*, Cr*
NFMW12	6E+00	1E+01	Mn	1E-05	5E-05	As*
NFMW19	5E+01	1E+02	Co, Fe, Mn	4E-05	1E-04	As*
NFMW20	1E+01	3E+01	Mn	5E-05	2E-04	As*, Cr*
NFMW22	4E+00	9E+00	As, Mn	1E-04	4E-04	As, Cr
NFMW23	1E+01	2E+01	As, Mn	3E-04	2E-03	As
SMW7	1E+00	3E+00	As*, Co*, Mn*	2E-05	8E-05	As*
SMW8	2E+00	4E+00	As*, Mn*	3E-05	1E-04	As*
SMW9	1E+00	2E+00	As*	4E-05	2E-04	As
SMW10	5E+00	1E+01	As, Mn	1E-04	7E-04	As
SMW11	1E+01	3E+01	As, Co*, Mn	2E-04	9E-04	As, Cr
SMW12	5E+00	1E+01	As, Mn	1E-04	5E-04	As, Cr
SMW13	6E+00	1E+01	As*, Mn	7E-05	3E-04	As
SMW14	5E+00	1E+01	As, Mn	9E-05	5E-04	As
SMW15	3E+01	7E+01	Co, Mn	9E-05	3E-04	Cr
SMW16	7E+00	2E+01	As, Mn	3E-04	1E-03	As, Cr
SMW17	1E+01	3E+01	As, Mn	4E-04	2E-03	As, Cr
SMW18	6E+00	1E+01	Mn	1E-04	4E-04	As, Cr
SMW19	8E+00	2E+01	Fe, Mn	3E-05	1E-04	As*
TW2R	3E+00	6E+00	As*, Mn	5E-05	2E-04	As*
TW5R	1E+00	3E+00	As*, Mn*	3E-05	1E-04	As*
Unit 3 Wells						
SMW16d	6E-01	1E+00	As*, Mn*	1E-05	5E-05	As*
SMW17d	1E+00	2E+00	As*, Mn*	2E-05	8E-05	As*
SMW18d	1E+00	3E+00	As*, Mn*	2E-05	1E-04	As*
Waste Water Clarifier Well	5E+00	1E+01	As, Mn*	1E-04	6E-04	As

CTE = central tendency estimate; RME = reasonably maximum exposure; As = arsenic; Co = cobalt; Fe = iron; Mn = manganese; Tl = thallium.
Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.
* = HQ for this individual COPC < 1E+00 or Cancer Risk for this individual COPC < 1E-04

Table 5-5. Total Non-Cancer Hazards for Hypothetical Future Residents from Combined Exposures to OU3 Soils and Groundwater

OU3 Groundwater			OU3 Soil			Total (Soil + Groundwater)	
Well ID	Non-Cancer HI		Exposure Grid	Non-cancer HI		Non-cancer HI	
	CTE	RME		CTE	RME	CTE	RME
Unit 1 Wells							
ATMW6	4E+00	9E+00	75	5E-01	1E+00	4E+00	**1E+01**
NFMW1d	6E+00	**1E+01**	65	7E-01	2E+00	6E+00	**1E+01**
NFMW1s	5E+00	**1E+01**	65	7E-01	2E+00	6E+00	**1E+01**
NFMW2	6E+00	**1E+01**	61	4E-01	1E+00	6E+00	**1E+01**
NFMW3	7E+00	**2E+01**	71	4E-01	1E+00	7E+00	**2E+01**
NFMW4	7E+00	**2E+01**	37	3E-01	9E-01	8E+00	**2E+01**
NFMW7	2E+00	4E+00	73	no data	no data	--	--
NFMW8	9E+00	**2E+01**	95	6E-01	2E+00	1E+01	**2E+01**
NFMW9	**1E+01**	**3E+01**	66	3E-01	9E-01	**1E+01**	**3E+01**
NFMW10	8E+00	**2E+01**	60	5E-01	1E+00	9E+00	**2E+01**
NFMW11	4E+00	1E+01	51	2E-01	6E-01	4E+00	**1E+01**
NFMW12	6E+00	**1E+01**	40	2E-01	6E-01	7E+00	**2E+01**
NFMW19	**5E+01**	**1E+02**	58	1E+00	4E+00	**5E+01**	**1E+02**
NFMW20	**1E+01**	**3E+01**	53	7E-01	2E+00	**1E+01**	**3E+01**
NFMW22	4E+00	9E+00	94	6E-01	2E+00	5E+00	**1E+01**
NFMW23	**1E+01**	**2E+01**	98	6E-01	2E+00	**1E+01**	**3E+01**
SMW7	1E+00	3E+00	83	no data	no data	--	--
SMW8	2E+00	4E+00	83	no data	no data	--	--
SMW9	1E+00	2E+00	85	1E-01	4E-01	1E+00	3E+00
SMW10	5E+00	**1E+01**	86	8E-01	2E+00	6E+00	**1E+01**
SMW11	**1E+01**	**3E+01**	88	9E-01	2E+00	**1E+01**	**3E+01**
SMW12	5E+00	**1E+01**	90	1E+00	3E+00	6E+00	**1E+01**
SMW13	6E+00	**1E+01**	93	9E-01	3E+00	7E+00	**2E+01**
SMW14	5E+00	**1E+01**	94	6E-01	2E+00	5E+00	**1E+01**
SMW15	**3E+01**	**7E+01**	95	6E-01	2E+00	**3E+01**	**7E+01**
SMW16	7E+00	**2E+01**	93	9E-01	3E+00	8E+00	**2E+01**
SMW17	**1E+01**	**3E+01**	49	1E+00	3E+00	**1E+01**	**3E+01**
SMW18	6E+00	**1E+01**	36	6E-01	2E+00	6E+00	**2E+01**
SMW19	8E+00	**2E+01**	46	4E-01	1E+00	9E+00	**2E+01**
TW2R	3E+00	6E+00	93	9E-01	3E+00	4E+00	9E+00
TW5R	1E+00	3E+00	84	no data	no data	--	--
Unit 3 Wells							
SMW16d	6E-01	1E+00	93	9E-01	3E+00	2E+00	4E+00
SMW17d	1E+00	2E+00	49	1E+00	3E+00	2E+00	5E+00
SMW18d	1E+00	3E+00	36	6E-01	2E+00	2E+00	5E+00
Waste Water Clarifier Well	5E+00	**1E+01**	62	3E-01	1E+00	6E+00	**1E+01**

HI = hazard index; CTE = central tendency estimate; RME = reasonably maximum exposure.

Orange highlight flags non-cancer hazards > 1E+00 and bolded values flag non-cancer hazards > 1E+01.

Table 5-6. Total Cancer Risks for Hypothetical Future Residents from Combined Exposures to OU3 Soils and Groundwater

OU3 Groundwater			OU3 Soil			Total (Soil + Groundwater)		
Well ID	Cancer Risk		Exposure Grid	Cancer Risk		Cancer Risk		
	CTE	RME		CTE	RME	CTE		RME
Unit 1 Wells								
ATMW6	6E-05	3E-04	75	2E-05	7E-05	9E-05		3E-04
NFMW1d	2E-04	7E-04	65	5E-05	1E-04	2E-04		8E-04
NFMW1s	3E-03	7E-03	65	5E-05	1E-04	3E-03		7E-03
NFMW2	5E-05	3E-04	61	2E-05	7E-05	7E-05		3E-04
NFMW3	9E-05	3E-04	71	6E-05	2E-04	2E-04	x	5E-04
NFMW4	3E-05	1E-04	37	2E-05	5E-05	5E-05		2E-04
NFMW7	7E-05	3E-04	73	no data	no data	--		--
NFMW8	6E-05	2E-04	95	3E-05	1E-04	1E-04	x	3E-04
NFMW9	2E-04	9E-04	66	2E-05	6E-05	3E-04		1E-03
NFMW10	1E-04	6E-04	60	3E-05	8E-05	2E-04		6E-04
NFMW11	3E-05	1E-04	51	2E-05	5E-05	4E-05		2E-04
NFMW12	1E-05	5E-05	40	2E-05	6E-05	3E-05		1E-04
NFMW19	4E-05	1E-04	58	7E-05	2E-04	1E-04	x	4E-04
NFMW20	5E-05	2E-04	53	4E-05	1E-04	9E-05		3E-04
NFMW22	1E-04	4E-04	94	4E-05	1E-04	1E-04		5E-04
NFMW23	3E-04	2E-03	98	4E-05	1E-04	3E-04		2E-03
SMW7	2E-05	8E-05	83	no data	no data	--		--
SMW8	3E-05	1E-04	83	no data	no data	--		--
SMW9	4E-05	2E-04	85	7E-06	2E-05	5E-05		2E-04
SMW10	1E-04	7E-04	86	4E-05	1E-04	2E-04		8E-04
SMW11	2E-04	9E-04	88	5E-05	1E-04	2E-04		1E-03
SMW12	1E-04	5E-04	90	5E-05	2E-04	2E-04		7E-04
SMW13	7E-05	3E-04	93	5E-05	1E-04	1E-04	x	4E-04
SMW14	9E-05	5E-04	94	4E-05	1E-04	1E-04	x	6E-04
SMW15	9E-05	3E-04	95	3E-05	1E-04	1E-04	x	4E-04
SMW16	3E-04	1E-03	93	5E-05	1E-04	4E-04		1E-03
SMW17	4E-04	2E-03	49	5E-05	1E-04	4E-04		2E-03
SMW18	1E-04	4E-04	36	3E-05	9E-05	1E-04		5E-04
SMW19	3E-05	1E-04	46	3E-05	9E-05	6E-05		2E-04
TW2R	5E-05	2E-04	93	5E-05	1E-04	1E-04	x	3E-04
TW5R	3E-05	1E-04	84	no data	no data	--		--
Unit 3 Wells								
SMW16d	1E-05	5E-05	93	5E-05	1E-04	6E-05		2E-04
SMW17d	2E-05	8E-05	49	5E-05	1E-04	7E-05		2E-04
SMW18d	2E-05	1E-04	36	3E-05	9E-05	6E-05		2E-04
Waste Water Clarifier Well	1E-04	6E-04	62	2E-05	6E-05	1E-04		7E-04

HI = hazard index; CTE = central tendency estimate; RME = reasonably maximum exposure.
Orange highlight flags cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.
"x" denotes where the cancer risk from exposure to groundwater only and the exposure to soil only were < 1E-04, but the total cancer risk ≥ 1E-04.

Table 5-7. Risk Estimates for Hypothetical Future Commercial/Industrial Workers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 26	Incidental Ingestion	6E-02	1E-01	9E-07	6E-06
	Dermal Contact	2E-03	4E-03	1E-07	6E-07
	Total	6E-02	1E-01	1E-06	6E-06
Grid 27	Incidental Ingestion	2E-02	4E-02	3E-07	2E-06
	Dermal Contact	4E-04	8E-04	1E-08	7E-08
	Total	2E-02	5E-02	3E-07	2E-06
Grid 28	Incidental Ingestion	2E-02	4E-02	2E-07	1E-06
	Dermal Contact	2E-04	5E-04	1E-08	6E-08
	Total	2E-02	4E-02	2E-07	1E-06
Grid 29	Incidental Ingestion	2E-02	5E-02	4E-07	2E-06
	Dermal Contact	6E-04	1E-03	2E-08	1E-07
	Total	2E-02	6E-02	4E-07	2E-06
Grid 30	Incidental Ingestion	2E-02	5E-02	3E-07	2E-06
	Dermal Contact	4E-04	7E-04	1E-08	8E-08
	Total	2E-02	5E-02	3E-07	2E-06
Grid 31	Incidental Ingestion	2E-02	5E-02	3E-07	2E-06
	Dermal Contact	4E-04	8E-04	2E-08	1E-07
	Total	2E-02	5E-02	4E-07	2E-06
Grid 32	Incidental Ingestion	2E-02	4E-02	2E-07	1E-06
	Dermal Contact	2E-04	5E-04	1E-08	7E-08
	Total	2E-02	4E-02	2E-07	1E-06
Grid 33	Incidental Ingestion	3E-02	7E-02	4E-07	3E-06
	Dermal Contact	8E-04	2E-03	4E-08	2E-07
	Total	3E-02	8E-02	5E-07	3E-06
Grid 34	Incidental Ingestion	2E-02	5E-02	3E-07	2E-06
	Dermal Contact	4E-04	7E-04	2E-08	1E-07
	Total	2E-02	5E-02	3E-07	2E-06
Grid 35	Incidental Ingestion	3E-02	7E-02	3E-07	2E-06
	Dermal Contact	5E-04	9E-04	2E-08	1E-07
	Total	3E-02	7E-02	3E-07	2E-06
Grid 36	Incidental Ingestion	4E-02	1E-01	7E-07	4E-06
	Dermal Contact	2E-03	3E-03	6E-08	3E-07
	Total	5E-02	1E-01	8E-07	5E-06
Grid 37	Incidental Ingestion	3E-02	6E-02	4E-07	2E-06
	Dermal Contact	6E-04	1E-03	3E-08	2E-07
	Total	3E-02	6E-02	4E-07	2E-06
Grid 38[b]	Incidental Ingestion	1E-02	2E-02	1E-07	9E-07
	Dermal Contact	4E-04	7E-04	1E-08	7E-08
	Total	1E-02	2E-02	2E-07	1E-06
Grid 39	Incidental Ingestion	3E-02	6E-02	4E-07	3E-06
	Dermal Contact	6E-04	1E-03	3E-08	1E-07
	Total	3E-02	6E-02	4E-07	3E-06
Grid 40	Incidental Ingestion	2E-02	4E-02	4E-07	2E-06
	Dermal Contact	6E-04	1E-03	2E-08	1E-07
	Total	2E-02	4E-02	4E-07	2E-06

Table 5-7. Risk Estimates for Hypothetical Future Commercial/Industrial Workers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 41	Incidental Ingestion	1E-02	3E-02	3E-07	2E-06
	Dermal Contact	6E-04	1E-03	2E-08	1E-07
	Total	1E-02	3E-02	3E-07	2E-06
Grid 42	Incidental Ingestion	4E-02	1E-01	7E-07	4E-06
	Dermal Contact	1E-03	2E-03	4E-08	2E-07
	Total	4E-02	1E-01	7E-07	5E-06
Grid 43	Incidental Ingestion	3E-02	6E-02	5E-07	3E-06
	Dermal Contact	9E-04	2E-03	3E-08	2E-07
	Total	3E-02	6E-02	5E-07	3E-06
Grid 44	Incidental Ingestion	3E-02	7E-02	5E-07	3E-06
	Dermal Contact	1E-03	2E-03	5E-08	3E-07
	Total	3E-02	7E-02	5E-07	3E-06
Grid 45[b]	Incidental Ingestion	5E-02	1E-01	6E-07	4E-06
	Dermal Contact	6E-04	1E-03	3E-08	2E-07
	Total	5E-02	1E-01	6E-07	4E-06
Grid 46	Incidental Ingestion	4E-02	8E-02	5E-07	3E-06
	Dermal Contact	7E-04	1E-03	3E-08	1E-07
	Total	4E-02	8E-02	6E-07	4E-06
Grid 47	Incidental Ingestion	7E-02	2E-01	1E-06	8E-06
	Dermal Contact	4E-03	8E-03	2E-07	8E-07
	Total	7E-02	2E-01	1E-06	8E-06
Grid 48	Incidental Ingestion	1E-01	2E-01	2E-06	1E-05
	Dermal Contact	7E-03	1E-02	2E-07	1E-06
	Total	1E-01	3E-01	3E-06	2E-05
Grid 49	Incidental Ingestion	8E-02	2E-01	1E-06	7E-06
	Dermal Contact	4E-03	8E-03	8E-08	4E-07
	Total	8E-02	2E-01	1E-06	7E-06
Grid 50	Incidental Ingestion	6E-02	1E-01	1E-06	7E-06
	Dermal Contact	4E-03	7E-03	1E-07	6E-07
	Total	7E-02	2E-01	1E-06	7E-06
Grid 51	Incidental Ingestion	2E-02	4E-02	3E-07	2E-06
	Dermal Contact	7E-04	1E-03	3E-08	1E-07
	Total	2E-02	4E-02	4E-07	2E-06
Grid 52	Incidental Ingestion	2E-02	4E-02	3E-07	2E-06
	Dermal Contact	5E-04	1E-03	2E-08	1E-07
	Total	2E-02	4E-02	3E-07	2E-06
Grid 53	Incidental Ingestion	5E-02	1E-01	8E-07	5E-06
	Dermal Contact	2E-03	5E-03	5E-08	3E-07
	Total	6E-02	1E-01	8E-07	5E-06
Grid 54	Incidental Ingestion	7E-02	2E-01	1E-06	7E-06
	Dermal Contact	3E-03	7E-03	1E-07	7E-07
	Total	8E-02	2E-01	1E-06	8E-06
Grid 55	Incidental Ingestion	1E-01	3E-01	2E-06	1E-05
	Dermal Contact	7E-03	1E-02	2E-07	1E-06
	Total	1E-01	3E-01	2E-06	1E-05
Grid 56	Incidental Ingestion	1E-01	3E-01	2E-06	1E-05
	Dermal Contact	7E-03	1E-02	2E-07	1E-06
	Total	1E-01	3E-01	2E-06	1E-05

Table 5-7. Risk Estimates for Hypothetical Future Commercial/Industrial Workers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 58	Incidental Ingestion	1E-01	3E-01	2E-06	1E-05
	Dermal Contact	9E-03	2E-02	2E-07	1E-06
	Total	1E-01	3E-01	2E-06	1E-05
Grid 59	Incidental Ingestion	6E-02	1E-01	9E-07	6E-06
	Dermal Contact	3E-03	5E-03	8E-08	4E-07
	Total	6E-02	1E-01	1E-06	6E-06
Grid 60	Incidental Ingestion	4E-02	1E-01	6E-07	4E-06
	Dermal Contact	2E-03	3E-03	6E-08	3E-07
	Total	4E-02	1E-01	7E-07	4E-06
Grid 61	Incidental Ingestion	3E-02	8E-02	5E-07	3E-06
	Dermal Contact	1E-03	2E-03	5E-08	2E-07
	Total	4E-02	8E-02	5E-07	3E-06
Grid 62	Incidental Ingestion	3E-02	6E-02	4E-07	2E-06
	Dermal Contact	6E-04	1E-03	3E-08	2E-07
	Total	3E-02	6E-02	4E-07	3E-06
Grid 64	Incidental Ingestion	4E-02	1E-01	5E-07	3E-06
	Dermal Contact	2E-03	4E-03	5E-08	3E-07
	Total	5E-02	1E-01	6E-07	4E-06
Grid 65[b]	Incidental Ingestion	5E-02	1E-01	9E-07	6E-06
	Dermal Contact	2E-03	4E-03	6E-08	3E-07
	Total	6E-02	1E-01	1E-06	6E-06
Grid 66	Incidental Ingestion	3E-02	6E-02	4E-07	3E-06
	Dermal Contact	8E-04	2E-03	4E-08	2E-07
	Total	3E-02	6E-02	5E-07	3E-06
Grid 67	Incidental Ingestion	1E-01	3E-01	2E-06	1E-05
	Dermal Contact	1E-02	2E-02	2E-07	1E-06
	Total	1E-01	3E-01	2E-06	1E-05
Grid 68	Incidental Ingestion	1E-01	3E-01	2E-06	1E-05
	Dermal Contact	1E-02	2E-02	2E-07	1E-06
	Total	1E-01	3E-01	2E-06	1E-05
Grid 70	Incidental Ingestion	4E-02	9E-02	6E-07	4E-06
	Dermal Contact	2E-03	3E-03	7E-08	4E-07
	Total	4E-02	9E-02	7E-07	4E-06
Grid 71	Incidental Ingestion	3E-02	7E-02	1E-06	7E-06
	Dermal Contact	1E-03	3E-03	6E-08	3E-07
	Total	3E-02	7E-02	1E-06	7E-06
Grid 72	Incidental Ingestion	6E-02	1E-01	9E-07	6E-06
	Dermal Contact	3E-03	6E-03	1E-07	5E-07
	Total	7E-02	2E-01	1E-06	6E-06
Grid 74	Incidental Ingestion	3E-01	7E-01	4E-06	3E-05
	Dermal Contact	3E-02	6E-02	7E-07	4E-06
	Total	3E-01	7E-01	5E-06	3E-05
Grid 75	Incidental Ingestion	4E-02	9E-02	5E-07	3E-06
	Dermal Contact	8E-04	2E-03	5E-08	3E-07
	Total	4E-02	9E-02	6E-07	3E-06
Grid 76	Incidental Ingestion	2E-02	5E-02	4E-07	2E-06
	Dermal Contact	7E-04	1E-03	3E-08	2E-07
	Total	2E-02	5E-02	4E-07	2E-06

Table 5-7. Risk Estimates for Hypothetical Future Commercial/Industrial Workers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 77	Incidental Ingestion	2E-02	5E-02	4E-07	2E-06
	Dermal Contact	7E-04	1E-03	3E-08	2E-07
	Total	2E-02	5E-02	4E-07	2E-06
Grid 78	Incidental Ingestion	4E-02	9E-02	5E-07	3E-06
	Dermal Contact	8E-04	2E-03	5E-08	3E-07
	Total	4E-02	9E-02	6E-07	3E-06
Grid 79	Incidental Ingestion	2E-02	5E-02	4E-07	2E-06
	Dermal Contact	7E-04	1E-03	3E-08	2E-07
	Total	2E-02	5E-02	4E-07	2E-06
Grid 80	Incidental Ingestion	2E-02	5E-02	4E-07	2E-06
	Dermal Contact	7E-04	1E-03	3E-08	2E-07
	Total	2E-02	5E-02	4E-07	2E-06
Grid 81	Incidental Ingestion	3E-02	6E-02	4E-07	3E-06
	Dermal Contact	9E-04	2E-03	5E-08	3E-07
	Total	3E-02	6E-02	5E-07	3E-06
Grid 85[b]	Incidental Ingestion	1E-02	3E-02	2E-07	1E-06
	Dermal Contact	4E-04	8E-04	2E-08	1E-07
	Total	1E-02	3E-02	2E-07	1E-06
Grid 86	Incidental Ingestion	6E-02	1E-01	8E-07	5E-06
	Dermal Contact	2E-03	5E-03	7E-08	4E-07
	Total	6E-02	1E-01	9E-07	5E-06
Grid 87	Incidental Ingestion	4E-02	9E-02	6E-07	4E-06
	Dermal Contact	1E-03	3E-03	6E-08	3E-07
	Total	4E-02	9E-02	7E-07	4E-06
Grid 88	Incidental Ingestion	7E-02	2E-01	1E-06	8E-06
	Dermal Contact	6E-03	1E-02	1E-07	6E-07
	Total	7E-02	2E-01	1E-06	8E-06
Grid 89	Incidental Ingestion	4E-02	1E-01	7E-07	4E-06
	Dermal Contact	2E-03	3E-03	6E-08	3E-07
	Total	4E-02	1E-01	7E-07	5E-06
Grid 90	Incidental Ingestion	8E-02	2E-01	1E-06	9E-06
	Dermal Contact	6E-03	1E-02	2E-07	9E-07
	Total	9E-02	2E-01	2E-06	1E-05
Grid 91	Incidental Ingestion	6E-02	1E-01	1E-06	7E-06
	Dermal Contact	3E-03	6E-03	9E-08	5E-07
	Total	6E-02	1E-01	1E-06	7E-06
Grid 93	Incidental Ingestion	7E-02	2E-01	1E-06	8E-06
	Dermal Contact	5E-03	1E-02	1E-07	7E-07
	Total	8E-02	2E-01	1E-06	9E-06
Grid 94	Incidental Ingestion	5E-02	1E-01	8E-07	5E-06
	Dermal Contact	3E-03	5E-03	6E-08	3E-07
	Total	5E-02	1E-01	9E-07	5E-06
Grid 95	Incidental Ingestion	5E-02	1E-01	8E-07	5E-06
	Dermal Contact	3E-03	5E-03	8E-08	4E-07
	Total	5E-02	1E-01	9E-07	6E-06
Grid 97	Incidental Ingestion	1E-02	3E-02	3E-07	2E-06
	Dermal Contact	6E-04	1E-03	2E-08	1E-07
	Total	2E-02	3E-02	3E-07	2E-06
Grid 98	Incidental Ingestion	4E-02	1E-01	8E-07	5E-06
	Dermal Contact	2E-03	4E-03	7E-08	4E-07
	Total	5E-02	1E-01	8E-07	5E-06

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.

[a]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks≥ 1E-05.

[b]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

Table 5-8. Summary of Non-Cancer Hazards and Cancer Risks for Hypothetical Future Commercial/Industrial Workers from Ingesting Groundwater

Well ID	Non-Cancer Hazard Index			Cancer Risk		
	CTE	RME	Risk Driver(s)	CTE	RME	Risk Driver(s)
Unit 1 Wells						
ATMW6	8E-01	2E+00	Mn*	8E-06	5E-05	As*
NFMW1d	1E+00	3E+00	As*, Mn*	2E-05	1E-04	As*
NFMW1s	1E+00	2E+00	As*, Cr*	7E-05	5E-04	As*, Cr
NFMW2	1E+00	3E+00	Mn*	1E-05	7E-05	As*
NFMW3	2E+00	4E+00	Mn	7E-06	4E-05	As*, Cr*
NFMW4	2E+00	4E+00	Mn	4E-06	2E-05	As*
NFMW7	4E-01	8E-01	As*	7E-06	5E-05	As*
NFMW8	2E+00	5E+00	Mn	5E-06	3E-05	As*
NFMW9	3E+00	7E+00	Mn	3E-05	2E-04	As
NFMW10	2E+00	4E+00	Mn	2E-05	1E-04	As*
NFMW11	9E-01	2E+00	Mn*	4E-06	2E-05	As*
NFMW12	1E+00	3E+00	Mn*	2E-06	1E-05	As*
NFMW19	**1E+01**	**2E+01**	Co, Mn	5E-06	3E-05	As*
NFMW20	3E+00	7E+00	Mn	5E-06	3E-05	As*
NFMW22	9E-01	2E+00	As*, Mn*	1E-05	9E-05	As*
NFMW23	2E+00	5E+00	As, Mn*	7E-05	4E-04	As
SMW7	3E-01	7E-01	As*, Mn*	3E-06	2E-05	As*
SMW8	3E-01	8E-01	As*, Mn*	6E-06	4E-05	As*
SMW9	2E-01	5E-01	As*	9E-06	6E-05	As*
SMW10	1E+00	3E+00	As*, Mn*	3E-05	2E-04	As
SMW11	3E+00	7E+00	As*, Mn	4E-05	2E-04	As
SMW12	1E+00	2E+00	As*, Mn*	2E-05	1E-04	As*, Cr*
SMW13	1E+00	3E+00	As*, Mn*	1E-05	7E-05	As*
SMW14	1E+00	2E+00	As*, Mn*	2E-05	1E-04	As*
SMW15	6E+00	**1E+01**	Co, Mn	8E-06	5E-05	As*
SMW16	2E+00	4E+00	As*, Mn*	3E-05	2E-04	As
SMW17	3E+00	7E+00	As, Mn	5E-05	3E-04	As
SMW18	1E+00	3E+00	Mn*	1E-05	7E-05	As*, Cr*
SMW19	2E+00	4E+00	Mn	3E-06	2E-05	As*
TW2R	6E-01	1E+00	As*, Fe*, Mn*	7E-06	4E-05	As*
TW5R	3E-01	6E-01	As*, Mn*	4E-06	3E-05	As*
Unit 3 Wells						
SMW16d	1E-01	3E-01	As*, Mn*	2E-06	1E-05	As*
SMW17d	2E-01	5E-01	As*, Mn*	3E-06	2E-05	As*
SMW18d	3E-01	7E-01	As*, Mn*	4E-06	3E-05	As*
Waste Water Clarifier Well	1E+00	3E+00	As*, Mn*	3E-05	2E-04	As

CTE = central tendency estimate; RME = reasonably maximum exposure; As = arsenic; Co = cobalt; Fe = iron; Mn = manganese; Tl = thallium.

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

* = HQ for this individual COPC < 1E+00 or Cancer Risk for this individual COPC < 1E-04

Table 5-9. Total Non-Cancer Hazards for Hypothetical Future Commercial/Industrial Workers from Combined Exposures to OU3 Soils and Groundwater

OU3 Groundwater			OU3 Soil			Total (Soil + Groundwater)	
Well ID	Non-Cancer HI		Exposure Grid	Non-cancer HI		Non-cancer HI	
	CTE	RME		CTE	RME	CTE	RME
Unit 1 Wells							
ATMW6	8E-01	2E+00	75	4E-02	9E-02	9E-01	2E+00
NFMW1d	1E+00	3E+00	65	6E-02	1E-01	1E+00	3E+00
NFMW1s	1E+00	2E+00	65	6E-02	1E-01	1E+00	3E+00
NFMW2	1E+00	3E+00	61	4E-02	8E-02	1E+00	3E+00
NFMW3	2E+00	4E+00	71	3E-02	7E-02	2E+00	4E+00
NFMW4	2E+00	4E+00	37	3E-02	6E-02	2E+00	4E+00
NFMW7	4E-01	8E-01	73	no data	no data	--	--
NFMW8	2E+00	5E+00	95	5E-02	1E-01	2E+00	5E+00
NFMW9	3E+00	7E+00	66	3E-02	6E-02	3E+00	7E+00
NFMW10	2E+00	4E+00	60	4E-02	1E-01	2E+00	4E+00
NFMW11	9E-01	2E+00	51	2E-02	4E-02	9E-01	2E+00
NFMW12	1E+00	3E+00	40	2E-02	4E-02	1E+00	3E+00
NFMW19	**1E+01**	**2E+01**	58	1E-01	3E-01	**1E+01**	**3E+01**
NFMW20	3E+00	7E+00	53	6E-02	1E-01	3E+00	7E+00
NFMW22	9E-01	2E+00	94	5E-02	1E-01	9E-01	2E+00
NFMW23	2E+00	5E+00	98	5E-02	1E-01	2E+00	5E+00
SMW7	3E-01	7E-01	83	no data	no data	--	--
SMW8	3E-01	8E-01	83	no data	no data	--	--
SMW9	2E-01	5E-01	85	1E-02	3E-02	2E-01	5E-01
SMW10	1E+00	3E+00	86	6E-02	1E-01	1E+00	3E+00
SMW11	3E+00	7E+00	88	7E-02	2E-01	3E+00	7E+00
SMW12	1E+00	2E+00	90	9E-02	2E-01	1E+00	3E+00
SMW13	1E+00	3E+00	93	8E-02	2E-01	1E+00	3E+00
SMW14	1E+00	2E+00	94	5E-02	1E-01	1E+00	2E+00
SMW15	6E+00	**1E+01**	95	5E-02	1E-01	6E+00	**1E+01**
SMW16	2E+00	4E+00	93	8E-02	2E-01	2E+00	4E+00
SMW17	3E+00	7E+00	49	8E-02	2E-01	3E+00	7E+00
SMW18	1E+00	3E+00	36	5E-02	1E-01	1E+00	3E+00
SMW19	2E+00	4E+00	46	4E-02	8E-02	2E+00	4E+00
TW2R	6E-01	1E+00	93	8E-02	2E-01	7E-01	2E+00
TW5R	3E-01	6E-01	84	no data	no data	--	--
Unit 3 Wells							
SMW16d	1E-01	3E-01	93	8E-02	2E-01	2E-01	5E-01
SMW17d	2E-01	5E-01	49	8E-02	2E-01	3E-01	7E-01
SMW18d	3E-01	7E-01	36	5E-02	1E-01	4E-01	8E-01
Waste Water Clarifier Well	1E+00	3E+00	62	3E-02	6E-02	1E+00	3E+00

HI = hazard index; CTE = central tendency estimate; RME = reasonably maximum exposure.
Orange highlight flags non-cancer hazards > 1E+00 and bolded values flag non-cancer hazards > 1E+01.

Table 5-10. Total Cancer Risks for Hypothetical Future Commercial/Industrial Workers from Combined Exposures to OU3 Soils and Groundwater

OU3 Groundwater			OU3 Soil			Total (Soil + Groundwater)	
Well ID	Cancer Risk		Exposure Grid	Cancer Risk		Cancer Risk	
	CTE	RME		CTE	RME	CTE	RME
Unit 1 Wells							
ATMW6	8E-06	5E-05	75	6E-07	3E-06	9E-06	6E-05
NFMW1d	2E-05	1E-04	65	1E-06	6E-06	2E-05	1E-04
NFMW1s	7E-05	5E-04	65	1E-06	6E-06	7E-05	5E-04
NFMW2	1E-05	7E-05	61	5E-07	3E-06	1E-05	7E-05
NFMW3	7E-06	4E-05	71	1E-06	7E-06	8E-06	5E-05
NFMW4	4E-06	2E-05	37	4E-07	2E-06	4E-06	3E-05
NFMW7	7E-06	5E-05	73	no data	no data	--	--
NFMW8	5E-06	3E-05	95	9E-07	6E-06	6E-06	4E-05
NFMW9	3E-05	2E-04	66	5E-07	3E-06	3E-05	2E-04
NFMW10	2E-05	1E-04	60	7E-07	4E-06	2E-05	1E-04
NFMW11	4E-06	2E-05	51	4E-07	2E-06	4E-06	3E-05
NFMW12	2E-06	1E-05	40	4E-07	2E-06	2E-06	1E-05
NFMW19	5E-06	3E-05	58	2E-06	1E-05	7E-06	4E-05
NFMW20	5E-06	3E-05	53	8E-07	5E-06	6E-06	4E-05
NFMW22	1E-05	9E-05	94	9E-07	5E-06	2E-05	1E-04
NFMW23	7E-05	4E-04	98	8E-07	5E-06	7E-05	4E-04
SMW7	3E-06	2E-05	83	no data	no data	--	--
SMW8	6E-06	4E-05	83	no data	no data	--	--
SMW9	9E-06	6E-05	85	2E-07	1E-06	9E-06	6E-05
SMW10	3E-05	2E-04	86	9E-07	5E-06	3E-05	2E-04
SMW11	4E-05	2E-04	88	1E-06	8E-06	4E-05	2E-04
SMW12	2E-05	1E-04	90	2E-06	1E-05	2E-05	1E-04
SMW13	1E-05	7E-05	93	1E-06	9E-06	1E-05	8E-05
SMW14	2E-05	1E-04	94	9E-07	5E-06	2E-05	1E-04
SMW15	8E-06	5E-05	95	9E-07	6E-06	9E-06	6E-05
SMW16	3E-05	2E-04	93	1E-06	9E-06	3E-05	2E-04
SMW17	5E-05	3E-04	49	1E-06	7E-06	5E-05	3E-04
SMW18	1E-05	7E-05	36	8E-07	5E-06	1E-05	7E-05
SMW19	3E-06	2E-05	46	6E-07	4E-06	4E-06	3E-05
TW2R	7E-06	4E-05	93	1E-06	9E-06	8E-06	5E-05
TW5R	4E-06	3E-05	84	no data	no data	--	--
Unit 3 Wells							
SMW16d	2E-06	1E-05	93	1E-06	9E-06	3E-06	2E-05
SMW17d	3E-06	2E-05	49	1E-06	7E-06	4E-06	3E-05
SMW18d	4E-06	3E-05	36	8E-07	5E-06	5E-06	3E-05
Waste Water Clarifier Well	3E-05	2E-04	62	4E-07	3E-06	3E-05	2E-04

HI = hazard index; CTE = central tendency estimate; RME = reasonably maximum exposure.
Orange highlight flags cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.
"x" denotes where the cancer risk from exposure to groundwater only and the exposure to soil only were < 1E-04, but the total cancer risk ≥ 1E-04.

Table 5-11. Risk Estimates for Hypothetical Future Construction Workers Exposed to OU3 Soils[a]

Exposure Unit	Exposure	Non-cancer HI		Cancer Risk	
	Route	CTE	RME	CTE	RME
Grid 26	Incidental Ingestion	3E-02	1E-01	4E-08	3E-07
	Dermal Contact	6E-04	4E-03	2E-09	2E-08
	Inhalation	2E-03	3E-03	1E-09	6E-12
	Total	4E-02	1E-01	4E-08	4E-07
Grid 27	Incidental Ingestion	1E-02	4E-02	1E-08	1E-07
	Dermal Contact	8E-05	5E-04	3E-10	4E-09
	Inhalation	5E-04	1E-03	7E-10	3E-12
	Total	1E-02	5E-02	1E-08	1E-07
Grid 28	Incidental Ingestion	1E-02	4E-02	1E-08	9E-08
	Dermal Contact	8E-05	5E-04	2E-10	3E-09
	Inhalation	4E-04	8E-04	6E-10	2E-12
	Total	1E-02	4E-02	1E-08	9E-08
Grid 29	Incidental Ingestion	1E-02	6E-02	2E-08	1E-07
	Dermal Contact	1E-04	8E-04	5E-10	6E-09
	Inhalation	7E-04	1E-03	9E-10	4E-12
	Total	1E-02	6E-02	2E-08	2E-07
Grid 30	Incidental Ingestion	1E-02	5E-02	2E-08	1E-07
	Dermal Contact	1E-04	6E-04	3E-10	4E-09
	Inhalation	5E-04	1E-03	8E-10	3E-12
	Total	1E-02	5E-02	2E-08	1E-07
Grid 31	Incidental Ingestion	1E-02	4E-02	2E-08	1E-07
	Dermal Contact	1E-04	8E-04	4E-10	5E-09
	Inhalation	5E-04	1E-03	7E-10	3E-12
	Total	1E-02	4E-02	2E-08	1E-07
Grid 32	Incidental Ingestion	1E-02	4E-02	1E-08	8E-08
	Dermal Contact	9E-05	5E-04	3E-10	3E-09
	Inhalation	4E-04	8E-04	5E-10	2E-12
	Total	1E-02	4E-02	1E-08	9E-08
Grid 33	Incidental Ingestion	2E-02	8E-02	2E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation	1E-03	3E-03	9E-10	3E-12
	Total	2E-02	9E-02	2E-08	2E-07
Grid 34	Incidental Ingestion	1E-02	5E-02	1E-08	1E-07
	Dermal Contact	1E-04	8E-04	4E-10	5E-09
	Inhalation	6E-04	1E-03	7E-10	3E-12
	Total	1E-02	5E-02	2E-08	1E-07
Grid 35	Incidental Ingestion	2E-02	8E-02	2E-08	1E-07
	Dermal Contact	2E-04	1E-03	5E-10	6E-09
	Inhalation	2E-03	3E-03	7E-10	3E-12
	Total	2E-02	9E-02	2E-08	1E-07

Table 5-11. Risk Estimates for Hypothetical Future Construction Workers Exposed to OU3 Soils[a]

Exposure Unit	Exposure	Non-cancer HI		Cancer Risk	
	Route	CTE	RME	CTE	RME
Grid 36	Incidental Ingestion	3E-02	1E-01	4E-08	3E-07
	Dermal Contact	4E-04	3E-03	1E-09	2E-08
	Inhalation	2E-03	3E-03	1E-09	6E-12
	Total	3E-02	1E-01	4E-08	3E-07
Grid 37	Incidental Ingestion	2E-02	7E-02	2E-08	2E-07
	Dermal Contact	2E-04	1E-03	6E-10	8E-09
	Inhalation	1E-03	2E-03	8E-10	3E-12
	Total	2E-02	7E-02	2E-08	2E-07
Grid 38	Incidental Ingestion	6E-03	2E-02	8E-09	6E-08
	Dermal Contact	8E-05	5E-04	3E-10	3E-09
	Inhalation	2E-04	4E-04	3E-10	1E-12
	Total	6E-03	2E-02	8E-09	6E-08
Grid 39	Incidental Ingestion	2E-02	6E-02	2E-08	2E-07
	Dermal Contact	2E-04	1E-03	6E-10	7E-09
	Inhalation	7E-04	1E-03	9E-10	4E-12
	Total	2E-02	7E-02	2E-08	2E-07
Grid 40	Incidental Ingestion	1E-02	4E-02	2E-08	1E-07
	Dermal Contact	1E-04	8E-04	4E-10	5E-09
	Inhalation	4E-04	9E-04	9E-10	4E-12
	Total	1E-02	4E-02	2E-08	2E-07
Grid 41	Incidental Ingestion	8E-03	3E-02	1E-08	1E-07
	Dermal Contact	1E-04	7E-04	4E-10	5E-09
	Inhalation	5E-04	9E-04	6E-10	2E-12
	Total	9E-03	3E-02	1E-08	1E-07
Grid 42	Incidental Ingestion	2E-02	1E-01	4E-08	3E-07
	Dermal Contact	3E-04	2E-03	9E-10	1E-08
	Inhalation	1E-03	2E-03	2E-09	7E-12
	Total	3E-02	1E-01	4E-08	3E-07
Grid 43	Incidental Ingestion	2E-02	7E-02	2E-08	2E-07
	Dermal Contact	2E-04	1E-03	8E-10	9E-09
	Inhalation	7E-04	1E-03	1E-09	4E-12
	Total	2E-02	7E-02	3E-08	2E-07
Grid 44	Incidental Ingestion	2E-02	8E-02	3E-08	2E-07
	Dermal Contact	4E-04	2E-03	1E-09	1E-08
	Inhalation	1E-03	2E-03	1E-09	4E-12
	Total	2E-02	9E-02	3E-08	2E-07
Grid 45	Incidental Ingestion	3E-02	1E-01	3E-08	2E-07
	Dermal Contact	2E-04	1E-03	8E-10	9E-09
	Inhalation	1E-03	2E-03	1E-09	6E-12
	Total	3E-02	1E-01	3E-08	3E-07

Table 5-11. Risk Estimates for Hypothetical Future Construction Workers Exposed to OU3 Soils[a]

Exposure Unit	Exposure	Non-cancer HI		Cancer Risk	
	Route	CTE	RME	CTE	RME
Grid 46	Incidental Ingestion	2E-02	8E-02	3E-08	2E-07
	Dermal Contact	2E-04	1E-03	6E-10	7E-09
	Inhalation	9E-04	2E-03	1E-09	5E-12
	Total	2E-02	8E-02	3E-08	2E-07
Grid 47	Incidental Ingestion	4E-02	2E-01	6E-08	5E-07
	Dermal Contact	1E-03	7E-03	3E-09	4E-08
	Inhalation	4E-03	7E-03	2E-09	7E-12
	Total	5E-02	2E-01	6E-08	5E-07
Grid 48	Incidental Ingestion	6E-02	3E-01	1E-07	1E-06
	Dermal Contact	2E-03	1E-02	4E-09	5E-08
	Inhalation	5E-03	1E-02	5E-09	2E-11
	Total	7E-02	3E-01	1E-07	1E-06
Grid 49	Incidental Ingestion	3E-02	1E-01	6E-08	5E-07
	Dermal Contact	4E-04	3E-03	2E-09	2E-08
	Inhalation	2E-03	4E-03	2E-09	9E-12
	Total	4E-02	1E-01	6E-08	5E-07
Grid 50	Incidental Ingestion	4E-02	2E-01	5E-08	4E-07
	Dermal Contact	8E-04	5E-03	2E-09	3E-08
	Inhalation	4E-03	7E-03	2E-09	8E-12
	Total	4E-02	2E-01	6E-08	5E-07
Grid 51	Incidental Ingestion	1E-02	4E-02	2E-08	1E-07
	Dermal Contact	2E-04	1E-03	6E-10	7E-09
	Inhalation	7E-04	1E-03	7E-10	3E-12
	Total	1E-02	5E-02	2E-08	1E-07
Grid 52	Incidental Ingestion	1E-02	4E-02	1E-08	1E-07
	Dermal Contact	1E-04	9E-04	5E-10	6E-09
	Inhalation	5E-04	1E-03	6E-10	2E-12
	Total	1E-02	4E-02	1E-08	1E-07
Grid 53	Incidental Ingestion	3E-02	1E-01	4E-08	3E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation	2E-03	3E-03	2E-09	7E-12
	Total	3E-02	1E-01	4E-08	3E-07
Grid 54	Incidental Ingestion	5E-02	2E-01	5E-08	4E-07
	Dermal Contact	1E-03	6E-03	3E-09	3E-08
	Inhalation	5E-03	1E-02	2E-09	7E-12
	Total	5E-02	2E-01	6E-08	4E-07
Grid 55	Incidental Ingestion	6E-02	2E-01	9E-08	7E-07
	Dermal Contact	1E-03	7E-03	4E-09	5E-08
	Inhalation	6E-03	1E-02	3E-09	1E-11
	Total	7E-02	3E-01	9E-08	7E-07

Table 5-11. Risk Estimates for Hypothetical Future Construction Workers Exposed to OU3 Soils[a]

Exposure Unit	Exposure	Non-cancer HI		Cancer Risk	
	Route	CTE	RME	CTE	RME
Grid 56	Incidental Ingestion	6E-02	2E-01	1E-07	8E-07
	Dermal Contact	1E-03	8E-03	4E-09	5E-08
	Inhalation	5E-03	1E-02	4E-09	2E-11
	Total	7E-02	3E-01	1E-07	9E-07
Grid 58	Incidental Ingestion	5E-02	2E-01	9E-08	7E-07
	Dermal Contact	1E-03	6E-03	4E-09	5E-08
	Inhalation	4E-03	8E-03	3E-09	1E-11
	Total	5E-02	2E-01	1E-07	8E-07
Grid 59	Incidental Ingestion	4E-02	2E-01	4E-08	4E-07
	Dermal Contact	7E-04	4E-03	2E-09	2E-08
	Inhalation	4E-03	9E-03	2E-09	7E-12
	Total	5E-02	2E-01	5E-08	4E-07
Grid 60	Incidental Ingestion	3E-02	1E-01	3E-08	3E-07
	Dermal Contact	5E-04	3E-03	1E-09	2E-08
	Inhalation	3E-03	5E-03	1E-09	5E-12
	Total	3E-02	1E-01	3E-08	3E-07
Grid 61	Incidental Ingestion	2E-02	9E-02	3E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation	2E-03	3E-03	1E-09	4E-12
	Total	2E-02	9E-02	3E-08	2E-07
Grid 62	Incidental Ingestion	2E-02	7E-02	2E-08	2E-07
	Dermal Contact	2E-04	1E-03	6E-10	8E-09
	Inhalation	1E-03	2E-03	9E-10	4E-12
	Total	2E-02	7E-02	2E-08	2E-07
Grid 64	Incidental Ingestion	2E-02	9E-02	3E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation	2E-03	3E-03	1E-09	4E-12
	Total	2E-02	9E-02	3E-08	2E-07
Grid 65	Incidental Ingestion	4E-02	1E-01	5E-08	4E-07
	Dermal Contact	5E-04	3E-03	1E-09	2E-08
	Inhalation	4E-03	8E-03	2E-09	8E-12
	Total	4E-02	2E-01	5E-08	4E-07
Grid 66	Incidental Ingestion	2E-02	7E-02	2E-08	2E-07
	Dermal Contact	3E-04	2E-03	8E-10	1E-08
	Inhalation	2E-03	3E-03	1E-09	4E-12
	Total	2E-02	8E-02	2E-08	2E-07
Grid 67	Incidental Ingestion	5E-02	2E-01	8E-08	7E-07
	Dermal Contact	1E-03	9E-03	5E-09	6E-08
	Inhalation	5E-03	1E-02	2E-09	6E-12
	Total	6E-02	2E-01	9E-08	7E-07

Table 5-11. Risk Estimates for Hypothetical Future Construction Workers Exposed to OU3 Soils[a]

Exposure Unit	Exposure	Non-cancer HI		Cancer Risk	
	Route	CTE	RME	CTE	RME
Grid 68	Incidental Ingestion	5E-02	2E-01	8E-08	7E-07
	Dermal Contact	1E-03	9E-03	5E-09	6E-08
	Inhalation	5E-03	1E-02	2E-09	6E-12
	Total	6E-02	2E-01	9E-08	7E-07
Grid 70	Incidental Ingestion	3E-02	1E-01	3E-08	3E-07
	Dermal Contact	6E-04	3E-03	2E-09	2E-08
	Inhalation	3E-03	6E-03	1E-09	5E-12
	Total	3E-02	1E-01	4E-08	3E-07
Grid 71	Incidental Ingestion	2E-02	9E-02	5E-08	4E-07
	Dermal Contact	5E-04	3E-03	1E-09	2E-08
	Inhalation	2E-03	4E-03	2E-09	1E-11
	Total	3E-02	1E-01	6E-08	5E-07
Grid 72	Incidental Ingestion	4E-02	2E-01	5E-08	4E-07
	Dermal Contact	7E-04	4E-03	2E-09	3E-08
	Inhalation	6E-03	1E-02	2E-09	6E-12
	Total	5E-02	2E-01	5E-08	4E-07
Grid 74	Incidental Ingestion	1E-01	4E-01	2E-07	2E-06
	Dermal Contact	4E-03	2E-02	2E-08	2E-07
	Inhalation	7E-03	1E-02	3E-09	1E-11
	Total	1E-01	4E-01	2E-07	2E-06
Grid 75	Incidental Ingestion	2E-02	1E-01	3E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation	1E-03	3E-03	1E-09	4E-12
	Total	3E-02	1E-01	3E-08	2E-07
Grid 76	Incidental Ingestion	1E-02	5E-02	2E-08	1E-07
	Dermal Contact	2E-04	1E-03	7E-10	9E-09
	Inhalation	7E-04	1E-03	7E-10	3E-12
	Total	1E-02	6E-02	2E-08	2E-07
Grid 77	Incidental Ingestion	1E-02	5E-02	2E-08	1E-07
	Dermal Contact	2E-04	1E-03	7E-10	9E-09
	Inhalation	7E-04	1E-03	7E-10	3E-12
	Total	1E-02	6E-02	2E-08	2E-07
Grid 78	Incidental Ingestion	2E-02	1E-01	3E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation	1E-03	3E-03	1E-09	4E-12
	Total	3E-02	1E-01	3E-08	2E-07
Grid 79	Incidental Ingestion	1E-02	5E-02	2E-08	1E-07
	Dermal Contact	2E-04	1E-03	7E-10	9E-09
	Inhalation	7E-04	1E-03	7E-10	3E-12
	Total	1E-02	6E-02	2E-08	2E-07

Table 5-11. Risk Estimates for Hypothetical Future Construction Workers Exposed to OU3 Soils[a]

Exposure Unit	Exposure	Non-cancer HI		Cancer Risk	
	Route	CTE	RME	CTE	RME
Grid 80	Incidental Ingestion	1E-02	5E-02	2E-08	1E-07
	Dermal Contact	2E-04	1E-03	7E-10	9E-09
	Inhalation	7E-04	1E-03	7E-10	3E-12
	Total	1E-02	6E-02	2E-08	2E-07
Grid 81	Incidental Ingestion	2E-02	7E-02	2E-08	2E-07
	Dermal Contact	4E-04	2E-03	1E-09	1E-08
	Inhalation	1E-03	2E-03	7E-10	3E-12
	Total	2E-02	7E-02	2E-08	2E-07
Grid 85	Incidental Ingestion	7E-03	3E-02	9E-09	7E-08
	Dermal Contact	1E-04	9E-04	5E-10	6E-09
	Inhalation	3E-04	6E-04	3E-10	1E-12
	Total	7E-03	3E-02	1E-08	8E-08
Grid 86	Incidental Ingestion	3E-02	1E-01	4E-08	3E-07
	Dermal Contact	3E-04	2E-03	1E-09	2E-08
	Inhalation	2E-03	4E-03	1E-09	6E-12
	Total	3E-02	1E-01	4E-08	3E-07
Grid 87	Incidental Ingestion	2E-02	8E-02	3E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation	1E-03	2E-03	1E-09	4E-12
	Total	2E-02	8E-02	3E-08	2E-07
Grid 88	Incidental Ingestion	3E-02	1E-01	6E-08	5E-07
	Dermal Contact	6E-04	3E-03	2E-09	3E-08
	Inhalation	2E-03	4E-03	2E-09	8E-12
	Total	3E-02	1E-01	7E-08	5E-07
Grid 89	Incidental Ingestion	2E-02	1E-01	3E-08	3E-07
	Dermal Contact	4E-04	2E-03	1E-09	2E-08
	Inhalation	1E-03	3E-03	1E-09	5E-12
	Total	3E-02	1E-01	4E-08	3E-07
Grid 90	Incidental Ingestion	4E-02	2E-01	8E-08	6E-07
	Dermal Contact	1E-03	6E-03	4E-09	4E-08
	Inhalation	3E-03	7E-03	2E-09	9E-12
	Total	5E-02	2E-01	8E-08	6E-07
Grid 91	Incidental Ingestion	3E-02	1E-01	5E-08	4E-07
	Dermal Contact	6E-04	4E-03	2E-09	2E-08
	Inhalation	2E-03	3E-03	2E-09	8E-12
	Total	3E-02	1E-01	6E-08	5E-07
Grid 93	Incidental Ingestion	4E-02	1E-01	6E-08	5E-07
	Dermal Contact	8E-04	5E-03	3E-09	3E-08
	Inhalation	3E-03	6E-03	2E-09	8E-12
	Total	4E-02	2E-01	7E-08	5E-07

Table 5-11. Risk Estimates for Hypothetical Future Construction Workers Exposed to OU3 Soils[a]

Exposure Unit	Exposure	Non-cancer HI		Cancer Risk	
	Route	CTE	RME	CTE	RME
Grid 94	Incidental Ingestion	2E-02	9E-02	4E-08	3E-07
	Dermal Contact	4E-04	2E-03	1E-09	2E-08
	Inhalation	1E-03	3E-03	2E-09	6E-12
	Total	2E-02	1E-01	4E-08	3E-07
Grid 95	Incidental Ingestion	3E-02	1E-01	4E-08	3E-07
	Dermal Contact	5E-04	3E-03	2E-09	2E-08
	Inhalation	2E-03	5E-03	1E-09	6E-12
	Total	3E-02	1E-01	4E-08	4E-07
Grid 97	Incidental Ingestion	1E-02	4E-02	2E-08	1E-07
	Dermal Contact	2E-04	1E-03	5E-10	6E-09
	Inhalation	4E-04	9E-04	7E-10	3E-12
	Total	1E-02	4E-02	2E-08	1E-07
Grid 98	Incidental Ingestion	3E-02	1E-01	4E-08	3E-07
	Dermal Contact	4E-04	2E-03	1E-09	2E-08
	Inhalation	1E-03	2E-03	1E-09	6E-12
	Total	3E-02	1E-01	4E-08	3E-07

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.

[a]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

Table 5-12. Risk Estimates for Hikers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 26	Incidental Ingestion	1E-02	4E-02	3E-07	2E-06
	Dermal Contact	8E-05	1E-03	7E-09	2E-07
	Total	1E-02	4E-02	3E-07	2E-06
Grid 27	Incidental Ingestion	4E-03	1E-02	9E-08	7E-07
	Dermal Contact	2E-05	2E-04	8E-10	2E-08
	Total	4E-03	1E-02	9E-08	7E-07
Grid 28	Incidental Ingestion	3E-03	1E-02	7E-08	5E-07
	Dermal Contact	9E-06	1E-04	7E-10	2E-08
	Total	3E-03	1E-02	7E-08	6E-07
Grid 29	Incidental Ingestion	5E-03	2E-02	1E-07	9E-07
	Dermal Contact	2E-05	3E-04	1E-09	4E-08
	Total	5E-03	2E-02	1E-07	9E-07
Grid 30	Incidental Ingestion	4E-03	2E-02	1E-07	8E-07
	Dermal Contact	1E-05	2E-04	9E-10	3E-08
	Total	4E-03	2E-02	1E-07	8E-07
Grid 31	Incidental Ingestion	4E-03	2E-02	1E-07	8E-07
	Dermal Contact	2E-05	2E-04	1E-09	4E-08
	Total	4E-03	2E-02	1E-07	9E-07
Grid 32	Incidental Ingestion	3E-03	1E-02	7E-08	5E-07
	Dermal Contact	1E-05	1E-04	8E-10	2E-08
	Total	3E-03	1E-02	7E-08	5E-07
Grid 33	Incidental Ingestion	6E-03	2E-02	1E-07	1E-06
	Dermal Contact	3E-05	4E-04	3E-09	8E-08
	Total	6E-03	2E-02	1E-07	1E-06
Grid 34	Incidental Ingestion	4E-03	2E-02	9E-08	7E-07
	Dermal Contact	1E-05	2E-04	1E-09	3E-08
	Total	4E-03	2E-02	9E-08	7E-07
Grid 35	Incidental Ingestion	6E-03	2E-02	1E-07	8E-07
	Dermal Contact	2E-05	2E-04	1E-09	4E-08
	Total	6E-03	2E-02	1E-07	8E-07
Grid 36	Incidental Ingestion	9E-03	3E-02	2E-07	2E-06
	Dermal Contact	7E-05	9E-04	4E-09	1E-07
	Total	9E-03	3E-02	2E-07	2E-06
Grid 37	Incidental Ingestion	5E-03	2E-02	1E-07	9E-07
	Dermal Contact	2E-05	3E-04	2E-09	5E-08
	Total	5E-03	2E-02	1E-07	9E-07
Grid 38[b]	Incidental Ingestion	2E-03	7E-03	5E-08	4E-07
	Dermal Contact	1E-05	2E-04	8E-10	2E-08
	Total	2E-03	7E-03	5E-08	4E-07
Grid 39	Incidental Ingestion	5E-03	2E-02	1E-07	1E-06
	Dermal Contact	2E-05	3E-04	2E-09	5E-08
	Total	5E-03	2E-02	1E-07	1E-06
Grid 40	Incidental Ingestion	3E-03	1E-02	1E-07	9E-07
	Dermal Contact	2E-05	3E-04	1E-09	3E-08
	Total	3E-03	1E-02	1E-07	9E-07

Table 5-12. Risk Estimates for Hikers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 41	Incidental Ingestion	3E-03	1E-02	9E-08	7E-07
	Dermal Contact	2E-05	3E-04	1E-09	3E-08
	Total	3E-03	1E-02	9E-08	7E-07
Grid 42	Incidental Ingestion	8E-03	3E-02	2E-07	2E-06
	Dermal Contact	5E-05	6E-04	3E-09	7E-08
	Total	8E-03	3E-02	2E-07	2E-06
Grid 43	Incidental Ingestion	5E-03	2E-02	2E-07	1E-06
	Dermal Contact	3E-05	5E-04	2E-09	6E-08
	Total	5E-03	2E-02	2E-07	1E-06
Grid 44	Incidental Ingestion	6E-03	2E-02	2E-07	1E-06
	Dermal Contact	4E-05	6E-04	3E-09	9E-08
	Total	6E-03	2E-02	2E-07	1E-06
Grid 45[b]	Incidental Ingestion	9E-03	3E-02	2E-07	1E-06
	Dermal Contact	2E-05	3E-04	2E-09	6E-08
	Total	9E-03	3E-02	2E-07	1E-06
Grid 46	Incidental Ingestion	7E-03	3E-02	2E-07	1E-06
	Dermal Contact	3E-05	4E-04	2E-09	5E-08
	Total	7E-03	3E-02	2E-07	1E-06
Grid 47	Incidental Ingestion	1E-02	5E-02	4E-07	3E-06
	Dermal Contact	2E-04	2E-03	1E-08	3E-07
	Total	1E-02	5E-02	4E-07	3E-06
Grid 48	Incidental Ingestion	2E-02	8E-02	8E-07	6E-06
	Dermal Contact	3E-04	4E-03	1E-08	4E-07
	Total	2E-02	9E-02	8E-07	6E-06
Grid 49	Incidental Ingestion	1E-02	6E-02	4E-07	3E-06
	Dermal Contact	2E-04	2E-03	5E-09	1E-07
	Total	1E-02	6E-02	4E-07	3E-06
Grid 50	Incidental Ingestion	1E-02	5E-02	3E-07	3E-06
	Dermal Contact	1E-04	2E-03	7E-09	2E-07
	Total	1E-02	5E-02	4E-07	3E-06
Grid 51	Incidental Ingestion	3E-03	1E-02	1E-07	8E-07
	Dermal Contact	3E-05	4E-04	2E-09	5E-08
	Total	3E-03	1E-02	1E-07	9E-07
Grid 52	Incidental Ingestion	3E-03	1E-02	8E-08	6E-07
	Dermal Contact	2E-05	3E-04	1E-09	4E-08
	Total	3E-03	1E-02	8E-08	7E-07
Grid 53	Incidental Ingestion	1E-02	4E-02	3E-07	2E-06
	Dermal Contact	9E-05	1E-03	3E-09	9E-08
	Total	1E-02	4E-02	3E-07	2E-06
Grid 54	Incidental Ingestion	1E-02	5E-02	4E-07	3E-06
	Dermal Contact	1E-04	2E-03	8E-09	2E-07
	Total	1E-02	6E-02	4E-07	3E-06
Grid 55	Incidental Ingestion	2E-02	9E-02	6E-07	5E-06
	Dermal Contact	3E-04	4E-03	1E-08	3E-07
	Total	2E-02	9E-02	6E-07	5E-06
Grid 56	Incidental Ingestion	2E-02	8E-02	7E-07	5E-06
	Dermal Contact	3E-04	4E-03	1E-08	3E-07
	Total	2E-02	9E-02	7E-07	5E-06

Table 5-12. Risk Estimates for Hikers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 58	Incidental Ingestion	2E-02	8E-02	6E-07	5E-06
	Dermal Contact	4E-04	5E-03	1E-08	4E-07
	Total	2E-02	9E-02	7E-07	5E-06
Grid 59	Incidental Ingestion	1E-02	5E-02	3E-07	2E-06
	Dermal Contact	1E-04	1E-03	5E-09	1E-07
	Total	1E-02	5E-02	3E-07	2E-06
Grid 60	Incidental Ingestion	8E-03	3E-02	2E-07	2E-06
	Dermal Contact	6E-05	9E-04	4E-09	1E-07
	Total	8E-03	3E-02	2E-07	2E-06
Grid 61	Incidental Ingestion	7E-03	3E-02	2E-07	1E-06
	Dermal Contact	5E-05	7E-04	3E-09	8E-08
	Total	7E-03	3E-02	2E-07	1E-06
Grid 62	Incidental Ingestion	5E-03	2E-02	1E-07	9E-07
	Dermal Contact	2E-05	3E-04	2E-09	5E-08
	Total	5E-03	2E-02	1E-07	1E-06
Grid 64	Incidental Ingestion	8E-03	3E-02	2E-07	1E-06
	Dermal Contact	7E-05	1E-03	3E-09	8E-08
	Total	8E-03	3E-02	2E-07	1E-06
Grid 65[b]	Incidental Ingestion	1E-02	4E-02	3E-07	2E-06
	Dermal Contact	8E-05	1E-03	4E-09	1E-07
	Total	1E-02	4E-02	3E-07	2E-06
Grid 66	Incidental Ingestion	5E-03	2E-02	1E-07	1E-06
	Dermal Contact	3E-05	4E-04	2E-09	6E-08
	Total	5E-03	2E-02	1E-07	1E-06
Grid 67	Incidental Ingestion	2E-02	9E-02	5E-07	4E-06
	Dermal Contact	4E-04	5E-03	2E-08	4E-07
	Total	2E-02	9E-02	5E-07	4E-06
Grid 68	Incidental Ingestion	2E-02	9E-02	5E-07	4E-06
	Dermal Contact	4E-04	5E-03	2E-08	4E-07
	Total	2E-02	9E-02	5E-07	4E-06
Grid 70	Incidental Ingestion	7E-03	3E-02	2E-07	2E-06
	Dermal Contact	6E-05	8E-04	4E-09	1E-07
	Total	7E-03	3E-02	2E-07	2E-06
Grid 71	Incidental Ingestion	6E-03	2E-02	4E-07	3E-06
	Dermal Contact	5E-05	7E-04	4E-09	1E-07
	Total	6E-03	2E-02	4E-07	3E-06
Grid 72	Incidental Ingestion	1E-02	5E-02	3E-07	2E-06
	Dermal Contact	1E-04	2E-03	6E-09	2E-07
	Total	1E-02	5E-02	3E-07	2E-06
Grid 74	Incidental Ingestion	6E-02	2E-01	1E-06	1E-05
	Dermal Contact	1E-03	2E-02	5E-08	1E-06
	Total	6E-02	2E-01	1E-06	1E-05
Grid 75	Incidental Ingestion	8E-03	3E-02	2E-07	1E-06
	Dermal Contact	3E-05	4E-04	3E-09	8E-08
	Total	8E-03	3E-02	2E-07	1E-06
Grid 76	Incidental Ingestion	4E-03	2E-02	1E-07	9E-07
	Dermal Contact	3E-05	4E-04	2E-09	6E-08
	Total	4E-03	2E-02	1E-07	1E-06

Table 5-12. Risk Estimates for Hikers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 77	Incidental Ingestion	4E-03	2E-02	1E-07	9E-07
	Dermal Contact	3E-05	4E-04	2E-09	6E-08
	Total	4E-03	2E-02	1E-07	1E-06
Grid 78	Incidental Ingestion	8E-03	3E-02	2E-07	1E-06
	Dermal Contact	3E-05	4E-04	3E-09	8E-08
	Total	8E-03	3E-02	2E-07	1E-06
Grid 79	Incidental Ingestion	4E-03	2E-02	1E-07	9E-07
	Dermal Contact	3E-05	4E-04	2E-09	6E-08
	Total	4E-03	2E-02	1E-07	1E-06
Grid 80	Incidental Ingestion	4E-03	2E-02	1E-07	9E-07
	Dermal Contact	3E-05	4E-04	2E-09	6E-08
	Total	4E-03	2E-02	1E-07	1E-06
Grid 81	Incidental Ingestion	5E-03	2E-02	1E-07	1E-06
	Dermal Contact	3E-05	5E-04	3E-09	9E-08
	Total	5E-03	2E-02	1E-07	1E-06
Grid 85[b]	Incidental Ingestion	2E-03	8E-03	6E-08	4E-07
	Dermal Contact	1E-05	2E-04	1E-09	4E-08
	Total	2E-03	9E-03	6E-08	5E-07
Grid 86	Incidental Ingestion	1E-02	5E-02	3E-07	2E-06
	Dermal Contact	9E-05	1E-03	4E-09	1E-07
	Total	1E-02	5E-02	3E-07	2E-06
Grid 87	Incidental Ingestion	8E-03	3E-02	2E-07	2E-06
	Dermal Contact	6E-05	8E-04	4E-09	1E-07
	Total	8E-03	3E-02	2E-07	2E-06
Grid 88	Incidental Ingestion	1E-02	5E-02	4E-07	3E-06
	Dermal Contact	2E-04	3E-03	7E-09	2E-07
	Total	1E-02	5E-02	4E-07	3E-06
Grid 89	Incidental Ingestion	8E-03	3E-02	2E-07	2E-06
	Dermal Contact	7E-05	9E-04	4E-09	1E-07
	Total	8E-03	3E-02	2E-07	2E-06
Grid 90	Incidental Ingestion	2E-02	6E-02	5E-07	4E-06
	Dermal Contact	2E-04	3E-03	1E-08	3E-07
	Total	2E-02	7E-02	5E-07	4E-06
Grid 91	Incidental Ingestion	1E-02	4E-02	3E-07	3E-06
	Dermal Contact	1E-04	2E-03	6E-09	2E-07
	Total	1E-02	5E-02	3E-07	3E-06
Grid 93	Incidental Ingestion	1E-02	5E-02	4E-07	3E-06
	Dermal Contact	2E-04	3E-03	8E-09	2E-07
	Total	1E-02	6E-02	4E-07	3E-06
Grid 94	Incidental Ingestion	9E-03	3E-02	3E-07	2E-06
	Dermal Contact	1E-04	1E-03	4E-09	1E-07
	Total	9E-03	4E-02	3E-07	2E-06
Grid 95	Incidental Ingestion	1E-02	4E-02	3E-07	2E-06
	Dermal Contact	1E-04	1E-03	5E-09	1E-07
	Total	1E-02	4E-02	3E-07	2E-06
Grid 97	Incidental Ingestion	3E-03	1E-02	1E-07	8E-07
	Dermal Contact	2E-05	3E-04	1E-09	4E-08
	Total	3E-03	1E-02	1E-07	8E-07
Grid 98	Incidental Ingestion	9E-03	3E-02	2E-07	2E-06
	Dermal Contact	8E-05	1E-03	4E-09	1E-07
	Total	9E-03	3E-02	3E-07	2E-06

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.

[a]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

[b]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

Table 5-13. Risk Estimates for Campers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 26	Incidental Ingestion	9E-02	3E-01	5E-06	1E-05
	Dermal Contact	6E-04	5E-03	1E-08	2E-07
	Total	9E-02	3E-01	5E-06	1E-05
Grid 27	Incidental Ingestion	3E-02	9E-02	2E-06	6E-06
	Dermal Contact	1E-04	9E-04	1E-09	2E-08
	Total	3E-02	9E-02	2E-06	6E-06
Grid 28	Incidental Ingestion	3E-02	8E-02	2E-06	6E-06
	Dermal Contact	7E-05	5E-04	1E-09	2E-08
	Total	3E-02	8E-02	2E-06	6E-06
Grid 29	Incidental Ingestion	4E-02	1E-01	3E-06	9E-06
	Dermal Contact	2E-04	1E-03	2E-09	3E-08
	Total	4E-02	1E-01	3E-06	9E-06
Grid 30	Incidental Ingestion	3E-02	1E-01	3E-06	8E-06
	Dermal Contact	1E-04	8E-04	1E-09	2E-08
	Total	3E-02	1E-01	3E-06	8E-06
Grid 31	Incidental Ingestion	3E-02	9E-02	3E-06	9E-06
	Dermal Contact	1E-04	9E-04	2E-09	3E-08
	Total	3E-02	1E-01	3E-06	9E-06
Grid 32	Incidental Ingestion	2E-02	7E-02	2E-06	5E-06
	Dermal Contact	7E-05	6E-04	1E-09	2E-08
	Total	2E-02	7E-02	2E-06	5E-06
Grid 33	Incidental Ingestion	5E-02	2E-01	4E-06	1E-05
	Dermal Contact	2E-04	2E-03	4E-09	7E-08
	Total	5E-02	2E-01	4E-06	1E-05
Grid 34	Incidental Ingestion	3E-02	1E-01	2E-06	7E-06
	Dermal Contact	1E-04	8E-04	2E-09	3E-08
	Total	3E-02	1E-01	2E-06	7E-06
Grid 35	Incidental Ingestion	5E-02	1E-01	3E-06	8E-06
	Dermal Contact	1E-04	1E-03	2E-09	3E-08
	Total	5E-02	2E-01	3E-06	8E-06
Grid 36	Incidental Ingestion	7E-02	2E-01	6E-06	2E-05
	Dermal Contact	5E-04	4E-03	6E-09	9E-08
	Total	7E-02	2E-01	6E-06	2E-05
Grid 37	Incidental Ingestion	4E-02	1E-01	3E-06	1E-05
	Dermal Contact	2E-04	1E-03	3E-09	4E-08
	Total	4E-02	1E-01	3E-06	1E-05
Grid 38[b]	Incidental Ingestion	2E-02	5E-02	1E-06	4E-06
	Dermal Contact	1E-04	8E-04	1E-09	2E-08
	Total	2E-02	5E-02	1E-06	4E-06
Grid 39	Incidental Ingestion	4E-02	1E-01	4E-06	1E-05
	Dermal Contact	2E-04	1E-03	3E-09	4E-08
	Total	4E-02	1E-01	4E-06	1E-05
Grid 40	Incidental Ingestion	3E-02	8E-02	3E-06	9E-06
	Dermal Contact	2E-04	1E-03	2E-09	3E-08
	Total	3E-02	8E-02	3E-06	9E-06

Table 5-13. Risk Estimates for Campers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 41	Incidental Ingestion	2E-02	7E-02	3E-06	8E-06
	Dermal Contact	2E-04	1E-03	2E-09	3E-08
	Total	2E-02	7E-02	3E-06	8E-06
Grid 42	Incidental Ingestion	6E-02	2E-01	6E-06	2E-05
	Dermal Contact	4E-04	3E-03	4E-09	6E-08
	Total	7E-02	2E-01	6E-06	2E-05
Grid 43	Incidental Ingestion	4E-02	1E-01	4E-06	1E-05
	Dermal Contact	3E-04	2E-03	3E-09	5E-08
	Total	4E-02	1E-01	4E-06	1E-05
Grid 44	Incidental Ingestion	5E-02	1E-01	4E-06	1E-05
	Dermal Contact	3E-04	2E-03	5E-09	7E-08
	Total	5E-02	1E-01	4E-06	1E-05
Grid 45[b]	Incidental Ingestion	7E-02	2E-01	5E-06	2E-05
	Dermal Contact	2E-04	1E-03	3E-09	5E-08
	Total	7E-02	2E-01	5E-06	2E-05
Grid 46	Incidental Ingestion	6E-02	2E-01	5E-06	1E-05
	Dermal Contact	2E-04	2E-03	3E-09	4E-08
	Total	6E-02	2E-01	5E-06	1E-05
Grid 47	Incidental Ingestion	1E-01	3E-01	1E-05	3E-05
	Dermal Contact	1E-03	9E-03	2E-08	2E-07
	Total	1E-01	3E-01	1E-05	3E-05
Grid 48	Incidental Ingestion	2E-01	5E-01	2E-05	6E-05
	Dermal Contact	2E-03	2E-02	2E-08	3E-07
	Total	2E-01	5E-01	2E-05	6E-05
Grid 49	Incidental Ingestion	1E-01	4E-01	1E-05	3E-05
	Dermal Contact	1E-03	9E-03	8E-09	1E-07
	Total	1E-01	4E-01	1E-05	3E-05
Grid 50	Incidental Ingestion	1E-01	3E-01	1E-05	3E-05
	Dermal Contact	1E-03	8E-03	1E-08	2E-07
	Total	1E-01	3E-01	1E-05	3E-05
Grid 51	Incidental Ingestion	3E-02	8E-02	3E-06	9E-06
	Dermal Contact	2E-04	2E-03	3E-09	4E-08
	Total	3E-02	8E-02	3E-06	9E-06
Grid 52	Incidental Ingestion	3E-02	8E-02	2E-06	7E-06
	Dermal Contact	2E-04	1E-03	2E-09	3E-08
	Total	3E-02	8E-02	2E-06	7E-06
Grid 53	Incidental Ingestion	8E-02	2E-01	7E-06	2E-05
	Dermal Contact	7E-04	5E-03	5E-09	7E-08
	Total	8E-02	3E-01	7E-06	2E-05
Grid 54	Incidental Ingestion	1E-01	3E-01	1E-05	3E-05
	Dermal Contact	1E-03	8E-03	1E-08	2E-07
	Total	1E-01	3E-01	1E-05	3E-05
Grid 55	Incidental Ingestion	2E-01	5E-01	2E-05	5E-05
	Dermal Contact	2E-03	2E-02	2E-08	3E-07
	Total	2E-01	6E-01	2E-05	5E-05
Grid 56	Incidental Ingestion	2E-01	5E-01	2E-05	6E-05
	Dermal Contact	2E-03	2E-02	2E-08	3E-07
	Total	2E-01	5E-01	2E-05	6E-05

Table 5-13. Risk Estimates for Campers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 58	Incidental Ingestion	2E-01	5E-01	2E-05	5E-05
	Dermal Contact	3E-03	2E-02	2E-08	3E-07
	Total	2E-01	6E-01	2E-05	5E-05
Grid 59	Incidental Ingestion	1E-01	3E-01	8E-06	2E-05
	Dermal Contact	8E-04	6E-03	8E-09	1E-07
	Total	1E-01	3E-01	8E-06	2E-05
Grid 60	Incidental Ingestion	7E-02	2E-01	5E-06	2E-05
	Dermal Contact	5E-04	4E-03	6E-09	9E-08
	Total	7E-02	2E-01	5E-06	2E-05
Grid 61	Incidental Ingestion	5E-02	2E-01	4E-06	1E-05
	Dermal Contact	4E-04	3E-03	4E-09	7E-08
	Total	5E-02	2E-01	4E-06	1E-05
Grid 62	Incidental Ingestion	4E-02	1E-01	3E-06	1E-05
	Dermal Contact	2E-04	1E-03	3E-09	4E-08
	Total	4E-02	1E-01	3E-06	1E-05
Grid 64	Incidental Ingestion	7E-02	2E-01	5E-06	1E-05
	Dermal Contact	6E-04	4E-03	5E-09	7E-08
	Total	7E-02	2E-01	5E-06	1E-05
Grid 65[b]	Incidental Ingestion	9E-02	3E-01	8E-06	2E-05
	Dermal Contact	6E-04	5E-03	6E-09	9E-08
	Total	9E-02	3E-01	8E-06	2E-05
Grid 66	Incidental Ingestion	4E-02	1E-01	4E-06	1E-05
	Dermal Contact	2E-04	2E-03	4E-09	5E-08
	Total	4E-02	1E-01	4E-06	1E-05
Grid 67	Incidental Ingestion	2E-01	5E-01	1E-05	4E-05
	Dermal Contact	3E-03	2E-02	2E-08	4E-07
	Total	2E-01	6E-01	1E-05	4E-05
Grid 68	Incidental Ingestion	2E-01	5E-01	1E-05	4E-05
	Dermal Contact	3E-03	2E-02	2E-08	4E-07
	Total	2E-01	6E-01	1E-05	4E-05
Grid 70	Incidental Ingestion	6E-02	2E-01	6E-06	2E-05
	Dermal Contact	5E-04	4E-03	7E-09	1E-07
	Total	6E-02	2E-01	6E-06	2E-05
Grid 71	Incidental Ingestion	5E-02	1E-01	1E-05	3E-05
	Dermal Contact	4E-04	3E-03	6E-09	1E-07
	Total	5E-02	1E-01	1E-05	3E-05
Grid 72	Incidental Ingestion	1E-01	3E-01	8E-06	2E-05
	Dermal Contact	1E-03	7E-03	1E-08	1E-07
	Total	1E-01	3E-01	8E-06	2E-05
Grid 74	Incidental Ingestion	5E-01	1E+00	4E-05	1E-04
	Dermal Contact	1E-02	7E-02	7E-08	1E-06
	Total	5E-01	1E+00	4E-05	1E-04
Grid 75	Incidental Ingestion	6E-02	2E-01	5E-06	1E-05
	Dermal Contact	3E-04	2E-03	5E-09	7E-08
	Total	6E-02	2E-01	5E-06	1E-05
Grid 76	Incidental Ingestion	4E-02	1E-01	3E-06	1E-05
	Dermal Contact	2E-04	2E-03	3E-09	5E-08
	Total	4E-02	1E-01	3E-06	1E-05

Table 5-13. Risk Estimates for Campers Exposed to OU3 Surface Soils[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 77	Incidental Ingestion	4E-02	1E-01	3E-06	1E-05
	Dermal Contact	2E-04	2E-03	3E-09	5E-08
	Total	4E-02	1E-01	3E-06	1E-05
Grid 78	Incidental Ingestion	6E-02	2E-01	5E-06	1E-05
	Dermal Contact	3E-04	2E-03	5E-09	7E-08
	Total	6E-02	2E-01	5E-06	1E-05
Grid 79	Incidental Ingestion	4E-02	1E-01	3E-06	1E-05
	Dermal Contact	2E-04	2E-03	3E-09	5E-08
	Total	4E-02	1E-01	3E-06	1E-05
Grid 80	Incidental Ingestion	4E-02	1E-01	3E-06	1E-05
	Dermal Contact	2E-04	2E-03	3E-09	5E-08
	Total	4E-02	1E-01	3E-06	1E-05
Grid 81	Incidental Ingestion	4E-02	1E-01	4E-06	1E-05
	Dermal Contact	3E-04	2E-03	5E-09	7E-08
	Total	4E-02	1E-01	4E-06	1E-05
Grid 85[b]	Incidental Ingestion	2E-02	5E-02	2E-06	5E-06
	Dermal Contact	1E-04	9E-04	2E-09	3E-08
	Total	2E-02	5E-02	2E-06	5E-06
Grid 86	Incidental Ingestion	1E-01	3E-01	7E-06	2E-05
	Dermal Contact	7E-04	5E-03	7E-09	1E-07
	Total	1E-01	3E-01	7E-06	2E-05
Grid 87	Incidental Ingestion	6E-02	2E-01	6E-06	2E-05
	Dermal Contact	4E-04	3E-03	6E-09	8E-08
	Total	6E-02	2E-01	6E-06	2E-05
Grid 88	Incidental Ingestion	1E-01	3E-01	1E-05	3E-05
	Dermal Contact	2E-03	1E-02	1E-08	2E-07
	Total	1E-01	3E-01	1E-05	3E-05
Grid 89	Incidental Ingestion	7E-02	2E-01	6E-06	2E-05
	Dermal Contact	5E-04	4E-03	6E-09	9E-08
	Total	7E-02	2E-01	6E-06	2E-05
Grid 90	Incidental Ingestion	1E-01	4E-01	1E-05	4E-05
	Dermal Contact	2E-03	1E-02	2E-08	2E-07
	Total	1E-01	4E-01	1E-05	4E-05
Grid 91	Incidental Ingestion	9E-02	3E-01	9E-06	3E-05
	Dermal Contact	9E-04	7E-03	9E-09	1E-07
	Total	9E-02	3E-01	9E-06	3E-05
Grid 93	Incidental Ingestion	1E-01	3E-01	1E-05	3E-05
	Dermal Contact	2E-03	1E-02	1E-08	2E-07
	Total	1E-01	4E-01	1E-05	3E-05
Grid 94	Incidental Ingestion	7E-02	2E-01	7E-06	2E-05
	Dermal Contact	8E-04	6E-03	6E-09	1E-07
	Total	7E-02	2E-01	7E-06	2E-05
Grid 95	Incidental Ingestion	8E-02	2E-01	7E-06	2E-05
	Dermal Contact	8E-04	6E-03	8E-09	1E-07
	Total	8E-02	2E-01	7E-06	2E-05
Grid 97	Incidental Ingestion	2E-02	7E-02	3E-06	8E-06
	Dermal Contact	2E-04	1E-03	2E-09	3E-08
	Total	2E-02	7E-02	3E-06	8E-06
Grid 98	Incidental Ingestion	7E-02	2E-01	7E-06	2E-05
	Dermal Contact	6E-04	5E-03	7E-09	1E-07
	Total	7E-02	2E-01	7E-06	2E-05

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.
Non-cancer hazards are based on the young child (assumed protective of an adult).

[a]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥1E-05.

[b]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

Table 5-14. Cancer Risks for a Camper from Exposure to OU3 Surface Soil in Grid 74

Grid	COPC	Risk	
		CTE	RME
74	$TEQ_{D/F}$	2E-05	5E-05
	Arsenic	2E-05	5E-05
	Chromium	6E-06	2E-05
	Total	4E-05	1E-04

COPC = contaminant of potential concern; $TEQ_{D/F}$ = toxicity equivalent for dioxins and furans; CTE = central tendency estimate; RME = reasonable maximum exposure.

Orange highlight flags cancer risks≥ 1E-04.
Blue highlight flags cancer risks ≥1E-05.

Chromium was evaluated as hexavalent chromium.

Table 5-15. Summary of Non-Cancer Hazards and Cancer Risks to Campers

Exposure Medium	Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
			CTE	RME	CTE	RME
Surface Water	On-site Creeks	Intentional Ingestion (as drinking water)	3E-02	8E-02	2E-06	7E-06
	CFR	Intentional Ingestion (as drinking water)	8E-02	2E-01	4E-06	1E-05
		Incidental Ingestion (while swimming)	4E-03	3E-02	1E-07	2E-06
		Dermal Contact (while swimming)	6E-04	2E-03	7E-11	2E-10
		Total	8E-02	2E-01	4E-06	1E-05
Sediment	CFR	Incidental Ingestion (while swimming)	1E-05	4E-05	1E-09	5E-09
		Dermal Contact (while swimming)	2E-03	1E-02	5E-08	8E-07
		Total	2E-03	1E-02	5E-08	9E-07
Surface Water and Sediment (Combined Exposure)	CFR	Intentional Ingestion (as drinking water)	8E-02	2E-01	4E-06	1E-05
		Incidental Ingestion (while swimming)	4E-03	3E-02	1E-07	2E-06
		Dermal Contact (while swimming)	2E-03	1E-02	5E-08	8E-07
		Total	8E-02	2E-01	4E-06	1E-05
Floodplain Soil	Floodplain[a]	Total	1E-01	4E-01	1E-05	4E-05
Combined Exposure (surface water, sediment, soil)	CFR/Floodplain	Total	2E-01	7E-01	2E-05	5E-05

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure; CFR = Clark Fork River.

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

Non-cancer hazards shown are for the young child (assumed protective of an adult).

[a]Non-cancer HI and cancer risk shown in this table for soil correspond to the maximum values estimated for the floodplain exposure unit grids.

Table 5-16. Risk Estimates for Recreational Fishers Exposed to OU3 Surface Soils within the Floodplain while Fishing[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 81	Incidental Ingestion	6E-02	3E-01	3E-06	1E-05
	Dermal Contact	5E-05	6E-04	5E-09	1E-07
	Total	6E-02	3E-01	3E-06	1E-05
Grid 85[b]	Incidental Ingestion	3E-02	1E-01	1E-06	6E-06
	Dermal Contact	2E-05	3E-04	2E-09	6E-08
	Total	3E-02	1E-01	1E-06	6E-06
Grid 86	Incidental Ingestion	1E-01	6E-01	7E-06	3E-05
	Dermal Contact	1E-04	2E-03	7E-09	2E-07
	Total	1E-01	6E-01	7E-06	3E-05
Grid 87	Incidental Ingestion	9E-02	4E-01	5E-06	2E-05
	Dermal Contact	8E-05	1E-03	6E-09	2E-07
	Total	9E-02	4E-01	5E-06	2E-05
Grid 88	Incidental Ingestion	2E-01	6E-01	9E-06	4E-05
	Dermal Contact	3E-04	4E-03	1E-08	3E-07
	Total	2E-01	6E-01	9E-06	4E-05
Grid 89	Incidental Ingestion	1E-01	4E-01	6E-06	2E-05
	Dermal Contact	9E-05	1E-03	6E-09	2E-07
	Total	1E-01	4E-01	6E-06	3E-05
Grid 90	Incidental Ingestion	2E-01	8E-01	1E-05	4E-05
	Dermal Contact	3E-04	5E-03	2E-08	5E-07
	Total	2E-01	8E-01	1E-05	4E-05
Grid 91	Incidental Ingestion	1E-01	5E-01	9E-06	4E-05
	Dermal Contact	2E-04	2E-03	9E-09	3E-07
	Total	1E-01	6E-01	9E-06	4E-05
Grid 93	Incidental Ingestion	2E-01	7E-01	9E-06	4E-05
	Dermal Contact	3E-04	4E-03	1E-08	4E-07
	Total	2E-01	7E-01	9E-06	4E-05
Grid 94	Incidental Ingestion	1E-01	4E-01	7E-06	3E-05
	Dermal Contact	1E-04	2E-03	7E-09	2E-07
	Total	1E-01	4E-01	7E-06	3E-05
Grid 95	Incidental Ingestion	1E-01	5E-01	6E-06	3E-05
	Dermal Contact	1E-04	2E-03	8E-09	2E-07
	Total	1E-01	5E-01	6E-06	3E-05
Grid 97	Incidental Ingestion	3E-02	1E-01	3E-06	1E-05
	Dermal Contact	3E-05	4E-04	2E-09	6E-08
	Total	3E-02	1E-01	3E-06	1E-05
Grid 98	Incidental Ingestion	1E-01	4E-01	7E-06	3E-05
	Dermal Contact	1E-04	2E-03	7E-09	2E-07
	Total	1E-01	4E-01	7E-06	3E-05

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.

[a]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

[b]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

Table 5-17. Summary of Predicted Non-Cancer Hazards and Cancer Risks to Recreational Fishers

Exposure Medium	Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
			CTE	RME	CTE	RME
Surface Water	CFR	Incidental Ingestion (while fishing)	6E-04	6E-03	3E-08	5E-07
		Dermal Contact (while fishing)	4E-04	2E-03	2E-11	4E-11
		Total	1E-03	8E-03	3E-08	5E-07
Sediment	CFR	Incidental Ingestion (while fishing)	2E-05	7E-05	2E-09	1E-08
		Dermal Contact (while fishing)	3E-04	4E-03	1E-08	4E-07
		Total	3E-04	4E-03	1E-08	4E-07
Combined Exposure - Surface Water & Sediment	CFR	Incidental Ingestion (while fishing)	6E-04	6E-03	3E-08	5E-07
		Dermal Contact (while fishing)	7E-04	5E-03	1E-08	4E-07
		Total	1E-03	1E-02	4E-08	9E-07
Floodplain Surface Soil	Floodplain[a]	Total	2E-01	8E-01	1E-05	4E-05
Combined Exposure - Surface water, Sediment, & Soil	CFR/Floodplain	Total	2E-01	8E-01	1E-05	5E-05
Fish Fillets[b]	CFR	Ingestion	2E+00	8E+00	3E-05	2E-04
Combined Exposure - Surface water, Sediment, Soil, & Fish	CFR/Floodplain	Total	3E+00	9E+00	4E-05	3E-04

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure; CFR = Clark Fork River.

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

[a]Non-cancer HI and cancer risk shown in this table correspond to the maximum values estimated for the floodplain exposure unit grids.

[b]Non-cancer HI and cancer risk shown in this table correspond to the maximum values estimated for fish consumption (assumes no cooking loss).

Table 5-18. Non-Cancer Hazards and Cancer Risks for Ingestion of TEQ and Total PCBs in Fish by a Recreational Fisher

Panel A: Northern Pike Fillets

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	4E-01	1E+00	5E-06	3E-05
TEQ_{PCB}	2E+00	7E+00	3E-05	2E-04
$TEQ_{D/F/PCB}$	2E+00	8E+00	3E-05	2E-04
Total PCBs			8E-06	5E-05

Panel B: Rainbow Trout Fillets

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	4E-01	1E+00	5E-06	3E-05
TEQ_{PCB}	1E+00	4E+00	2E-05	1E-04
$TEQ_{D/F/PCB}$	1E+00	5E+00	2E-05	1E-04
Total PCBs			3E-06	2E-05

HI = hazard index; CTE = central tendency estimate; RME = reasonably maximum exposure; $TEQ_{D/F}$ = toxicity equivalence for dioxin and furan congeners; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/PCB}$ = toxicity equivalence for dioxin, furan and dioxin-like polychlorinated biphenyl congeners; PCB = polychlorinated biphenyls.

Assumes no loss in concentrations while prepping and/or cooking fish fillets.

TEQ and Total PCB concentrations are calculated evaluating non-detects at 1/2 the sample-specific detection limit.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks≥ 1E-05.

Table 5-19. Non-Cancer Hazards and Cancer Risks for Ingestion of TEQ and Total PCBs in Fish by a Recreational Fisher Accounting for Potential Cooking Loss

Panel A: Northern Pike Fillets

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	2E-01	6E-01	2E-06	2E-05
TEQ_{PCB}	9E-01	3E+00	1E-05	9E-05
$TEQ_{D/F/PCB}$	1E+00	4E+00	1E-05	1E-04
Total PCBs			5E-06	4E-05

Panel B: Rainbow Trout Fillets

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	2E-01	6E-01	2E-06	2E-05
TEQ_{PCB} (ND = 1/2 DL)	5E-01	2E+00	7E-06	5E-05
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	7E-01	2E+00	9E-06	6E-05
Total PCBs			2E-06	1E-05

HI = hazard index; CTE = central tendency estimate; RME = reasonably maximum exposure; $TEQ_{D/F}$ = toxicity equivalence for dioxin and furan congeners; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/PCB}$ = toxicity equivalence for dioxin, furan and dioxin-like polychlorinated biphenyl congeners; PCB = polychlorinated biphenyls.

Assumes cooking loss of 54% for TEQ and 30% for PCBs.

TEQ and Total PCB concentrations are calculated evaluating non-detects at 1/2 the sample-specific detection limit.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

Table 5-20. Risk Estimates for Tribal Fishers Exposed to OU3 Surface Soils within the Floodplain while Fishing[a]

Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
		CTE	RME	CTE	RME
Grid 81	Incidental Ingestion	6E-02	3E-01	3E-06	1E-05
	Dermal Contact	1E-04	2E-03	5E-09	1E-07
	Total	6E-02	3E-01	3E-06	1E-05
Grid 85[b]	Incidental Ingestion	3E-02	1E-01	1E-06	6E-06
	Dermal Contact	5E-05	7E-04	2E-09	6E-08
	Total	3E-02	1E-01	1E-06	6E-06
Grid 86	Incidental Ingestion	1E-01	6E-01	7E-06	3E-05
	Dermal Contact	3E-04	4E-03	7E-09	2E-07
	Total	1E-01	6E-01	7E-06	3E-05
Grid 87	Incidental Ingestion	9E-02	4E-01	5E-06	2E-05
	Dermal Contact	2E-04	3E-03	6E-09	2E-07
	Total	9E-02	4E-01	5E-06	2E-05
Grid 88	Incidental Ingestion	2E-01	6E-01	9E-06	4E-05
	Dermal Contact	7E-04	1E-02	1E-08	3E-07
	Total	2E-01	7E-01	9E-06	4E-05
Grid 89	Incidental Ingestion	1E-01	4E-01	6E-06	2E-05
	Dermal Contact	2E-04	3E-03	6E-09	2E-07
	Total	1E-01	4E-01	6E-06	3E-05
Grid 90	Incidental Ingestion	2E-01	8E-01	1E-05	4E-05
	Dermal Contact	8E-04	1E-02	2E-08	5E-07
	Total	2E-01	8E-01	1E-05	4E-05
Grid 91	Incidental Ingestion	1E-01	5E-01	9E-06	4E-05
	Dermal Contact	4E-04	5E-03	9E-09	3E-07
	Total	1E-01	6E-01	9E-06	4E-05
Grid 93	Incidental Ingestion	2E-01	7E-01	9E-06	4E-05
	Dermal Contact	7E-04	9E-03	1E-08	4E-07
	Total	2E-01	7E-01	9E-06	4E-05
Grid 94	Incidental Ingestion	1E-01	4E-01	7E-06	3E-05
	Dermal Contact	3E-04	5E-03	7E-09	2E-07
	Total	1E-01	4E-01	7E-06	3E-05
Grid 95	Incidental Ingestion	1E-01	5E-01	6E-06	3E-05
	Dermal Contact	3E-04	5E-03	8E-09	2E-07
	Total	1E-01	5E-01	6E-06	3E-05
Grid 97	Incidental Ingestion	3E-02	1E-01	3E-06	1E-05
	Dermal Contact	7E-05	1E-03	2E-09	6E-08
	Total	3E-02	1E-01	3E-06	1E-05
Grid 98	Incidental Ingestion	1E-01	4E-01	7E-06	3E-05
	Dermal Contact	3E-04	4E-03	7E-09	2E-07
	Total	1E-01	4E-01	7E-06	3E-05

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.

Non-cancer hazards are based on the young child (assumed protective of an adolescent and an adult)

[a]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥1E-05.

[b]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

Table 5-21. Summary of Predicted Non-Cancer Hazards and Cancer Risks to Tribal Fishers

Exposure Medium	Exposure Unit	Exposure Route	Non-cancer HI		Cancer Risk	
			CTE	RME	CTE	RME
Surface Water	CFR	Incidental Ingestion (while fishing)	1E-03	9E-03	5E-08	8E-07
		Dermal Contact (while fishing)	8E-04	2E-03	5E-11	1E-10
		Total	2E-03	1E-02	5E-08	8E-07
Sediment	CFR	Incidental Ingestion (while fishing)	2E-05	7E-05	2E-09	1E-08
		Dermal Contact (while fishing)	3E-04	4E-03	1E-08	4E-07
		Total	3E-04	4E-03	1E-08	4E-07
Combined Exposure - Surface Water & Sediment	CFR	Incidental Ingestion (while fishing)	1E-03	9E-03	5E-08	8E-07
		Dermal Contact (while fishing)	1E-03	6E-03	1E-08	4E-07
		Total	2E-03	2E-02	7E-08	1E-06
Floodplain Surface Soil	Floodplain[a]	Total	2E-01	8E-01	7E-06	3E-05
Combined Exposure - Surface water, Sediment, & Soil	CFR/Floodplain	Total	2E-01	8E-01	7E-06	3E-05
Northern pike whole body fish	CFR	Ingestion[b]	1E+01	4E+01	1E-04	1E-03
Rainbow trout whole body fish	CFR	Ingestion[b]	4E+00	2E+01	6E-05	4E-04
Combined Exposure - Surface water, Sediment, Soil, & Fish	CFR/Floodplain	Total	4E+00 - 1E+01	2E+01 - 4E+01	6E-05 - 1E-04	5E-04 - 1E-03

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure; CFR = Clark Fork River.

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks ≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

[a]Non-cancer HI and cancer risk shown in this table correspond to the maximum values estimated for the floodplain exposure unit grids.

[b]Non-cancer HI and cancer risk shown in this table correspond to the maximum values assuming no cooking loss.

Table 5-22. Non-Cancer Hazards and Cancer Risks for Ingestion of TEQ and Total PCBs in Fish by a Tribal Fisher

Panel A: Northern Pike Fillets

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	7E-01	3E+00	9E-06	7E-05
TEQ_{PCB}	4E+00	2E+01	5E-05	4E-04
$TEQ_{D/F/PCB}$	4E+00	2E+01	6E-05	5E-04
Total PCBs			1E-05	1E-04

Panel B: Rainbow Trout Fillets

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	7E-01	3E+00	9E-06	7E-05
TEQ_{PCB}	2E+00	9E+00	3E-05	2E-04
$TEQ_{D/F/PCB}$	3E+00	1E+01	4E-05	3E-04
Total PCBs			5E-06	4E-05

Panel C: Northern Pike Whole-Body

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	1E+00	4E+00	1E-05	1E-04
TEQ_{PCB}	9E+00	4E+01	1E-04	1E-03
$TEQ_{D/F/PCB}$	1E+01	4E+01	1E-04	1E-03
Total PCBs			4E-05	3E-04

Panel D: Rainbow Trout Whole-Body

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	8E-01	3E+00	1E-05	8E-05
TEQ_{PCB}	3E+00	1E+01	4E-05	3E-04
$TEQ_{D/F/PCB}$	4E+00	2E+01	6E-05	4E-04
Total PCBs			7E-06	6E-05

HQ = hazard quotient; CTE = central tendency estimate; RME = reasonably maximum exposure; $TEQ_{D/F}$ = toxicity equivalence for dioxin and furan congeners; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/PCB}$ = toxicity equivalence for dioxin, furan and dioxin-like polychlorinated biphenyl congeners; PCB = polychlorinated biphenyls.

Assumes no loss in concentrations while prepping and/or cooking fish fillets.

TEQ and Total PCB concentrations are calculated evaluating non-detects at 1/2 the sample-specific detection limit.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥1E-05.

Table 5-23. Non-Cancer Hazards and Cancer Risks for Ingestion of TEQ and Total PCBs in Fish by a Tribal Fisher Accounting for Potential Cooking Loss

Panel A: Northern Pike Fillets

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	3E-01	1E+00	4E-06	3E-05
TEQ_{PCB}	2E+00	7E+00	2E-05	2E-04
$TEQ_{D/F/PCB}$	2E+00	8E+00	3E-05	2E-04
Total PCBs			1E-05	8E-05

Panel B: Rainbow Trout Fillets

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	3E-01	1E+00	4E-06	3E-05
TEQ_{PCB}	1E+00	4E+00	1E-05	1E-04
$TEQ_{D/F/PCB}$	1E+00	5E+00	2E-05	1E-04
Total PCBs			4E-06	3E-05

Panel C: Northern Pike Whole-Body

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	5E-01	2E+00	6E-06	5E-05
TEQ_{PCB}	4E+00	2E+01	6E-05	5E-04
$TEQ_{D/F/PCB}$	5E+00	2E+01	6E-05	5E-04
Total PCBs			3E-05	2E-04

Panel D: Rainbow Trout Whole-Body

	Non-Cancer		Cancer	
	HQ		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	4E-01	1E+00	5E-06	4E-05
TEQ_{PCB}	1E+00	6E+00	2E-05	2E-04
$TEQ_{D/F/PCB}$	2E+00	8E+00	3E-05	2E-04
Total PCBs			5E-06	4E-05

HQ = hazard quotient; CTE = central tendency estimate; RME = reasonably maximum exposure; $TEQ_{D/F}$ = toxicity equivalence for dioxin and furan congeners; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/PCB}$ = toxicity equivalence for dioxin, furan and dioxin-like polychlorinated biphenyl congeners; PCB = polychlorinated biphenyls.

Assumes cooking loss of 54% for TEQ and 30% for PCBs.

TEQ and Total PCB concentrations are calculated evaluating non-detects at 1/2 the sample-specific detection limit.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

Table 6-1. Non-Cancer Hazards and Cancer Risks for Ingestion of TEQ and Total PCBs in Fish by a Tribal Fisher Using Higher Ingestion Rates to Assess Uncertainties in Exposure Parameters

Panel A: Northern Pike Fillets

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	3E+00	1E+01	4E-05	3E-04
TEQ_{PCB}	2E+01	6E+01	2E-04	2E-03
$TEQ_{D/F/PCB}$	2E+01	7E+01	3E-04	2E-03
Total PCBs			6E-05	4E-04

Panel B: Rainbow Trout Fillets

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	3E+00	1E+01	4E-05	3E-04
TEQ_{PCB}	9E+00	3E+01	1E-04	9E-04
$TEQ_{D/F/PCB}$	1E+01	4E+01	2E-04	1E-03
Total PCBs			9E-05	3E-04

Panel C: Northern Pike Whole-Body

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	4E+00	2E+01	6E-05	4E-04
TEQ_{PCB}	4E+01	1E+02	5E-04	4E-03
$TEQ_{D/F/PCB}$	4E+01	2E+02	6E-04	4E-03
Total PCBs			2E-04	1E-03

Panel D: Rainbow Trout Whole-Body

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	3E+00	1E+01	4E-05	3E-04
TEQ_{PCB}	1E+01	5E+01	2E-04	1E-03
$TEQ_{D/F/PCB}$	2E+01	6E+01	2E-04	2E-03
Total PCBs			1E-04	4E-04

HQ = hazard quotient; CTE = central tendency estimate; RME = reasonably maximum exposure; $TEQ_{D/F}$ = toxicity equivalence for dioxin and furan congeners; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/PCB}$ = toxicity equivalence for dioxin, furan and dioxin-like polychlorinated biphenyl congeners; PCB = polychlorinated biphenyls.

Assumes no loss in concentrations while prepping and/or cooking fish fillets.

TEQ and Total PCB concentrations are calculated evaluating non-detects at 1/2 the sample-specific detection limit.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

Table 6-2. Non-Cancer Hazards and Cancer Risks for Ingestion of TEQ and Total PCBs in Fish by a Recreational Fisher (Based on 2018 and 2019 Fish)

Panel A: Northern Pike Fillets

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	3E-01	1E+00	4E-06	3E-05
TEQ_{PCB}	2E+00	6E+00	2E-05	2E-04
$TEQ_{D/F/PCB}$	2E+00	6E+00	2E-05	2E-04
Total PCBs			5E-06	4E-05

Panel B: Rainbow Trout Fillets

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	3E-01	1E+00	5E-06	3E-05
TEQ_{PCB}	8E-01	3E+00	1E-05	8E-05
$TEQ_{D/F/PCB}$	1E+00	4E+00	1E-05	1E-04
Total PCBs			3E-06	2E-05

HI = hazard index; CTE = central tendency estimate; RME = reasonably maximum exposure; $TEQ_{D/F}$ = toxicity equivalence for dioxin and furan congeners; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/PCB}$ = toxicity equivalence for dioxin, furan and dioxin-like polychlorinated biphenyl congeners; PCB = polychlorinated biphenyls.

Assumes no loss in concentrations while prepping and/or cooking fish fillets.

TEQ and Total PCB concentrations are calculated evaluating non-detects at 1/2 the sample-specific detection limit.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

Table 6-3. Non-Cancer Hazards and Cancer Risks for Ingestion of TEQ and Total PCBs in Fish by a Tribal Fisher (Based on 2018 and 2019 Fish)

Panel A: Northern Pike Fillets

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	6E-01	2E+00	8E-06	6E-05
TEQ_{PCB}	3E+00	1E+01	5E-05	4E-04
$TEQ_{D/F/PCB}$	3E+00	1E+01	5E-05	4E-04
Total PCBs			1E-05	8E-05

Panel B: Rainbow Trout Fillets

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	6E-01	3E+00	9E-06	7E-05
TEQ_{PCB}	2E+00	6E+00	2E-05	2E-04
$TEQ_{D/F/PCB}$	2E+00	8E+00	3E-05	2E-04
Total PCBs			5E-06	4E-05

Panel C: Northern Pike Whole-Body

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	1E+00	5E+00	2E-05	1E-04
TEQ_{PCB}	9E+00	3E+01	1E-04	9E-04
$TEQ_{D/F/PCB}$	7E+00	3E+01	9E-05	7E-04
Total PCBs			3E-05	2E-04

Panel D: Rainbow Trout Whole-Body

	Non-Cancer		Cancer	
	HI		Risk	
COPC	CTE	RME	CTE	RME
$TEQ_{D/F}$	6E-01	3E+00	9E-06	7E-05
TEQ_{PCB}	3E+00	1E+01	4E-05	3E-04
$TEQ_{D/F/PCB}$	4E+00	2E+01	5E-05	4E-04
Total PCBs			7E-06	6E-05

HQ = hazard quotient; CTE = central tendency estimate; RME = reasonably maximum exposure; $TEQ_{D/F}$ = toxicity equivalence for dioxin and furan congeners; TEQ_{PCB} = toxicity equivalence for dioxin-like polychlorinated biphenyl congeners; $TEQ_{D/F/PCB}$ = toxicity equivalence for dioxin, furan and dioxin-like polychlorinated biphenyl congeners; PCB = polychlorinated biphenyls.

Assumes no loss in concentrations while prepping and/or cooking fish fillets.

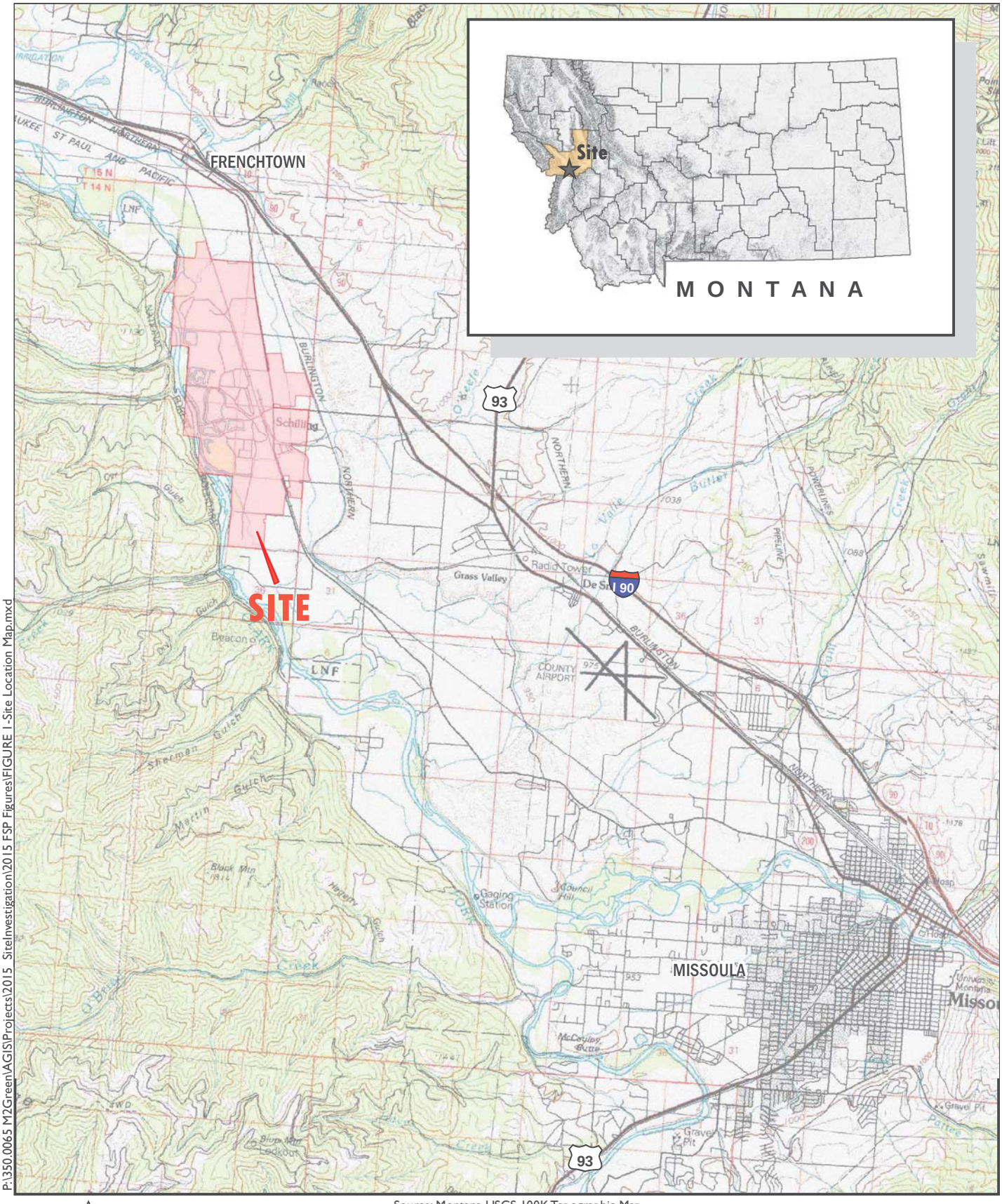
TEQ and Total PCB concentrations are calculated evaluating non-detects at 1/2 the sample-specific detection limit.

Non-cancer hazards shown are for the young child (assumed protective of an adolescent and an adult).

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks ≥ 1E-05.

FIGURES

OU3 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment



P:\350.0065 M2Green\AGIS\Projects\2015 SiteInvestigation\2015 FSP Figures\FIGURE 1-Site Location Map.mxd

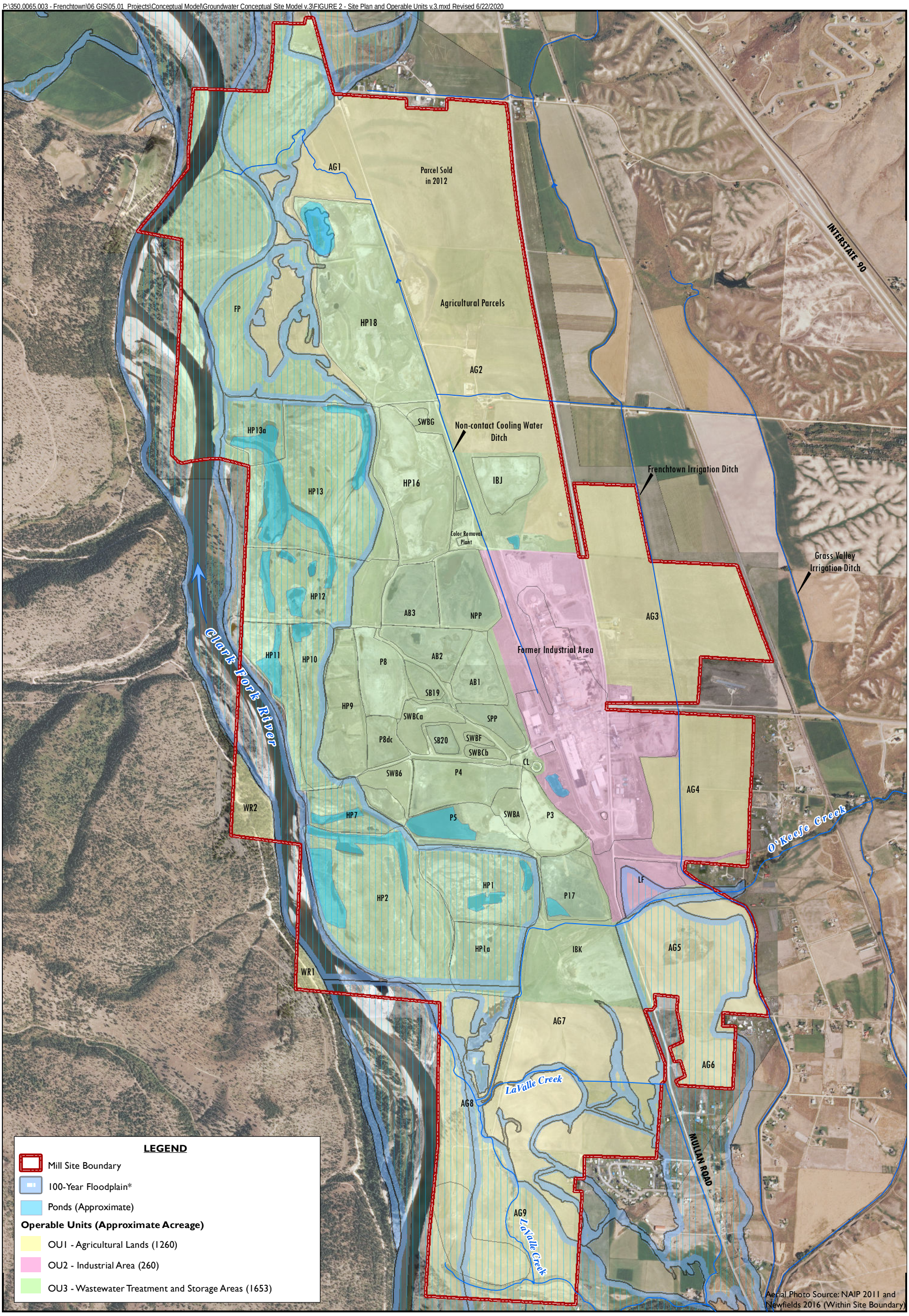
Source: Montana USGS 100K Topographic Map

0 Feet 10,000

NewFields

Site Location Map
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 2-1

P:\350.0065.003 - Frenchtown\06 GIS\05.01_Projects\Conceptual Model\Groundwater Conceptual Site Model v.3\FIGURE 2 - Site Plan and Operable Units v.3.mxd Revised 6/22/2020



N

0 Feet 1,600

NewFields

***Floodplain Source:**

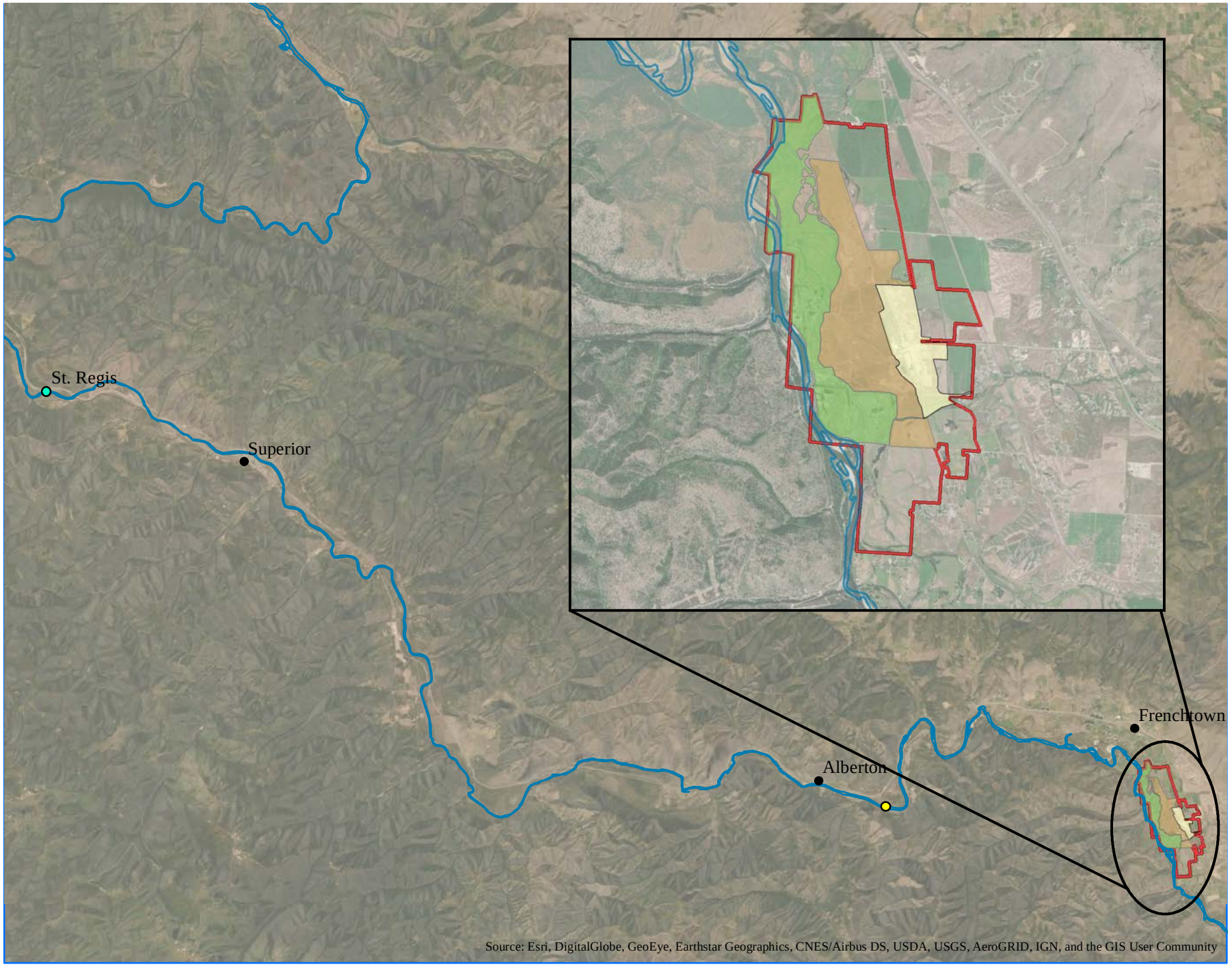
As defined by the Federal Emergency Management Agency (FEMA) 2013 Digital Flood Insurance Rate Map (DFIRM). (NFIP 2013)

Notes

AG - Agricultural Land
AB - Aeration Stabilization Basin
CFR - Clark Fork River
CL - Clarifier
FP - Floodplain
HP - Holding or Storage Pond
IB - Rapid Infiltration Basin
LF - Land Farm
NPP - North Polishing Pond
P - Settling Pond
SB - Spoils Basin
SPP - South Polishing Pond
SWB - Solid Waste Basin
WR - West of River

Map of Operable Units
Smurfit-Stone/Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 2-2
(*Figure adapted from NewFields 2020a*)

Figure 2-3. OU3 HHRA Study Area



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

0 4 Miles

Downstream extent of fish sampling

Downstream extent of surface water, sediment, and dace sampling

Clark Fork River

Site_Boundary

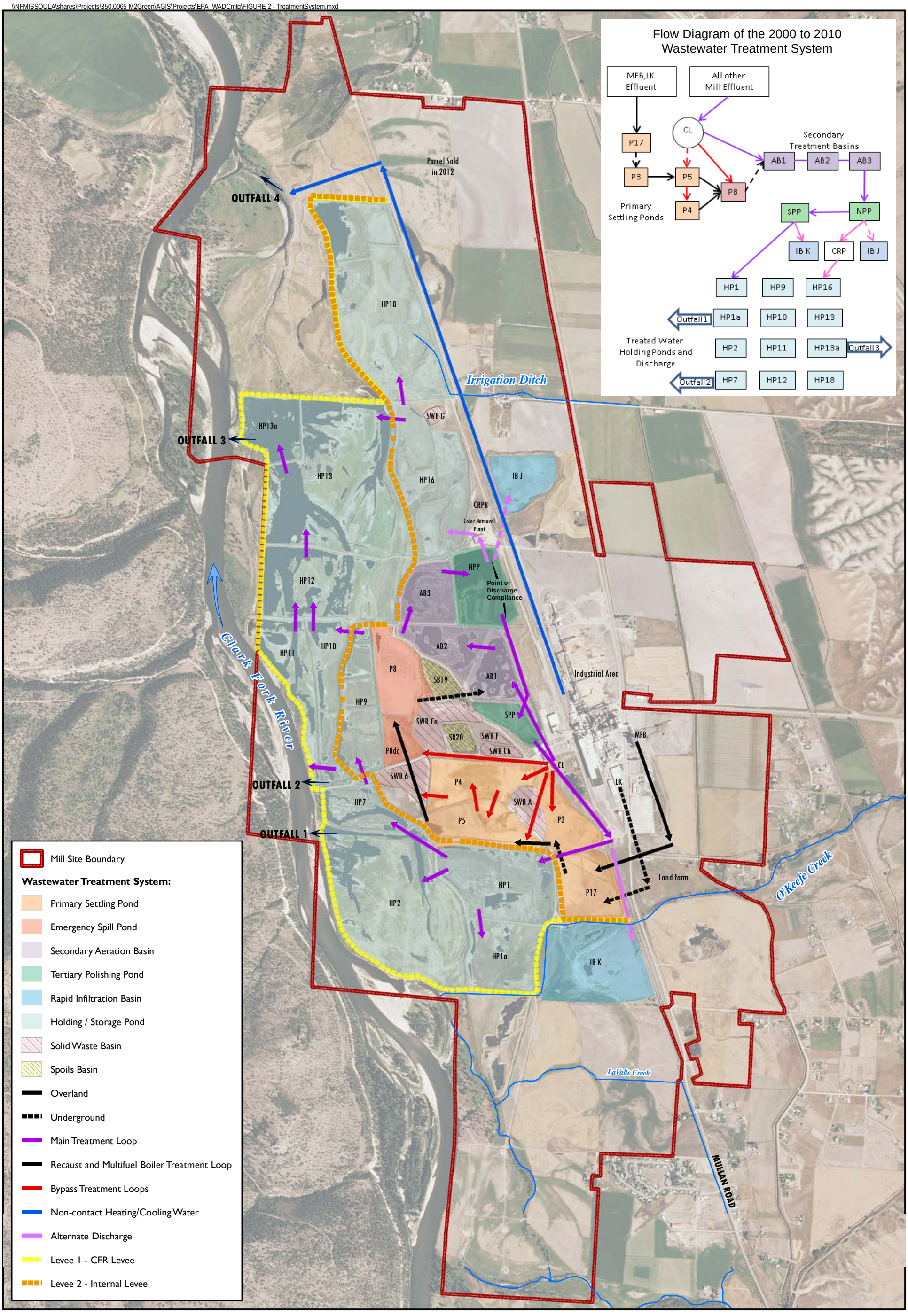
Site OUs

OU2

OU3 Upland

OU3 Floodplain

\\NFMISSOULA\shares\Projects\350.0065 M2Green\AGIS\Projects\EPA_WADCmtg\FIGURE 2 - TreatmentSystem.mxd



Aerial Photo Source: NAIP 2011

0 Feet 1,600

Wastewater Treatment System Overview from 2000 through 2010.

Notes

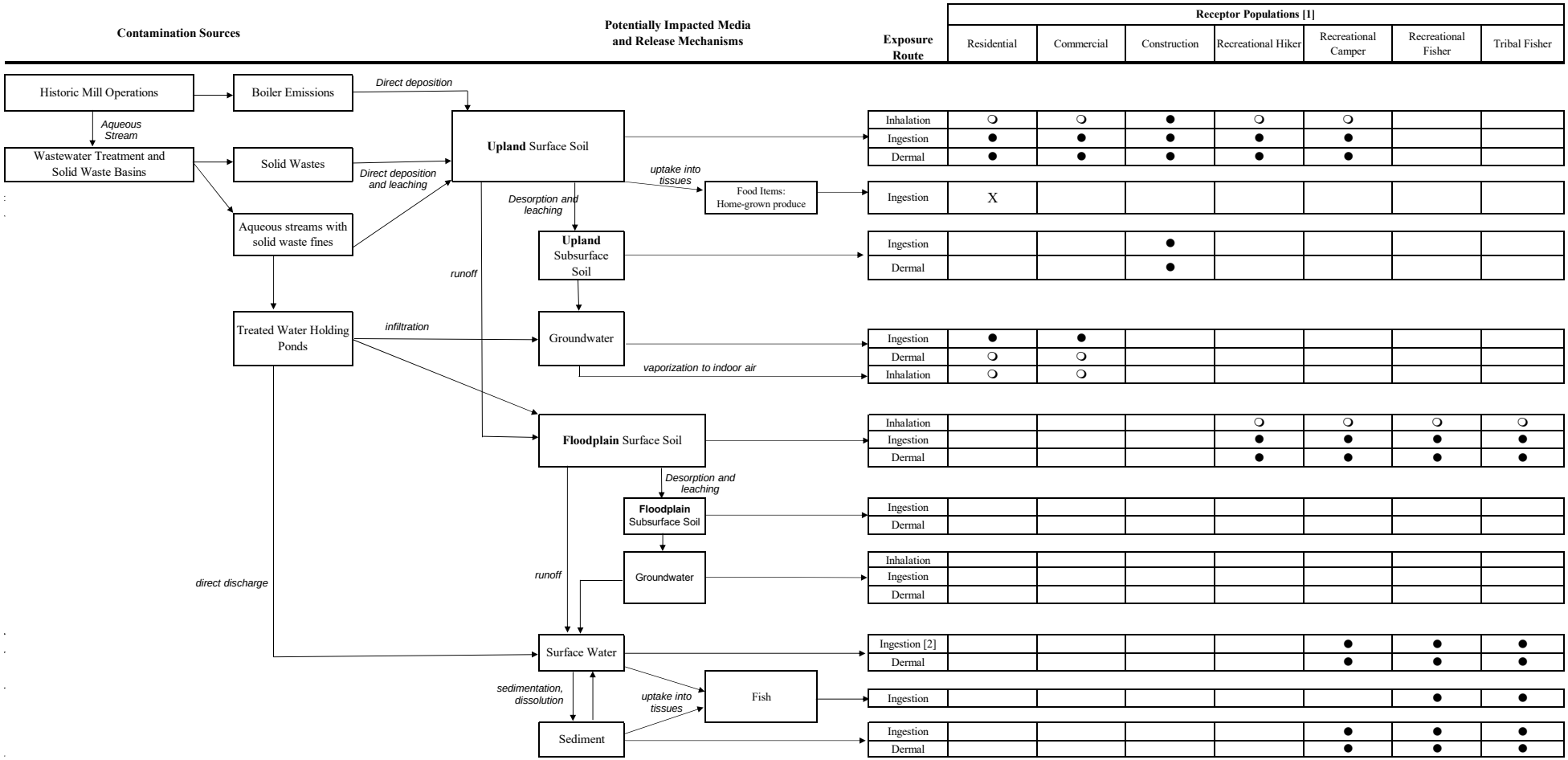
AB - Aeration Stabilization Basin
CL - Clarifier
CRPB - Color Removal Plant Basin
HP - Holding or Storage Pond
IB - Rapid Infiltration Basin
LK - Lime Kiln
MFB - Multifuel Boiler
NPP - North Polishing Pond
P - Settling Pond
SB - Spoils Basin
SPP - South Polishing Pond
SWB - Solid Waste Basin

NewFields

Schematic of 2000 - 2010 Wastewater Treatment System
Former Frenchtown Mill Site
Missoula County, Montana

Figure 2-4

Figure 3-1. Conceptual Site Model for Human Exposure at the OU3 Site



Exposure Route	Receptor Populations [1]						
	Residential	Commercial	Construction	Recreational Hiker	Recreational Camper	Recreational Fisher	Tribal Fisher
Upland Surface Soil – Inhalation	❍	❍	●	❍	❍		
Upland Surface Soil – Ingestion	●	●	●	●	●		
Upland Surface Soil – Dermal	●	●	●	●	●		
Food Items: Home-grown produce – Ingestion	X						
Upland Subsurface Soil – Ingestion			●				
Upland Subsurface Soil – Dermal			●				
Groundwater – Ingestion	●	●					
Groundwater – Dermal	❍	❍					
Groundwater – Inhalation	❍	❍					
Floodplain Surface Soil – Inhalation				❍	❍	❍	❍
Floodplain Surface Soil – Ingestion				●	●	●	●
Floodplain Surface Soil – Dermal				●	●	●	●
Floodplain Subsurface Soil – Ingestion							
Floodplain Subsurface Soil – Dermal							
Groundwater – Inhalation							
Groundwater – Ingestion							
Groundwater – Dermal							
Surface Water – Ingestion [2]					●	●	●
Surface Water – Dermal					●	●	●
Fish – Ingestion						●	●
Sediment – Ingestion					●	●	●
Sediment – Dermal					●	●	●

LEGEND

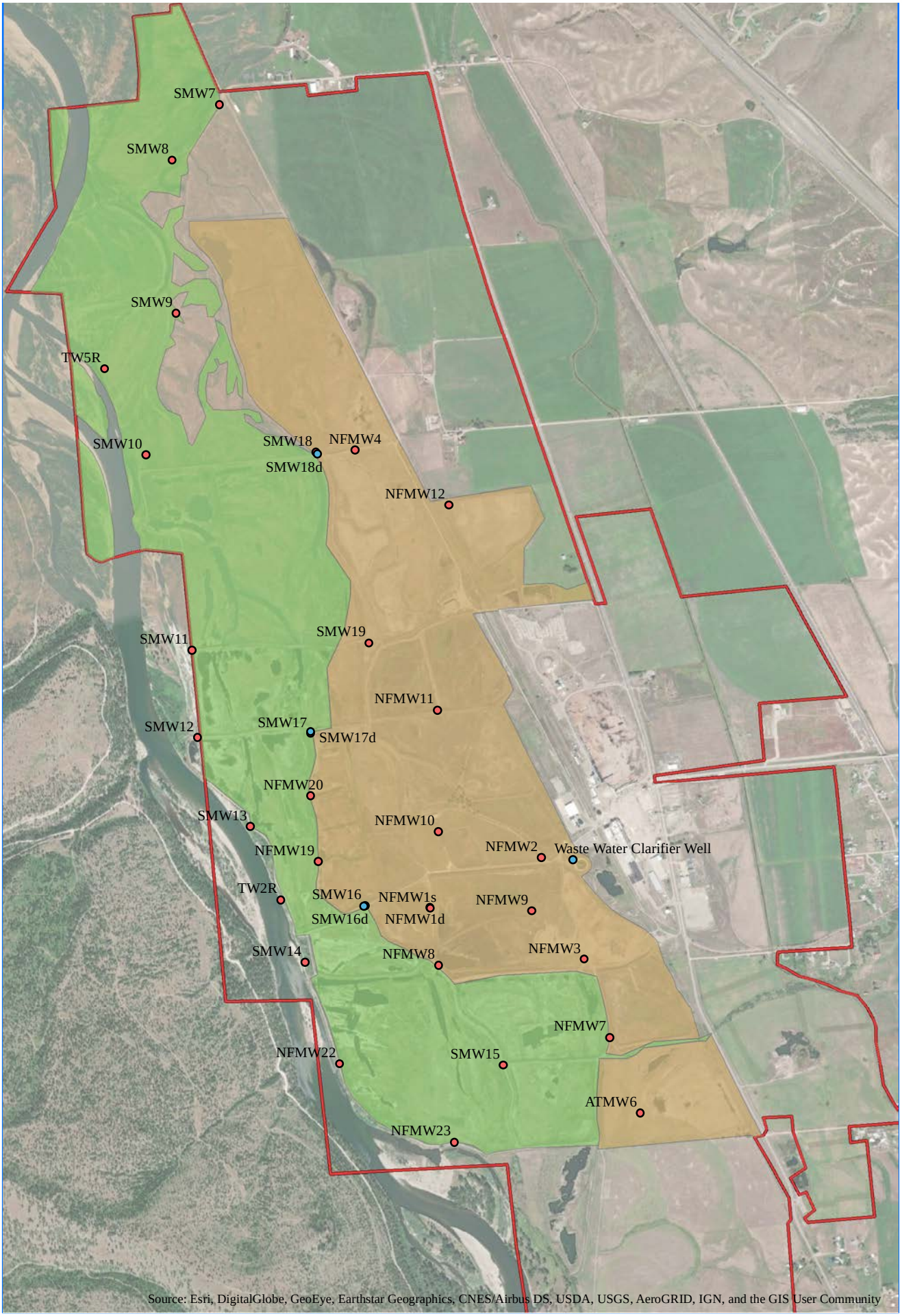
●	Pathway is complete and might be significant; quantitative evaluation.
❍	Pathway is complete, but is relatively minor; semi-quantitative evaluation.
X	Pathway is or may be complete, however, data are lacking. Qualitative evaluation only.
	Pathway is not complete; no evaluation required.

Notes

[1] Residents and workers represent hypothetical future exposure scenarios. Recreational visitors represent current and/or hypothetical future exposure scenarios. Fishers are only expected to be exposed within the floodplain while fishing within the CFR.

[2] Incidental ingestion of surface water within the CFR and on-Site creeks (O'Keefe and Lavalle Creeks) may occur while recreating. For this assessment, it is also assumed that the camper may ingest drinking water drawn from the CFR and on-Site creeks. It is not anticipated that humans will be exposed within on-Site ponds due to the nature of the ponds themselves (i.e., standing/stagnant water with algal growth).

Figure 3-2. Groundwater Wells Evaluated in OU3



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

0 0.3 Miles

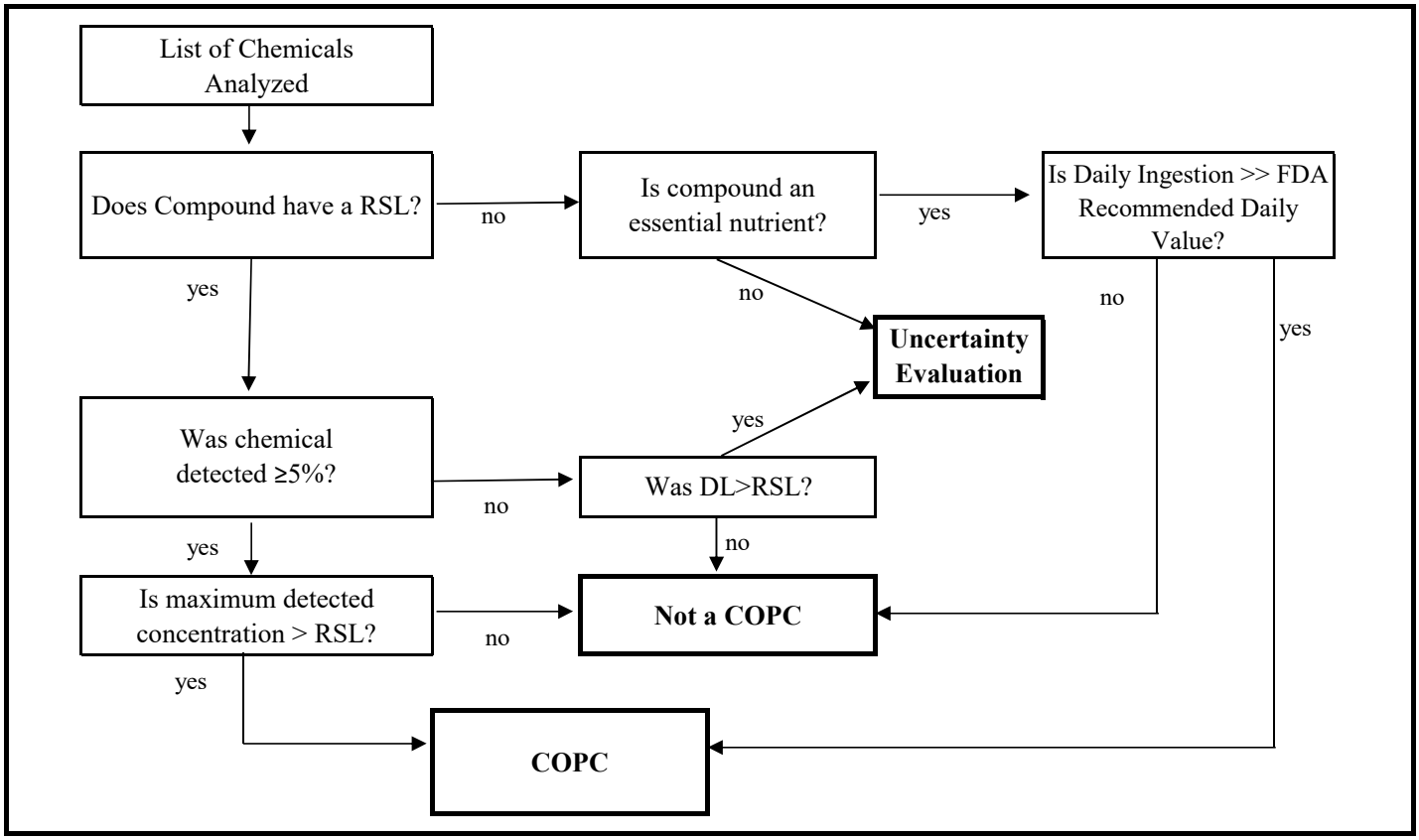
OU3 Upland

OU3 Floodplain

Groundwater wells

- Aquifer Unit 1 (~35-130 ft bgs)
- Aquifer Unit 3 (~130-160 ft bgs)

Figure 3-3. COPC Selection Procedure for Human Health



Notes:

RSL = USEPA's risk-based Regional Screening Level (HQ = 0.1, Cancer risk = 1E-06)

COPC = chemical of potential concern

DL = detection limit

FDA = Food and Drug Administration

Figure 3-4. Location of Surface Soil Samples in OU3 Upland: Smurfit-Stone/Frenchtown Mill Site, Montana

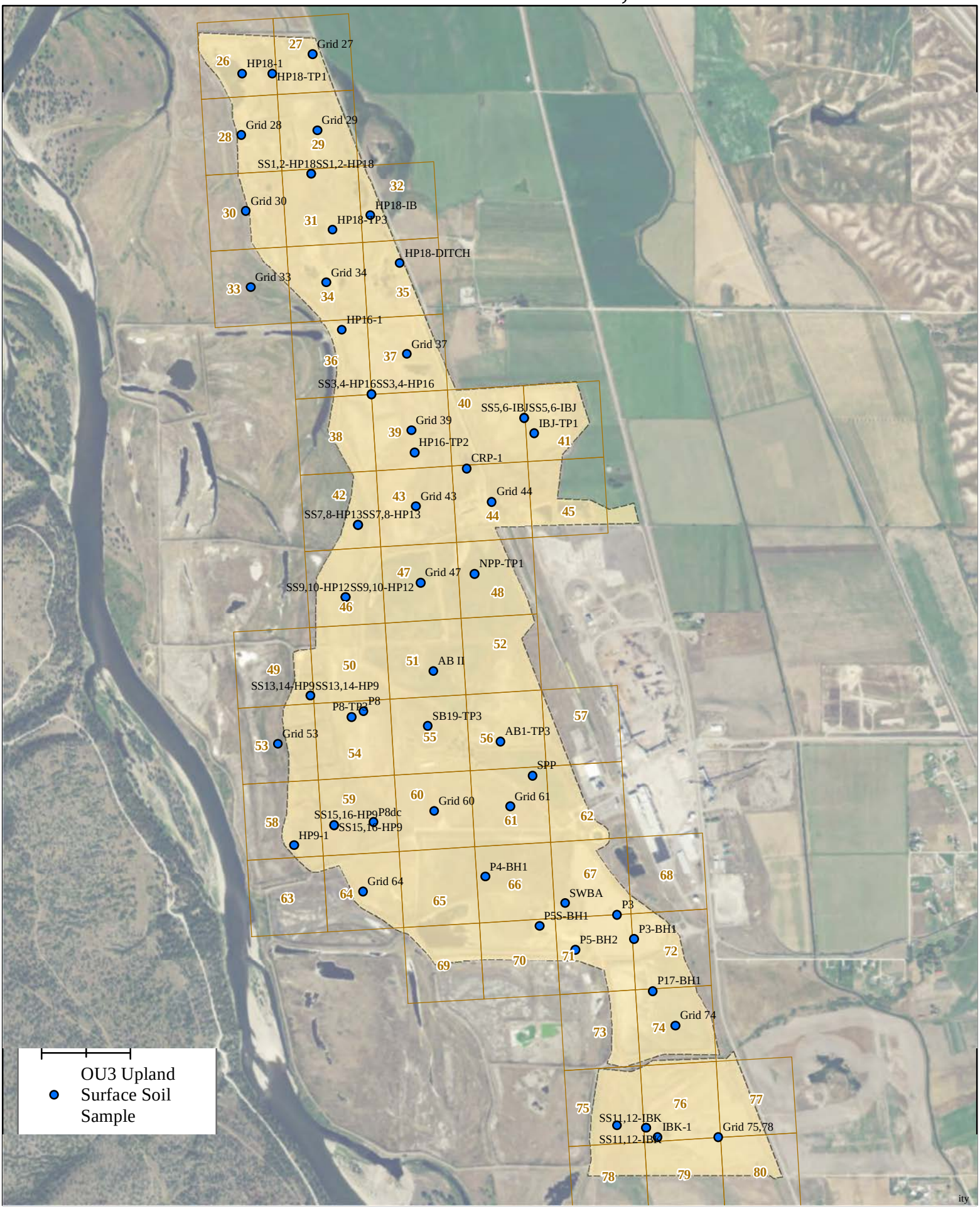


Figure 3-5. Location of Surface Soil Samples in OU3 Floodplain: Smurfit-Stone/Frenchtown Mill Site, Montana

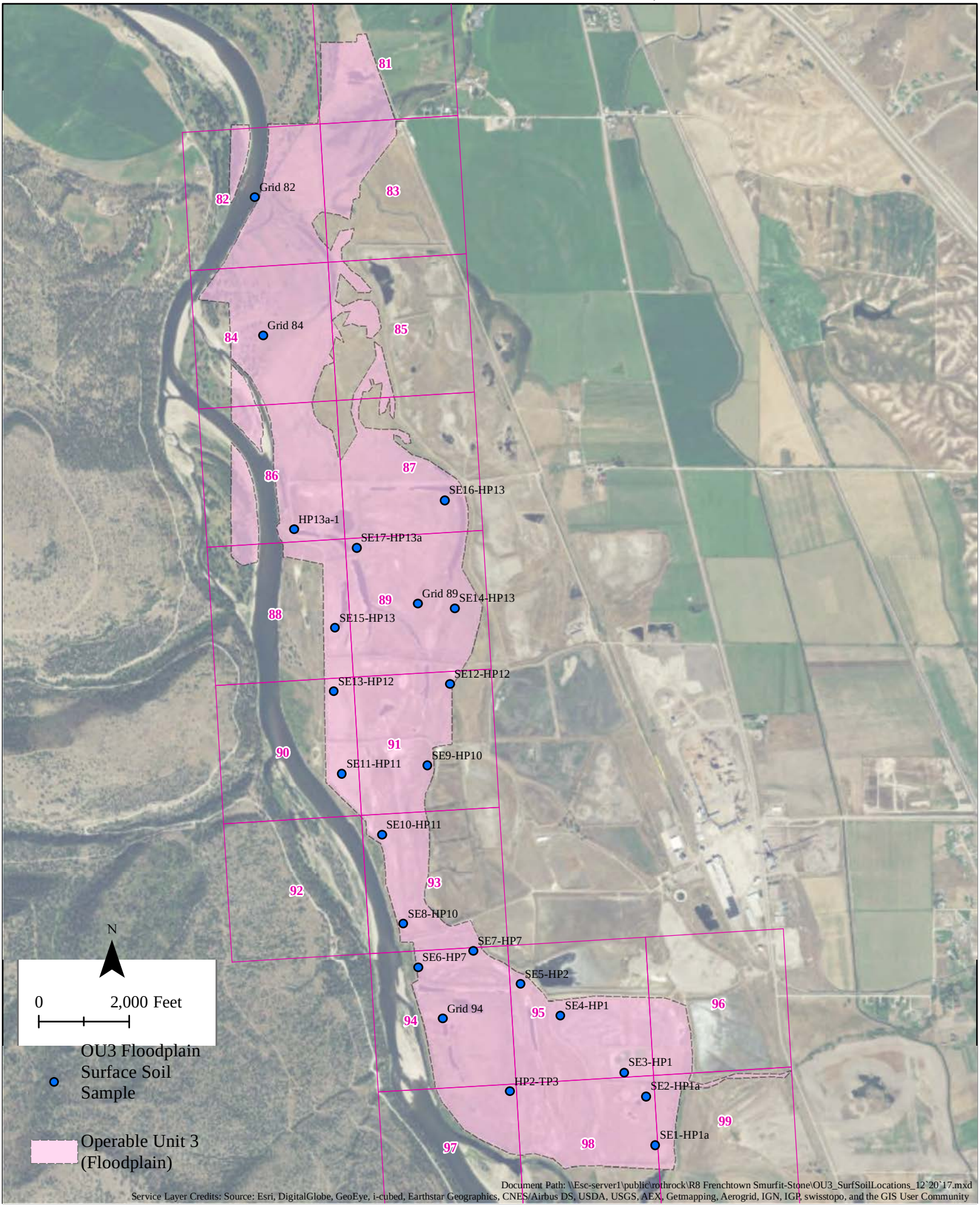
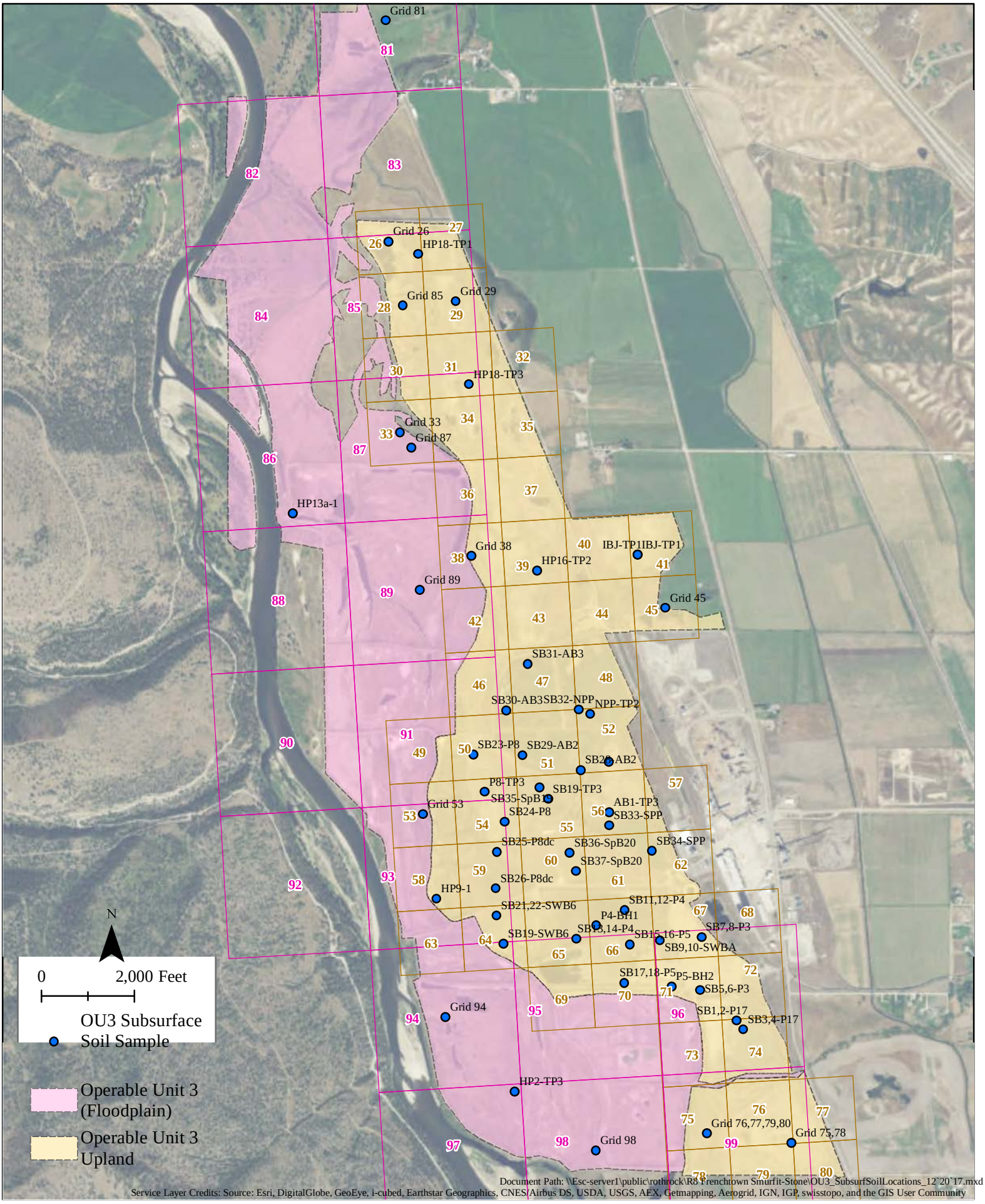
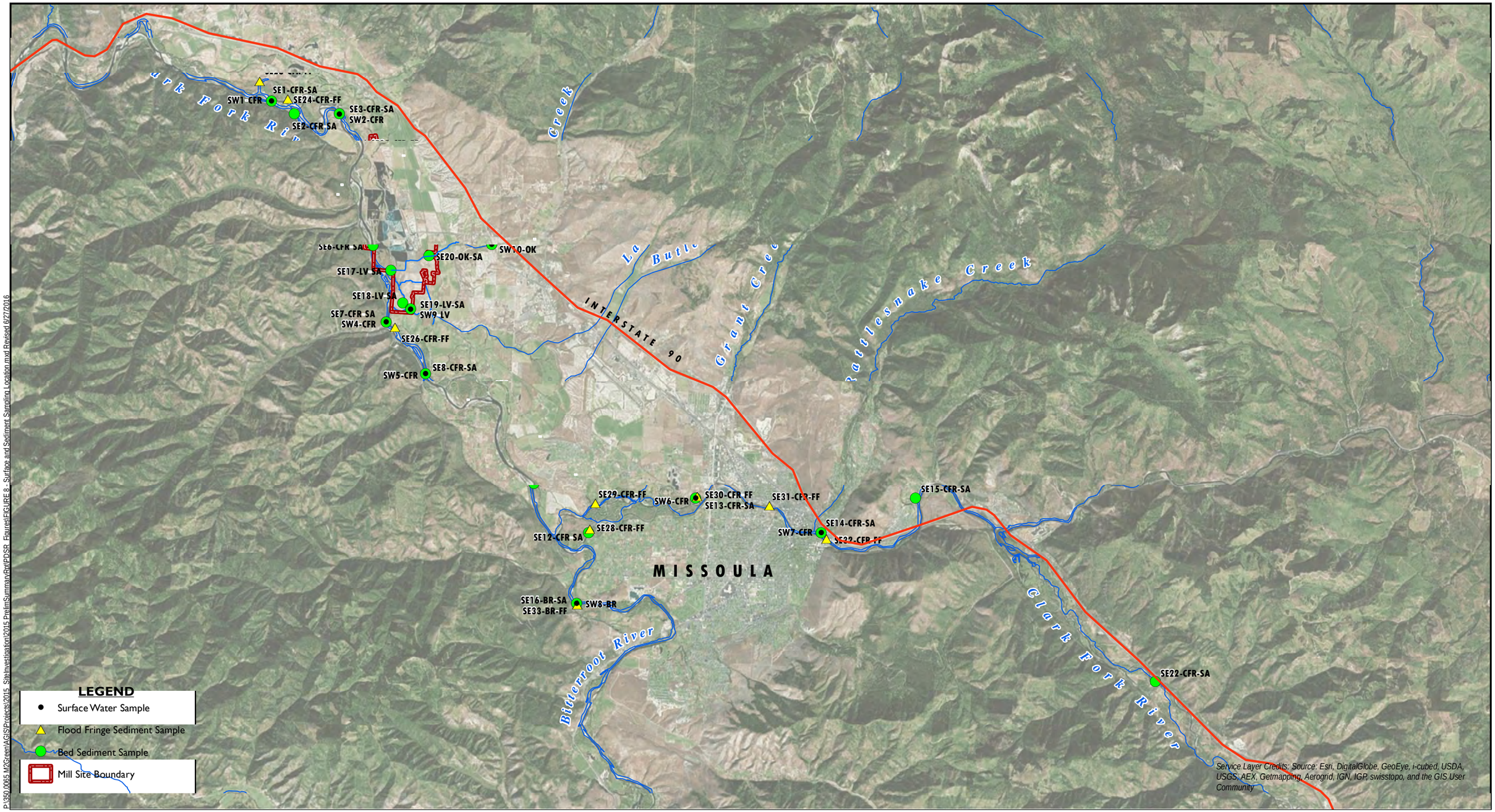


Figure 3-6. Location of Subsurface Soil Samples in OU3: Smurfit-Stone/Frenchtown Mill Site, Montana



Document Path: \\Esc-server1\public\rothrock\R8 Frenchtown Smurfit-Stone\OU3_SubsurfSoilLocations_12`20`17.mxd

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

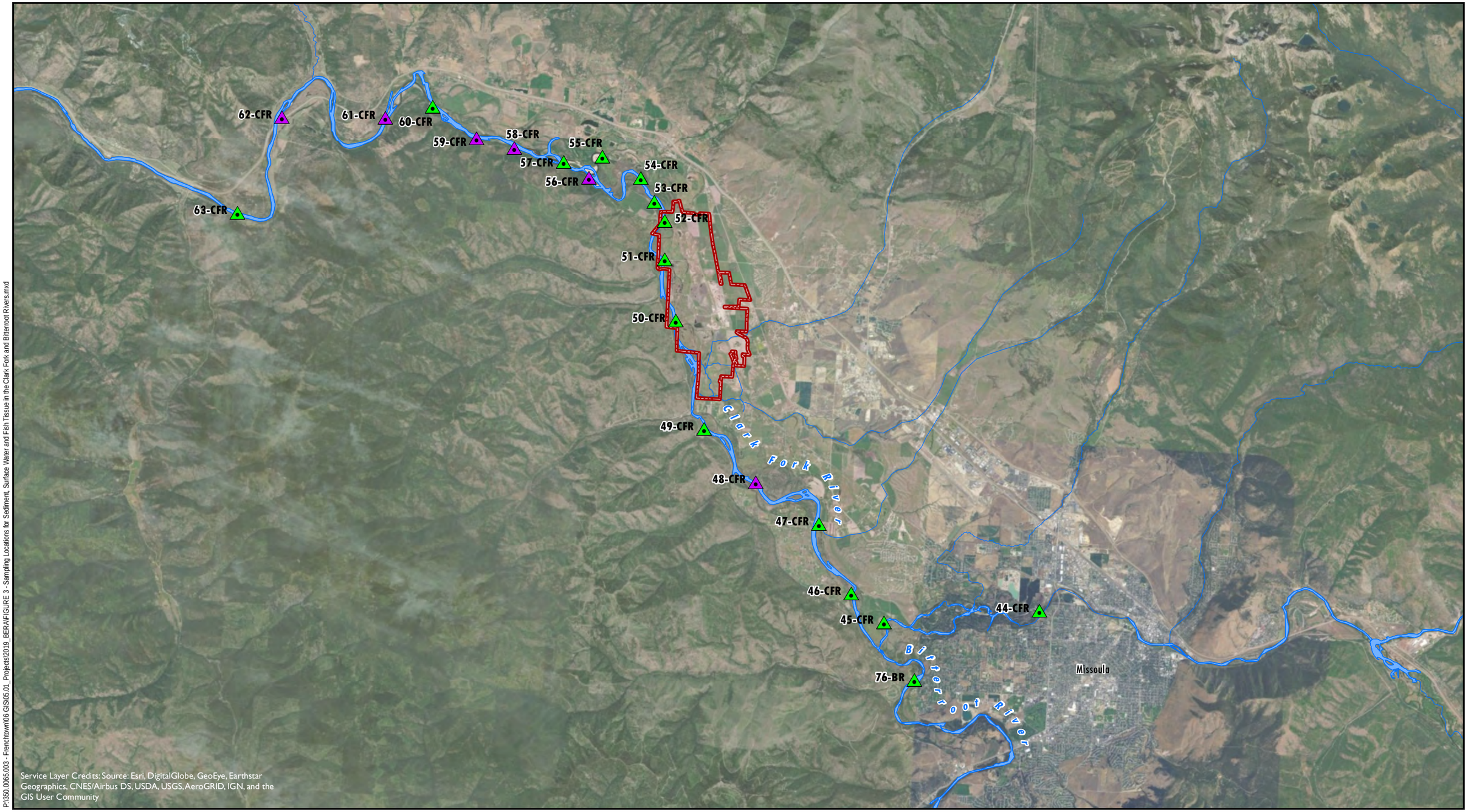


P:\350\0065 M2\Geom\AGIS\Projects\2015_SiteInvestigation\2015 PrelimSummaryRpt\PDSR_Figures\FIGURE 8 - Surface and Sediment Sampling Location.mxd Revised 6/27/2016

0 Feet 12,000

NewFields

Surface Water and Sediment
Sampling Locations (2015)
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 3-7



P:\350.0065.003 - Frenchtown\06 GIS\06.01_Projects\2019_BERA\FIGURE 3 - Sampling Locations for Sediment, Surface Water and Fish Tissue in the Clark Fork and Bitterroot Rivers.mxd

N

0 Miles 2

NewFields

Surface Water, Sediment, and Fish Tissue Sample Location

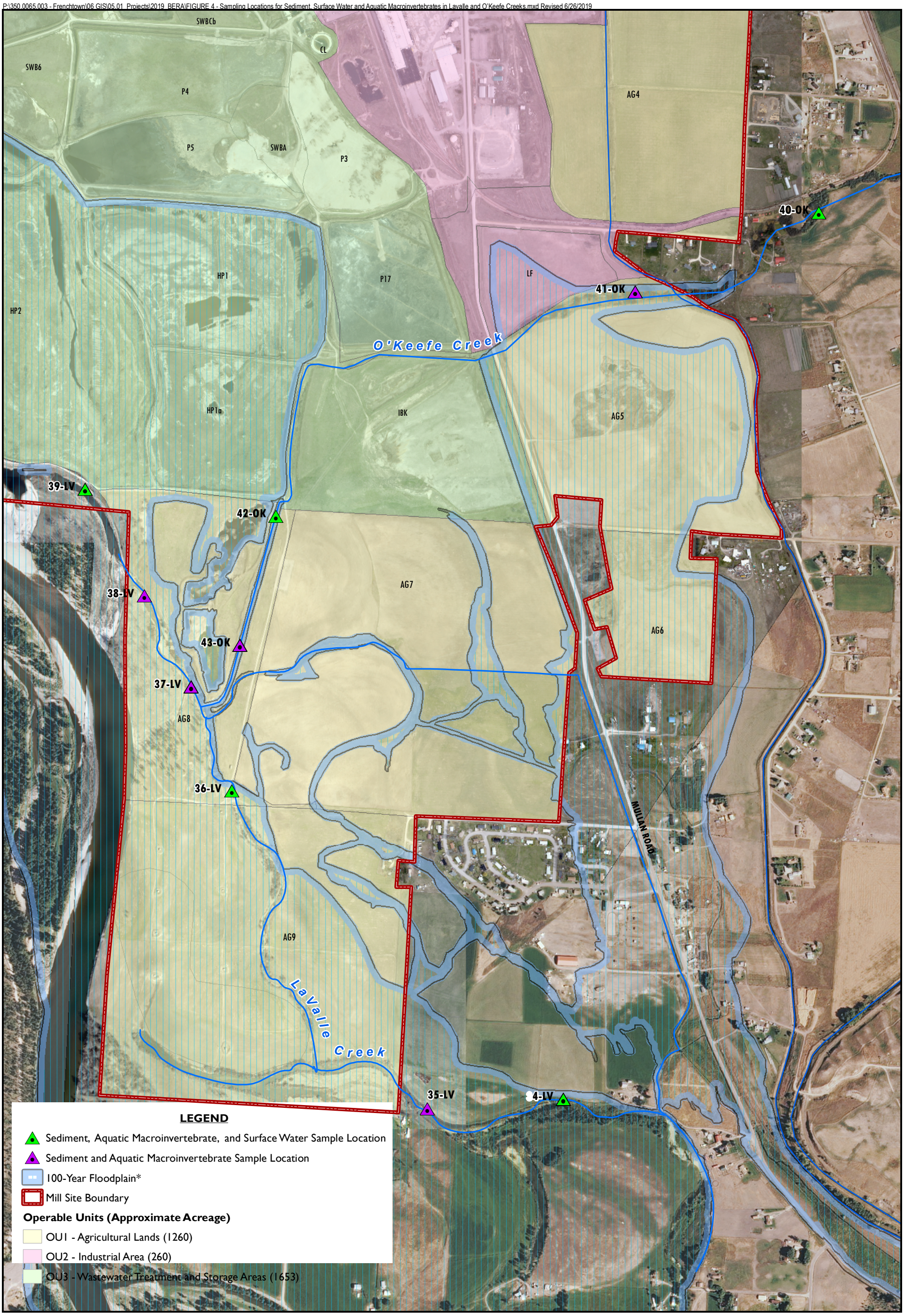
Surface Water and Sediment Sample Location

Mill Site Boundary

2018 Sampling Locations for Sediment and Surface Water in the Clark Fork and Bitterroot Rivers

Former Smurift Stone/Frenchtown Mill Site
Missoula County, Montana
FIGURE 3-8
(*adapted from NewFields 2020b*)

P:\350.0065.003 - Frenchtown\06 GIS\05.01 Projects\2019_BERA\FIGURE 4 - Sampling Locations for Sediment, Surface Water and Aquatic Macroinvertebrates in Lavalle and O'Keefe Creeks.mxd Revised 6/26/2019



0 800 Feet

NewFields

Aerial Photo Source: NAIP 2011 and Newfields 2016 (Within Site Boundary)

*Floodplain Source:
As defined by the Federal Emergency Management Agency (FEMA) 2013 Digital Flood Insurance Rate Map (DFIRM). (NFIP 2013)

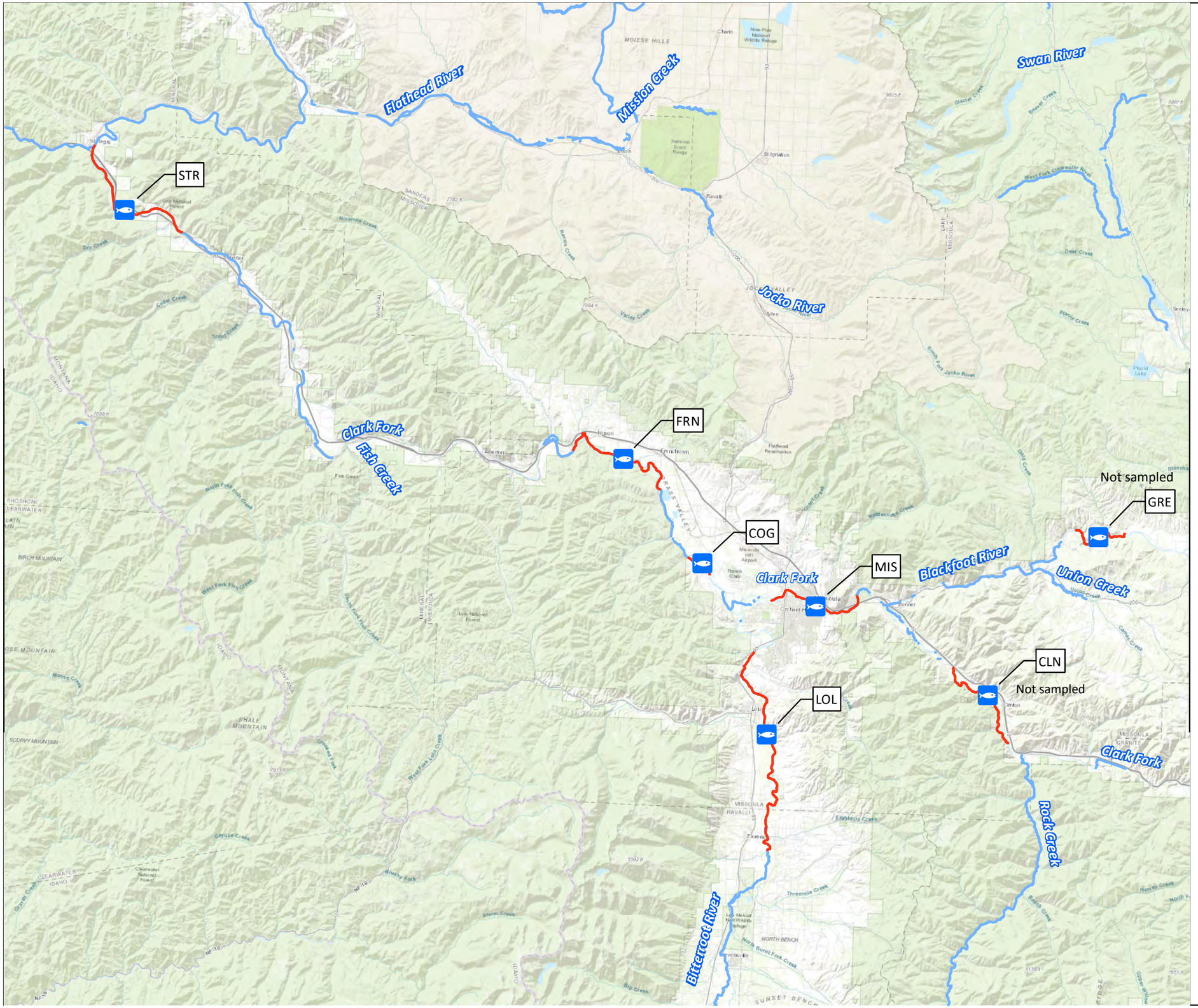
Notes

AG - Agricultural Land
AB - Aeration Stabilization Basin
CL - Clarifyer
FP - Flood Plain
HP - Holding or Storage Pond
IB - Rapid Infiltration Basin
LF - Landfarm
NPP - North Polishing Pond
P - Settling Pond
SB - Spoils Basin
SPP - South Polishing Pond
SWB - Solid Waste Basin
WR - West of River

Sampling Locations for Sediment and Surface Water in O'Keefe and Lavalle Creeks (2018)

Figure 3-9
(adapted from NewFields 2020b)

Figure 3-10
Fish Sampling Locations (2019)



Fish (Northern Pike and Rainbow Trout) Sampling Locations

Reaches

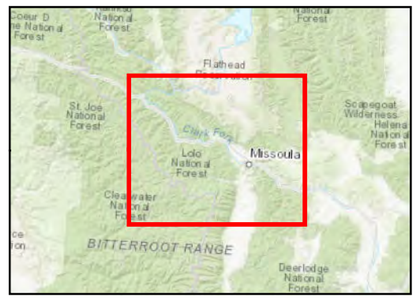
Rivers

Map Date: April 5, 2019

Data Sources:
Sample Locations: U.S. EPA (2019).
Rivers and Reaches: U.S. EPA and NHD Plus (2012).
Imagery: ESRI World Topo Service (2019).

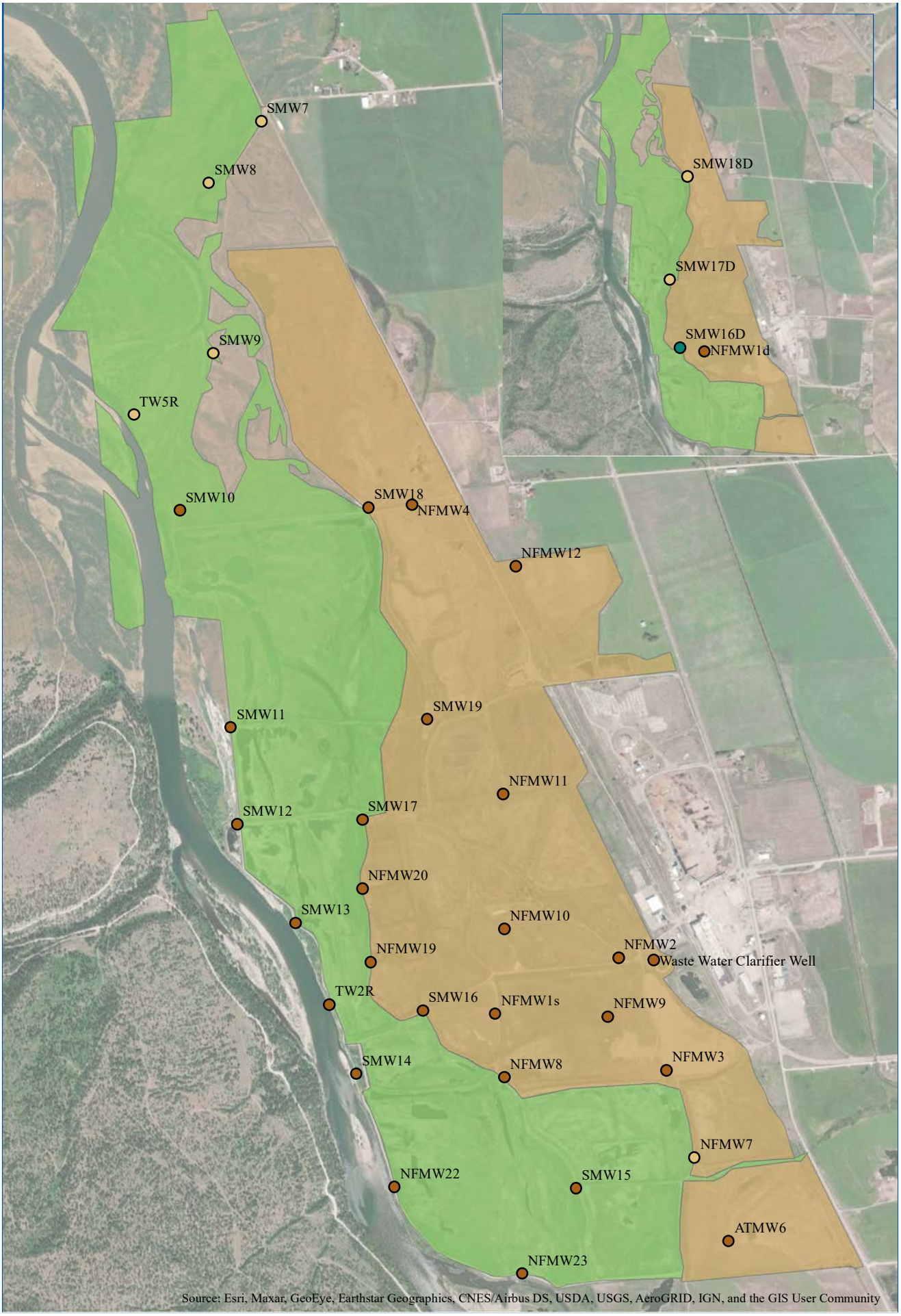
Map Projection: UTM Zone 12N, WGS84, Meters

0 10 20
Miles



Area of Interest

Figure 5-1. Total Non-Cancer Hazards to Hypothetical Future Residents from Exposures to Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

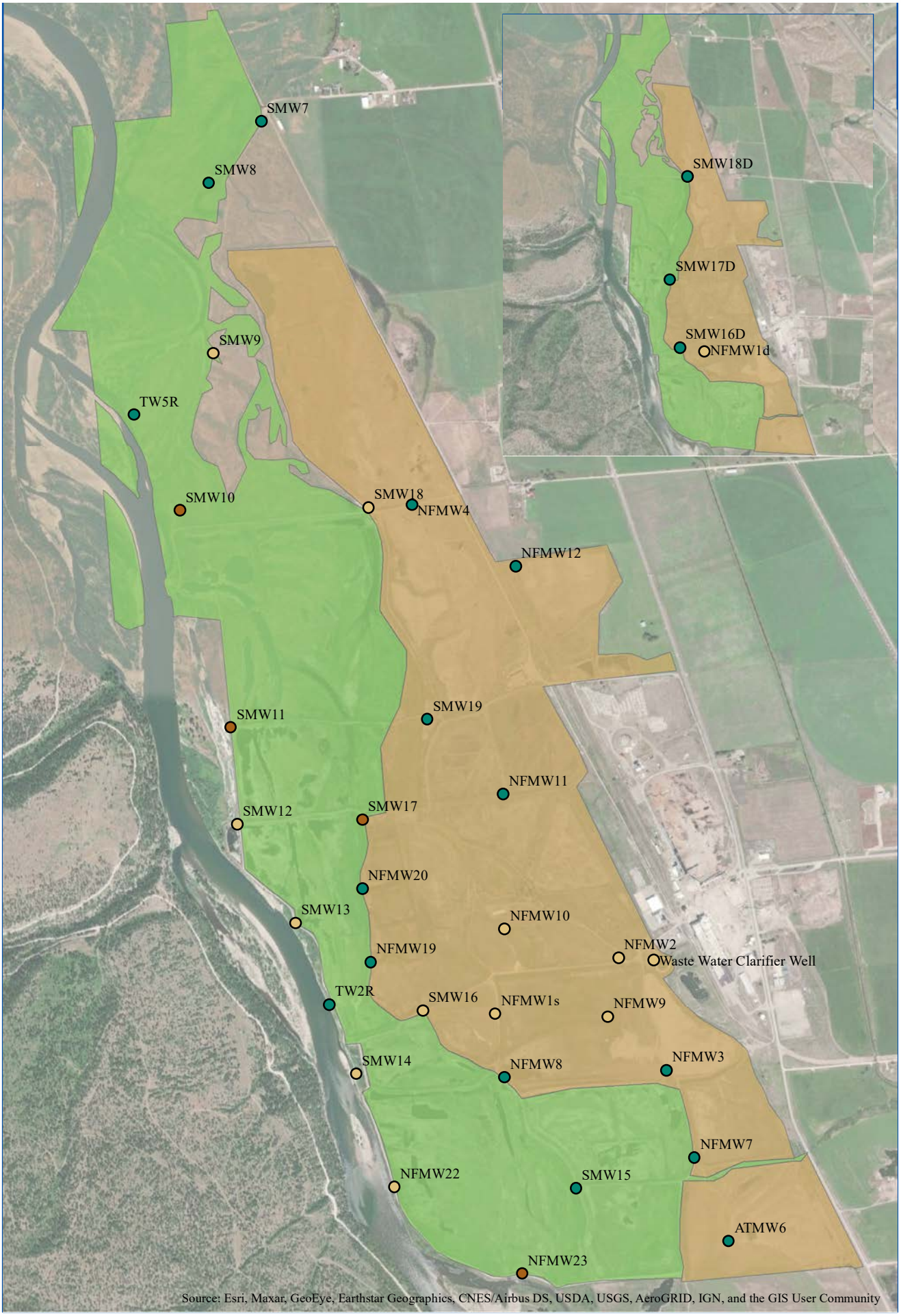
0 0.2 Miles

Total Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME child receptor.

Figure 5-2. Total Non Cancer Hazards to Hypothetical Future Residents from Exposures to Arsenic in Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

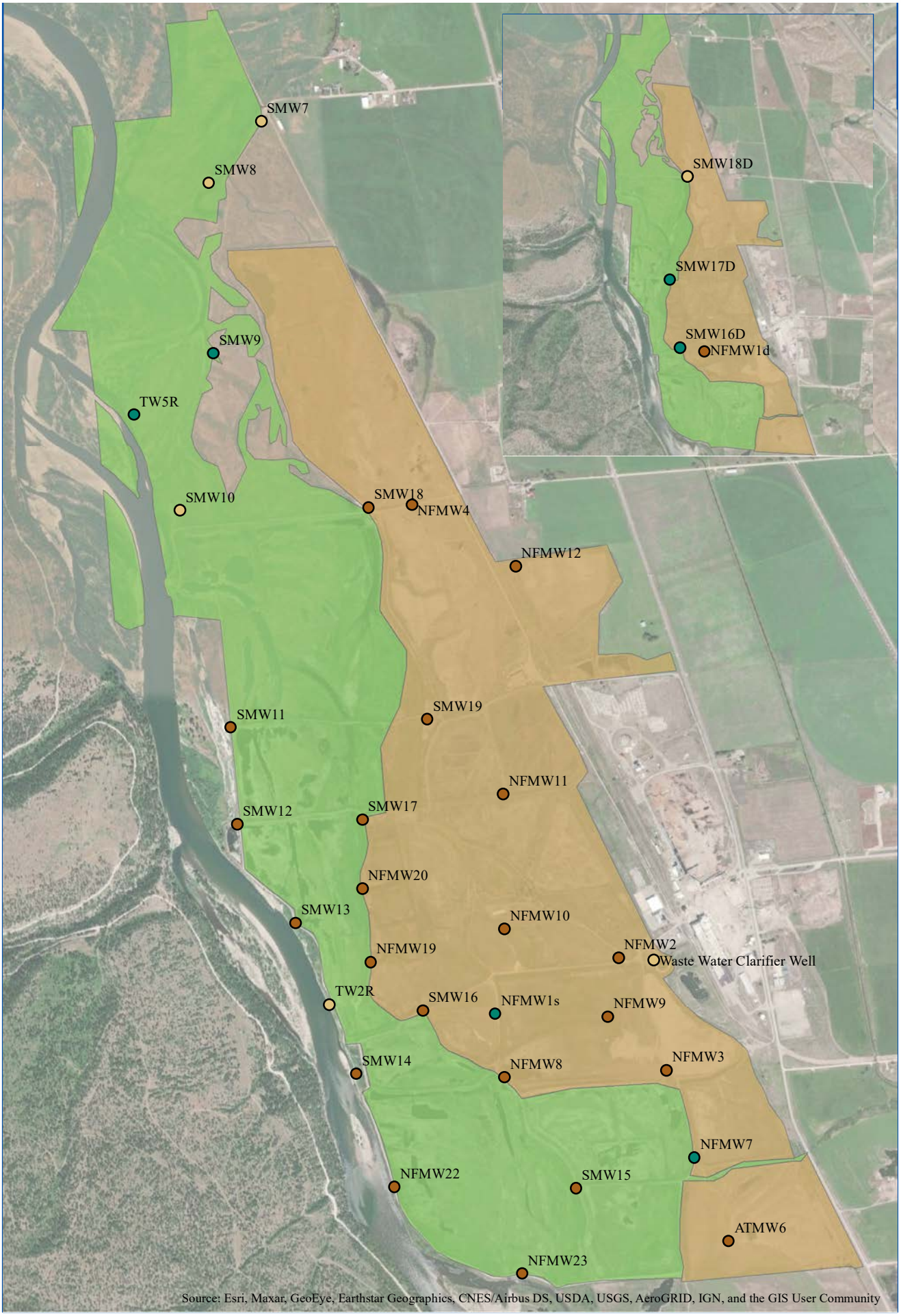
0 0.2 Miles

Arsenic Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME child receptor.

Figure 5-3. Total Non Cancer Hazards to Hypothetical Future Residents from Exposures to Manganese in Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

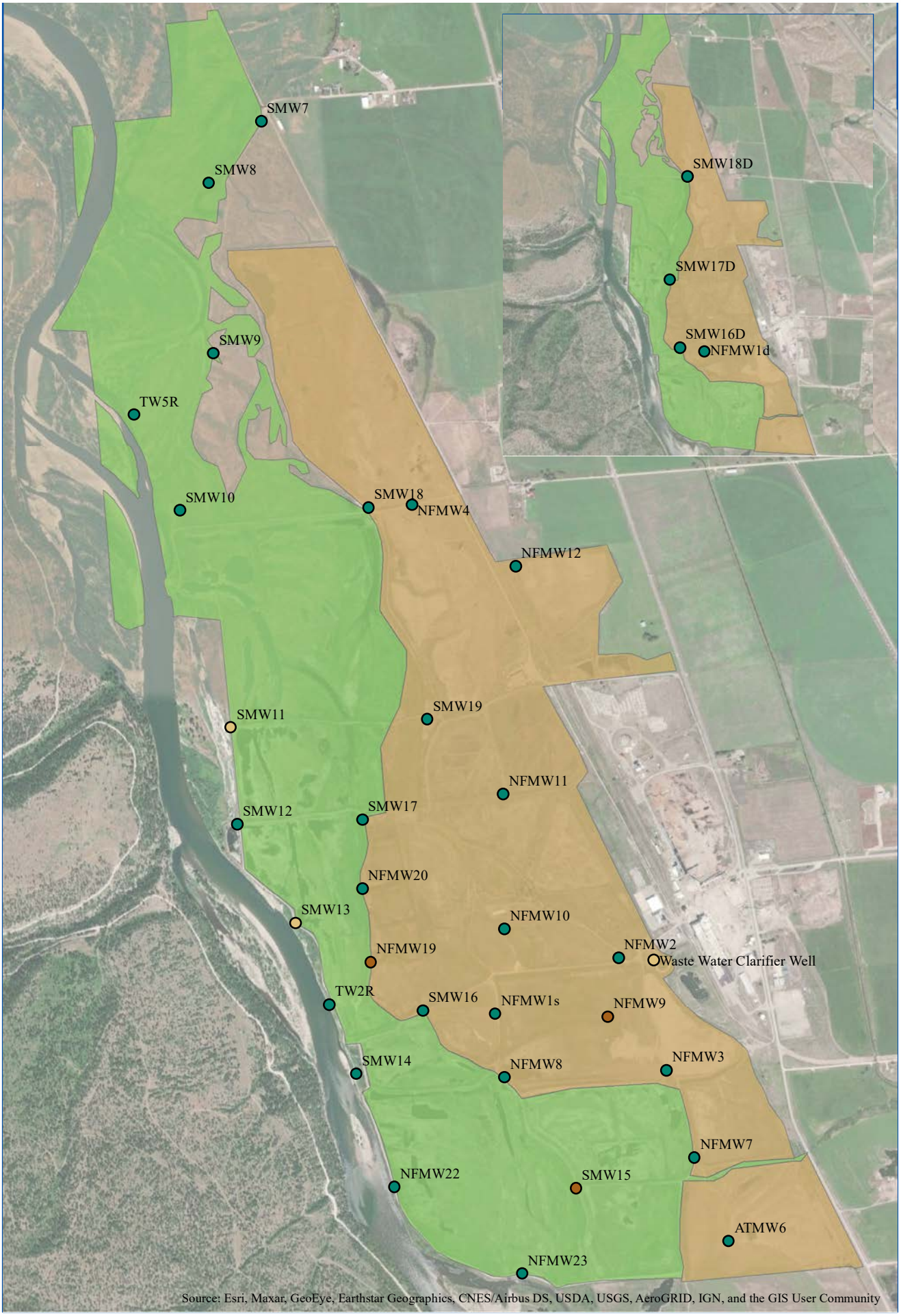
0 0.2 Miles

Manganese Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME child receptor.

Figure 5-4. Total Non Cancer Hazards to Hypothetical Future Residents from Exposures to Cobalt in Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

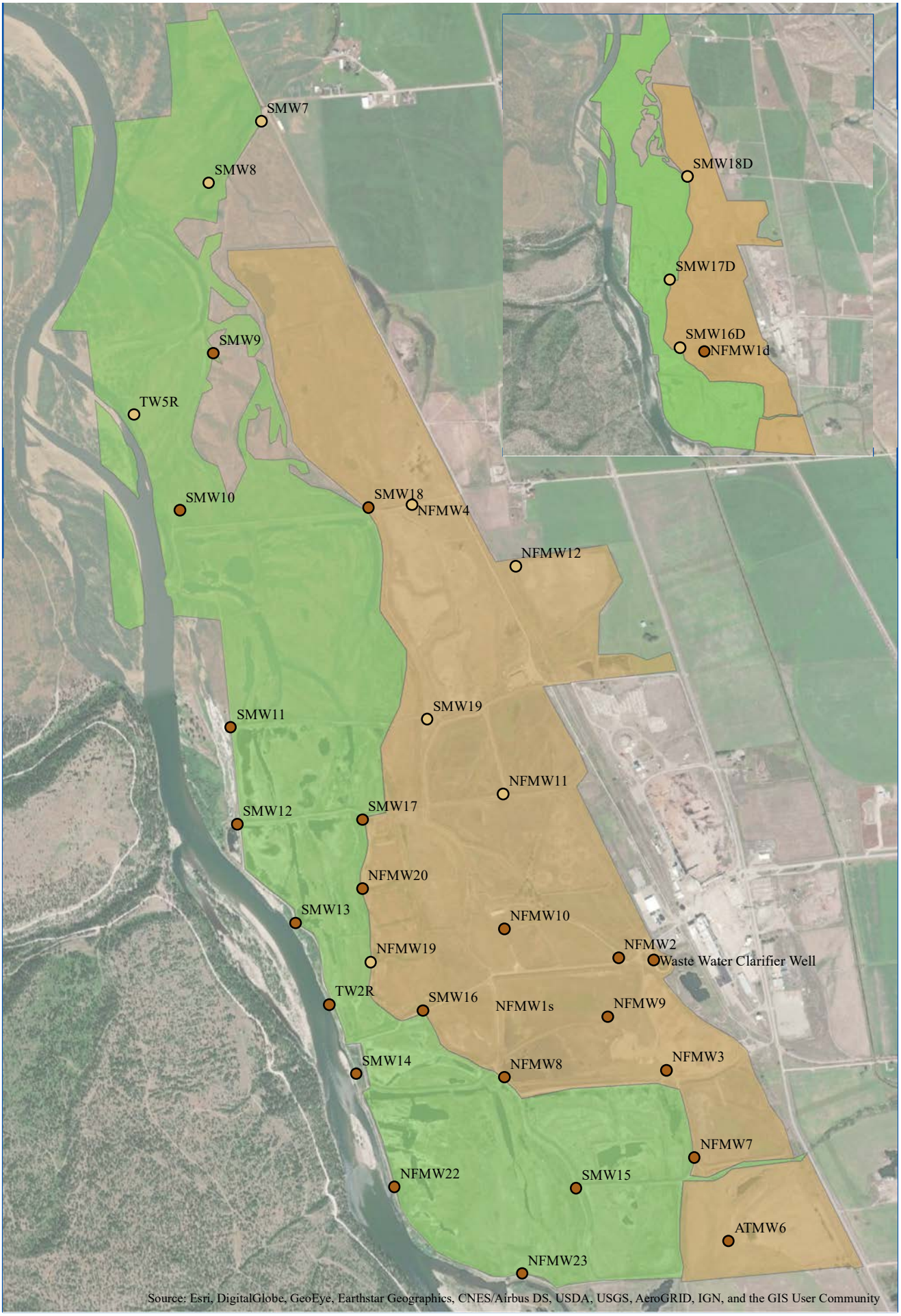
0 0.2 Miles

Cobalt Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME child receptor.

Figure 5-5. Total Cancer Risks to Hypothetical Future Residents from Exposures to Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

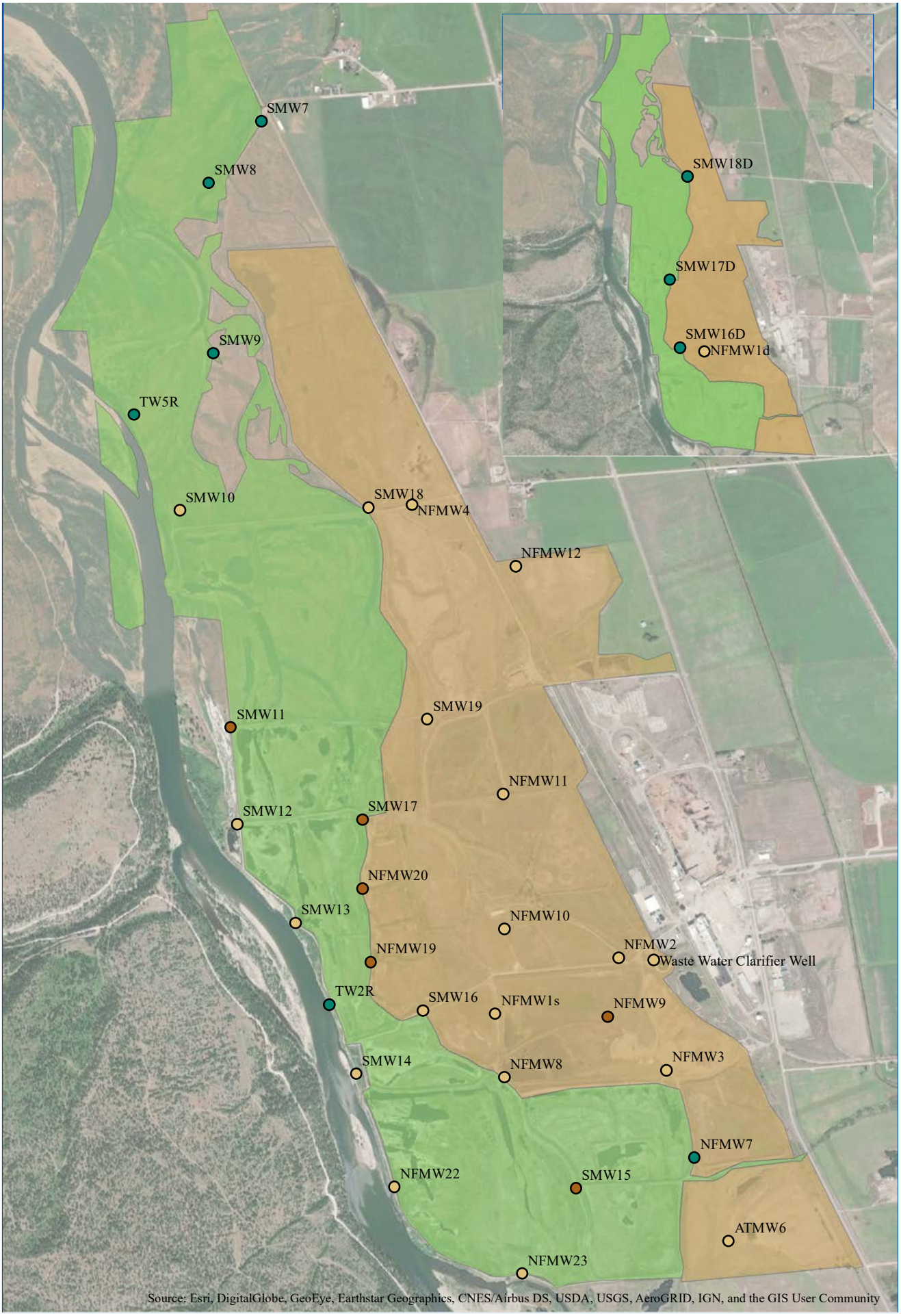
0 0.2 Miles

Total Cancer Risk

- Risk<1E-06
- Risk≥1E-06
- Risk≥1E-05
- Risk≥1E-04
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME receptor.

Figure 5-6. Total Non-Cancer Hazards to Hypothetical Future Workers from Exposures to Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

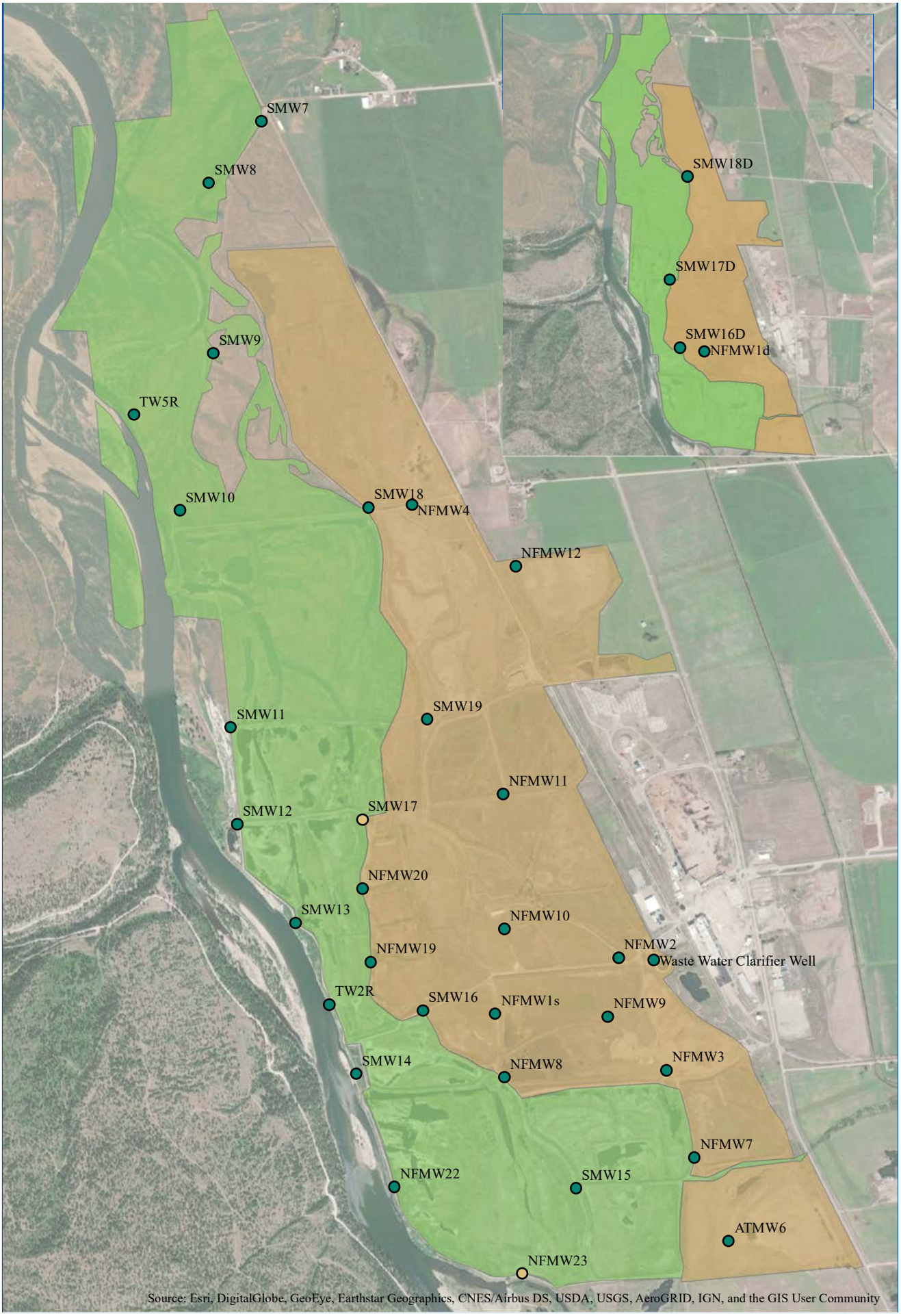
0 0.2 Miles

Total Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME receptor.

Figure 5-7. Total Non-Cancer Hazards to Hypothetical Future Workers from Exposures to Arsenic in Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

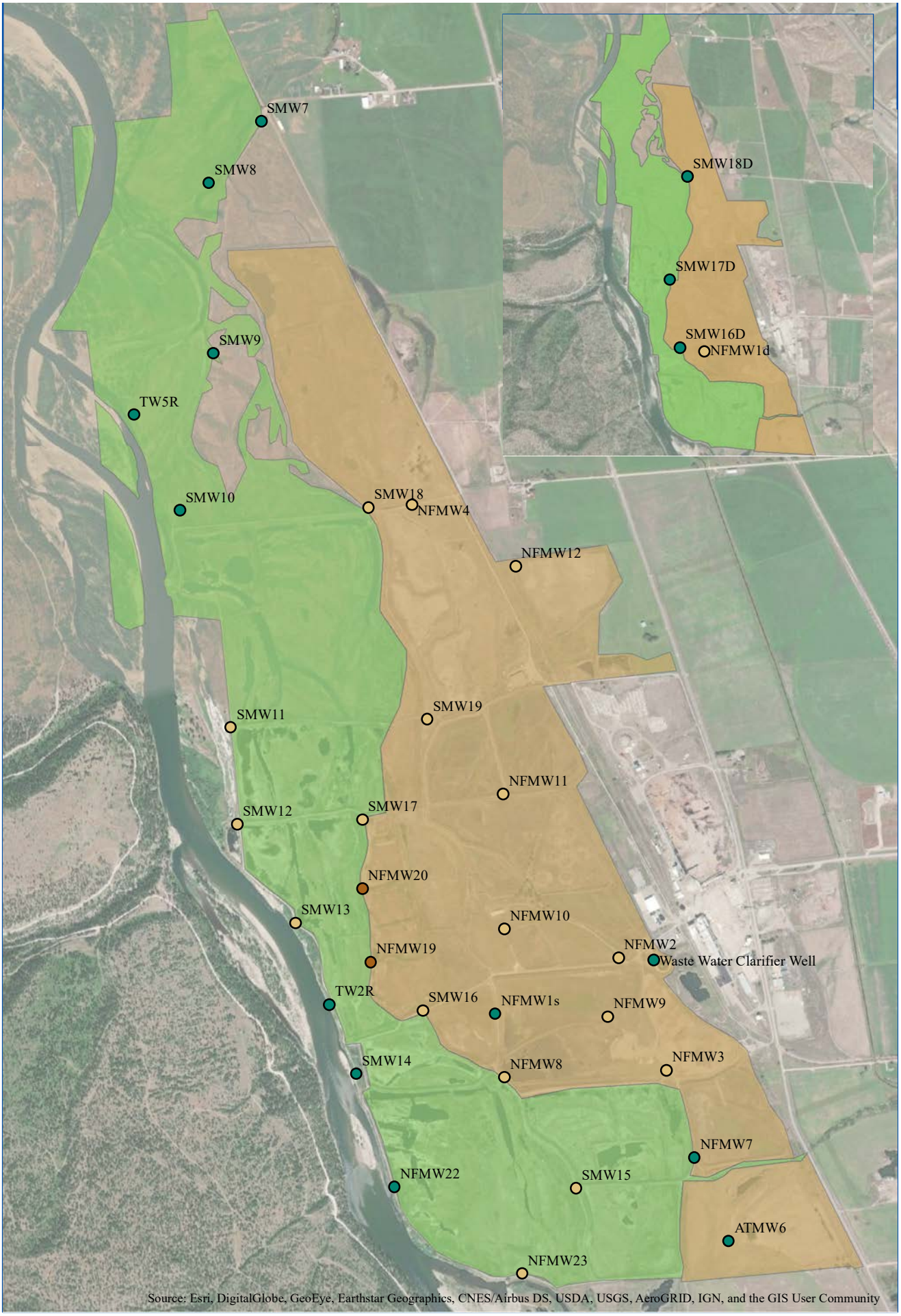
0 0.2 Miles

Arsenic Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME receptor.

Figure 5-8. Total Non-Cancer Hazards to Hypothetical Future Workers from Exposures to Manganese in Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

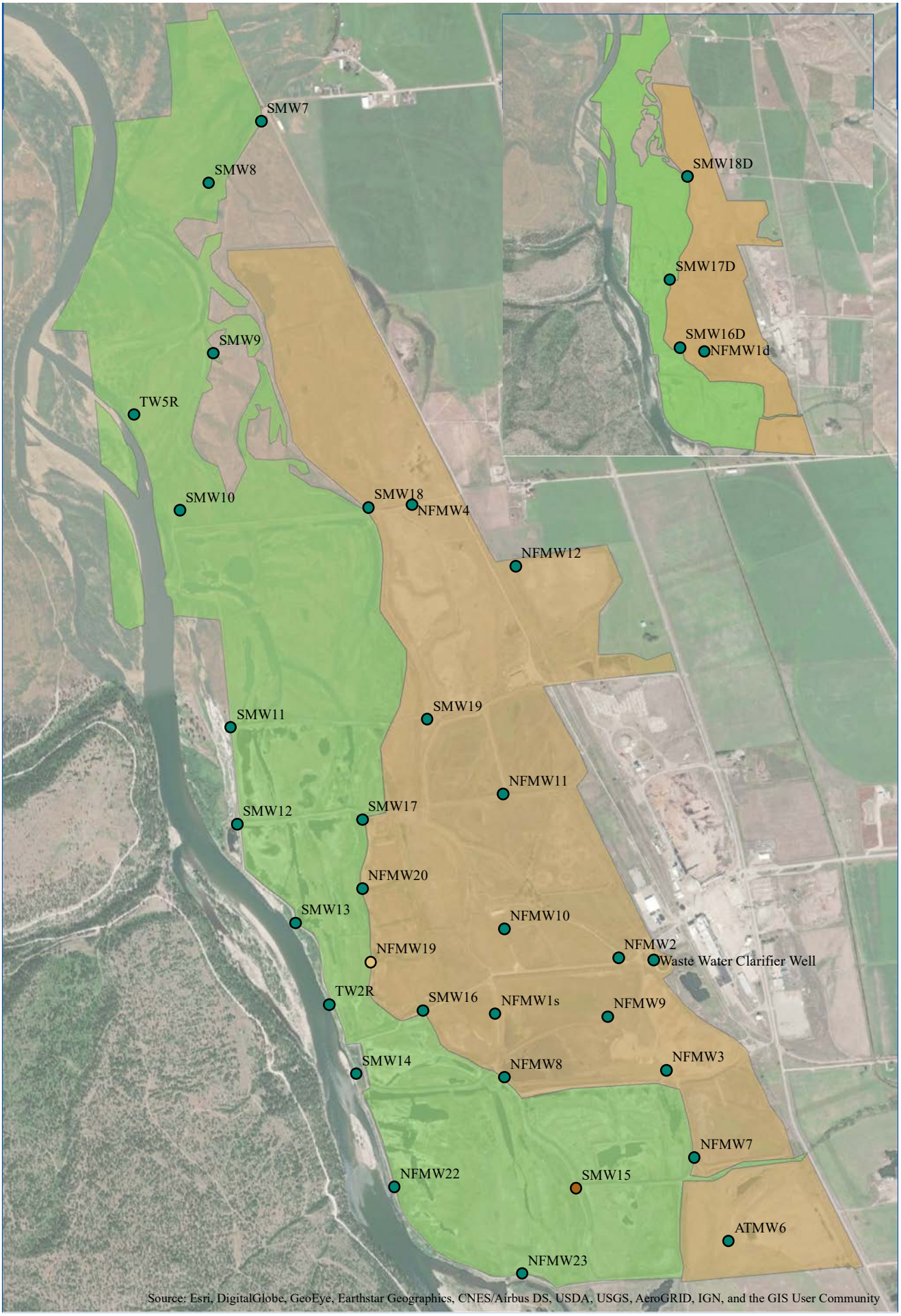
0 0.2 Miles

Manganese Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME receptor.

Figure 5-9. Total Non-Cancer Hazards to Hypothetical Future Workers from Exposures to Cobalt in Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

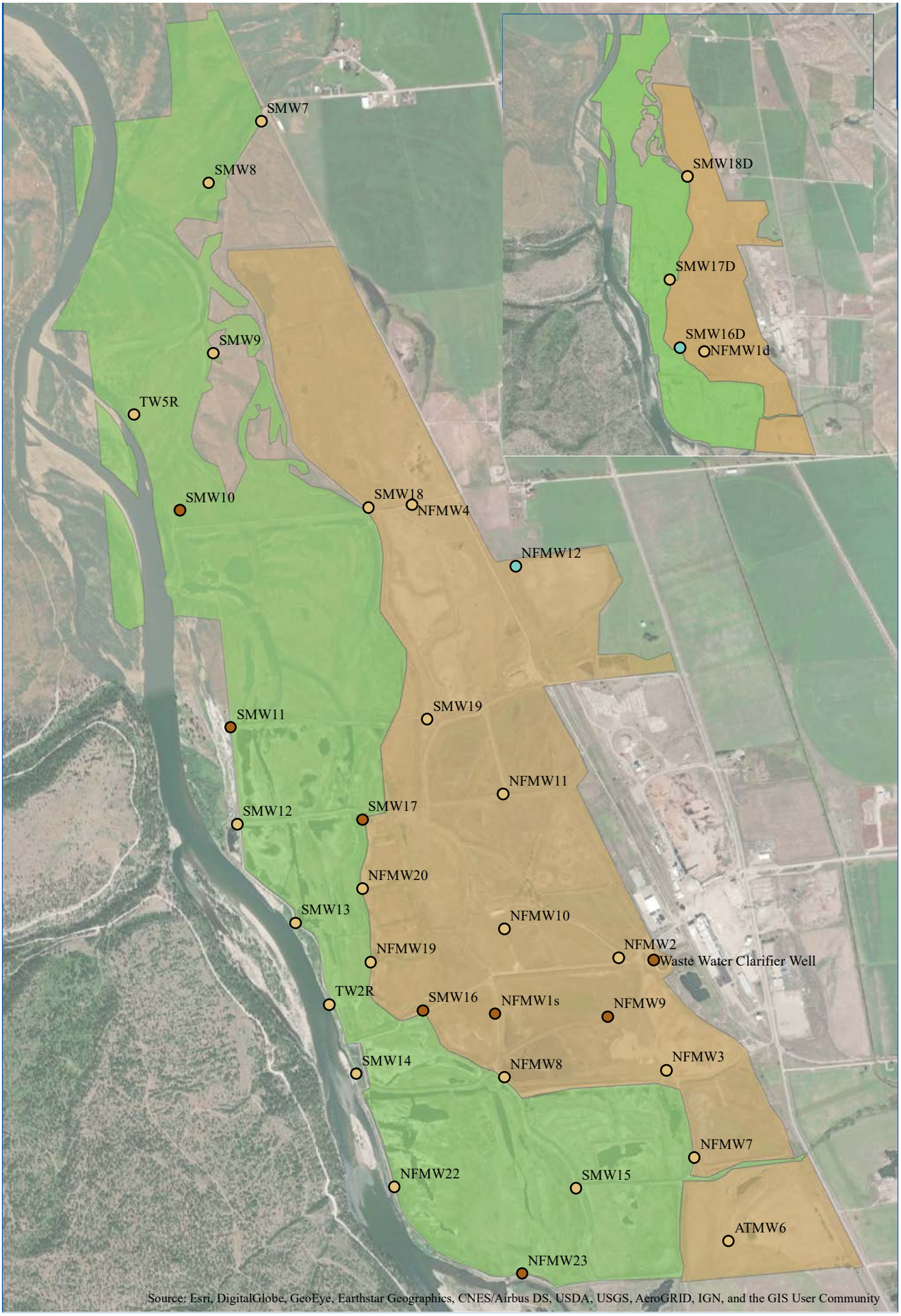
0 0.2 Miles

Cobalt Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME receptor.

Figure 5-10. Total Cancer Risks to Hypothetical Future Workers from Exposures to Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

0 0.2 Miles

Total Cancer Risk

- Risk<1E-06
- Risk≥1E-06
- Risk≥1E-05
- Risk≥1E-04
- OU3 Upland
- OU3 Floodplain

Note: This is reflective of the RME receptor.

APPENDIX A

OU3 DATA SUMMARY

Smurfit-Stone/Frenchtown Mill Site
OU3 Human Health Risk Assessment

1.0 INTRODUCTION

This appendix summarizes the data utilized in the Operable Unit 3 (OU3) human health risk assessment (HHRA). As described in the main text of this OU3 HHRA, soil, groundwater, sediment, surface water, and fish tissue samples were collected within OU3 as part of various Site investigations conducted between 2014 and 2020. All data were collected following United States Environmental Protection Agency (USEPA) approved sampling plans as part of ongoing remedial investigation (RI) activities. This appendix presents a brief overview of the available data used in the OU3 HHRA. Additional details on sampling and analysis can be found in the RI reports available on the Site webpage[1].

Data collected prior to 2014 to support the Preliminary Assessment/Site Investigation are not used in the HHRA due to deviations from the Quality Assurance Project Plan (QAPP) that occurred during sampling and analysis of those samples. Instead, USEPA used those data to inform the RI Work Plan (RIWP) and focused collection on those areas identified as having potentially elevated contamination. The sampling conducted as part of RI activities are more recent, were collected in accordance with the USEPA approved QAPP, and have been evaluated and determined to meet the needs of the risk assessment.

Data collected for the RIWP and associated Addenda have been uploaded to a USEPA Scribe database for the Smurfit-Stone/Frenchtown Mill Site. Data considered for use in the OU3 HHRA were based on a Scribe download conducted May 2021. Not all of the data in Scribe were utilized in the OU3 risk evaluation presented within the HHRA.

The available data downloaded from Scribe used in this HHRA were reduced as described below to produce the Site datasets utilized in the quantitative risk evaluations. Data used in the OU3 HHRA are provided as an electronic data file in Attachment A-1 to this appendix. Attachment A-1 includes separate tabs for each medium.

2.0 DATA SUMMARY

2.1 Soil

Soil samples were collected at locations throughout OU3 in April 2014, November/December 2015, and October 2017. In 2014/2015, surface soils were collected as localized 5-point composites over a 1 to 2-meter area. In 2017, 20-point composite samples were collected from

[1] Smurfit-Stone Mill Frenchtown, Missoula, MT webpage: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0802850

square grid units in OU3. Samples were collected from 20-acre grid units in the OU3 upland area outside of the 100-year floodplain, and from 100-acre grid units in the OU3 Floodplain. In addition to the 20-point composite samples, 30-point composite surface soil samples were also collected from historic wastewater treatment basins within the OU3 upland area. Surface soil samples were collected from 0 to 2 inches and from 0 to 6 inches. Subsurface samples were collected as vertical composites from varying depths down to 18 feet. Only those samples collected down to 10 feet (the depth to which a construction worker may be exposed) were considered in the HHRA. All of the soil samples collected from the Site represent bulk soil. OU3 soil samples were analyzed for metals, dioxins/furans, and polychlorinated biphenyls (PCBs; as Aroclors). These data are briefly summarized in the main text. OU3 soil samples were not analyzed for semi-volatile organic compounds (SVOCs) and volatile organic compounds (VOCs) based on the low level of detection of these contaminants observed in OU2 soil samples. More details on the soil sampling efforts are available in the RI Work Plan Addenda available on the Site webpage.

2.2 Groundwater

Within the Scribe database, the location zone for all groundwater samples is entered as “OU3”. Based on the maps provided in the RI reports, the following groundwater wells have been identified for inclusion in OU3: ATMW6, NFMW1 to NFMW4, NFMW7 to NFMW12, NFMW19, NFMW20, NFMW22, NFMW 23, SMW7 to SMW19, TW2R, TW5R and the waste water clarifier well. Groundwater monitoring has been happening at the Site annually since April 2014. Samples were collected multiple times within a year starting in 2017. Data collected through 2020 were considered in the OU3 HHRA. The monitoring wells (those identified as “MW”) are located within the water table aquifer below the Site that is generally present to a depth of approximately 35 feet below ground surface (ft bgs) (referred to as hydrostratigraphic unit 1) (NewFields 2020). The water supply well (waste water clarifier well) and deep wells (SMW16d, SMW17d, SMW18d) are located within the regional water supply aquifer that is generally present from approximately 130 to 160 ft bgs (referred to as hydrostratigraphic unit 3) (NewFields 2020). Groundwater samples have been analyzed for total recoverable and dissolved metals, dioxins/furans, PCBs (as Aroclors), SVOCs and VOCs. Not all samples were analyzed for all contaminant classes. Various field parameters were also measured including pH, temperature, dissolved oxygen, oxidation reduction potential, specific conductance, alkalinity and anions.

2.3 Sediment

Sediment samples were collected in 2015 and 2018. In November 2015, bed sediment samples were collected from O’Keefe and Lavalle Creeks and within the CFR downstream and adjacent

to the Site. In December 2015, additional sediment sampling was conducted along the CFR from the flood fringe of the 100-year floodplain downstream of the Site. In August 2018, bed sediment samples were collected from on-Site ponds, O'Keefe and Lavalle Creeks, and from the CFR adjacent to and downstream of the Site. Sediment samples were analyzed for dioxins/furans and metals. Miscellaneous parameters (e.g., organic carbon, percent fines) were also measured. Six of the bed sediment samples collected in 2015 were also analyzed for PCBs (as Aroclors) and SVOCs.

2.4 Surface Water

Surface water samples were collected in November 2015 from Lavalle Creek and within the CFR downstream and adjacent to the Site at locations coincident with the bed sediment samples. One surface water sample was collected from Lavalle Creek and three surface water samples were collected from the CFR adjacent to or downstream of the Site and analyzed for dioxins/furans, metals (total and dissolved), and miscellaneous parameters (e.g., measures of water quality such as alkalinity and pH, as well as ions such as chloride and fluoride). Three of the four surface water samples were also analyzed for PCBs (as Aroclors) and SVOCs.

To evaluate potential impacts to the CFR during high flows, surface water samples were collected in May 2018 from the CFR adjacent to the Site and within historic ponds during a high flow event. Two samples were collected from the CFR adjacent to the Site and two samples were collected from Site pond areas (HP2POND and HP13APOND). Samples were analyzed for dioxins/furans, metals (total and dissolved), and miscellaneous parameters (e.g., measures of water quality such as alkalinity and pH, as well as ions such as chloride and fluoride).

In August 2018, surface water samples were collected from 12 on-Site ponds, O'Keefe and Lavalle Creeks, and within the CFR downstream and adjacent to the Site co-incident with bed sediment samples. Samples were analyzed for dioxins/furans, metals (total and dissolved), and miscellaneous parameters (e.g., measures of water quality such as alkalinity and pH, as well as ions such as chloride and fluoride).

2.5 Fish Tissue

In July 2018, USEPA in cooperation with MFWP collected northern pike (*Esox lucius*) and rainbow trout (*Oncorhynchus mykiss*) from the CFR and its tributaries (USEPA 2018, 2019a). Four composite fillet and four composite carcass northern pike samples were collected from the Frenchtown reach of the CFR adjacent to the site. Eight composite fillet and eight composite carcass rainbow trout samples were collected from reaches of the CFR downstream of the site. As noted in USEPA (2020), sampling compliance issues, including the lack of chain-of-custody

(COC) forms and a lack of QC field samples, prohibited the use of these data in the quantitative risk evaluation. These data were not evaluated quantitatively in the OU3 HHRA, but were considered in the uncertainty assessment in accordance with USEPA (2020).

In June 2019, USEPA with the support of multiple agencies and contractors, collected additional northern pike and rainbow trout samples from the CFR and its tributaries to address a data gap (USEPA 2019b). Four composite fillet and four composite carcass northern pike samples were collected from the Frenchtown reach of the CFR adjacent to the Site. Eight composite fillet and eight composite carcass rainbow trout samples were collected from reaches of the CFR adjacent to (Frenchtown reach) and downstream (St. Regis reach) of the Site.

All northern pike and rainbow trout samples from the 2018 and 2019 sampling events were analyzed for dioxins/furans, PCB congeners, % solids, and % lipids. All fish tissue concentration data used in the OU3 HHRA were based on wet weight concentrations.

3.0 DATA REDUCTION

3.1 Categorization as Surface Soil and Subsurface Soil

For the purposes of the HHRA, surface soil samples were classified as samples collected from a starting depth of either zero or one inch down to six inches below ground surface (bgs). Samples collected from at or below one-foot bgs were classified as subsurface soil samples. Subsurface data used in the OU3 HHRA were restricted to samples collected within the top 10 feet bgs.

3.2 Treatment of Field Duplicates

In accordance with the RI work plan (RIWP) QAPP, blind field duplicates (one for every twenty natural samples) were collected to provide quality assurance for field sampling. Two concentration results for a parent sample-duplicate pair were reduced to a single value for each contaminant as follows:

- If both the parent sample and the duplicate sample results were detected, the maximum detected concentration was retained and the result was flagged as a detect.

- If both the parent sample and the duplicate sample results were qualified as not detected, the maximum DL was retained and the result was flagged as a non-detect.

- If one result from the sample pair was detected, while the other was qualified as not detected, the detected concentration was retained and the result was flagged as a detect.

TEQ concentrations were calculated for each parent sample and field duplicate as described in Sections 3.6 below. For each sample pair, the results were reduced to a single value for each calculated result in accordance with the protocol presented above. Duplicate reduction was not done at the congener level.

3.3 Treatment of Multiple Analytical Results

Some soil samples collected within OU3 were analyzed using two extraction methods during VOC analysis: EPA 5035/5030B and EPA 5035 Low. This resulted in several samples having two results for each VOC in the Scribe database. These results were reduced to a single value for each contaminant as follows:

- If both the results were detected, the maximum detected concentration was retained and the result was flagged as a detect.

- If both results were qualified as not detected, the maximum DL was retained and the result was flagged as a non-detect.

- If one of the results was detected, while the other was qualified as not detected, the detected concentration was retained and the result was flagged as a detect.

TEQ concentrations were calculated for each parent sample and field duplicate as described in Section 3.6. For each sample pair, the results were reduced to a single value for each calculated result in accordance with the protocol presented above. Duplicate reduction was not done at the congener level.

Field duplicates were not collected during the 2018 and 2019 northern pike and rainbow trout sampling events. However, duplicate homogenate samples were created during sample processing to assess whether contamination occurred during sample processing (e.g., two carcass homogenate samples created from the same composite sample were submitted for analysis). Homogenate duplicate samples were not evaluated in the OU3 HHRA, but were considered during the data validation process.

3.4 Treatment of Non-detects

When calculating summary statistics, non-detects (NDs) were evaluated at ½ the sample-specific detection limit (DL). When inputting data to ProUCL for the purposes of calculating 95 percent

(%) upper confidence limit (95UCL) values, ND data were based on the DL (i.e., sample-specific detection limit).

Various detection limits were reported for Site data by laboratories and are defined slightly different by each laboratory that analyzed Site samples. Pace Analytical performed sample analyses for metals, PCBs (in abiotic media only), SVOCs and VOCs. For each sample result, Pace reported a "MDL" (method detection limit; adjusted for sample dilution) and "RDL/QL" (laboratory reporting limit/quantitation level). The MDL refers to the lowest concentration that can be detected by the laboratory with confidence that the analyte is present (i.e., not a false positive). The RDL/QL refers to the lowest concentration that can be reported with confidence in the accuracy and precision of the value. Concentrations below this limit can be detected, but the value should be considered estimated. The MDL reported by Pace was used as the DL for Site data. Dioxins/furans were analyzed by Frontier Analytical (Frontier) for all media except the northern pike and rainbow trout tissue samples. For Frontier, the reported MDL is the method detection limit under ideal conditions – not accounting for matrix interferences, dilution, etc. If an analyte is not detected in a sample, Frontier calculates a sample-specific detection limit and reports it as the RDL. The QL reported by Frontier is the lowest point of calibration on the instrument. This is analogous to the QL reported by Pace: analytes detected below this limit are present, but the reported value is estimated. The RDL reported by Frontier was used as the DL for Site data.

The northern pike and rainbow trout samples were analyzed for dioxins/furans and PCB congeners by ALS Environmental (ALS). For dioxins/furans a contract required quantitation limit (CRQL) and MDL were reported by ALS. MDLs were calculated for each analyte in each sample by measuring the height of the noise level for each quantitation ion for the associated labeled standard. The concentration equivalent to 2.5 times the height of the noise is then calculated using the appropriate response factor and the weight of the sample. The calculated concentration equals the MDL. For PCB congeners an estimated detection limit (EDL) was reported by ALS. The EDL is defined as the Estimated Detection Limit and based on the measured background noise for this target in this sample. The dioxin/furan MDL and PCB EDL reported by ALS was used as the DL for Site data.

3.5 Calculation Total PCB Concentrations

There are 209 PCB congeners. PCBs generally occur as a mixture of congeners. Aroclors are commercial mixtures of PCB congeners that contain many of the individual congeners in varying ratios. When Aroclors are released into the environment, the original congener composition of the PCB mixture changes due to differential fate and transport processes (USEPA 1996). Chemical analyses of environmental samples often report PCB concentrations in terms of the

Aroclor mixture(s) they most closely resemble. All PCB data for OU3 abiotic media were reported in concentrations of Aroclor mixtures.

Fish tissues were analyzed for PCB congeners. Total PCB concentrations were calculated by summing across all reported congeners. Not all 209 PCB congeners can be separated using the procedures described in the analytical method. Thus, in some cases two or more PCB congeners elute from the chromatographic column at the same time. To avoid double counting of PCB congeners that co-elute, data are only reported for coeluting pair/group.

3.6 Calculation of TEQ

Because dioxin and furan congeners and dioxin-like PCBs all act by the same mechanism as 2,3,7,8-TCDD, data for the dioxin and furan congeners and dioxin-like PCBs was converted to a TCDD TEQ by computing the sum across congeners of the product of congener-specific concentration and relative toxicity equivalence factor (TEF):

$$TEQ = \sum (Ci \times TEFi)$$

TEFs were based on USEPA (2010). In the site database, separate TEQ values were calculated for dioxins and furans ($TEQ_{D/F}$), DL-PCBs (TEQ_{PCB}), and dioxins, furans, and dioxin-like PCBs combined ($TEQ_{D/F/PCB}$). A TEQ concentration is flagged as ND only if no individual congener was detected in that sample. Exposure and risk estimates in the HHRA are based on evaluating TEQ assuming ND = ½ DL consistent with other regional risk assessments.

4.0 REFERENCES

NewFields. 2020. Groundwater conceptual site model. Former Smurfit-Stone/Frenchtown Mill Site, Missoula County, Montana. June.

USEPA 1996. PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures. EPA/600/P-96/001F. September. 1996.

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USEPA. 2018. Sampling and Analysis Plan/Quality Assurance Project Plan: 2018 Fish Tissue Study. Smurfit-Stone/Frenchtown Mill Site Missoula County, Montana. Revision 0. June.

USEPA. 2019a. Technical Memorandum Summary of the July 2018 Game Fish Sampling. April.

USEPA 2019b. Sampling and Analysis Plan/Quality Assurance Project Plan: 2019 Fish Tissue Study. Smurfit-Stone/Frenchtown Mill Site Missoula County, Montana. Revision 0. May.

USEPA 2020. Technical Memorandum Summary of the June 2019 Fish Sampling Event Smurfit-Stone/Frenchtown Mill Site, Montana. September.

ATTACHMENT A-1

Data Used in the Smurfit-Stone/Frenchtown Mill OU3 HHRA

Electronic File

[Appendix A_Attachment A-1.xlsx]

APPENDIX B

SCREENING LEVEL EVALUATIONS

Smurfit-Stone/Frenchtown Mill Site
OU3 Human Health Risk Assessment

1.0 INTRODUCTION

This appendix presents a screening level evaluation of those pathways identified as "minor" in the conceptual site model (CSM) for the Operable Unit 3 Site (OU3 Site) (see Figure 3-1 of the main document). These pathways include the following:

- Inhalation of soil particulates generated via wind erosion
- Inhalation of vapors released from surface soils
- Dermal contact with groundwater used in future residential and commercial buildings

As discussed in the main text of the human health risk assessment (HHRA) for the OU3 Site, ingestion is the primary pathway by which exposure to site media is expected to occur at the OU3 Site. In general, the above pathways are considered minor exposure pathways when compared to the ingestion pathway. This screening level evaluation considers the relative risks from exposure to a chemical from each of the pathways listed above compared to the relative risks from exposure of the same chemical via the ingestion pathway.

2.0 INHALATION OF CONTAMINANTS IN SOIL

As described in the main text of this HHRA, human receptors at the OU3 Site may be exposed to contaminated soil via inhalation of soil particulates suspended in air by wind disturbance or via inhalation of vapors in the air emitted from soil. This section evaluates the relative comparison between the ingestion pathway and the inhalation pathway for exposures to soil. The basic equations recommended by USEPA (1989; 2009) for evaluating exposures via ingestion and inhalation are described in brief below.

2.1 Ingestion Exposures

The daily ingested intake for chronic exposures is calculated as (USEPA 1989):

$$DI = C \cdot (IR / BW) \cdot (EF \cdot ED / AT)$$

where:

DI	=	Daily intake of chemical (mg per kg of body weight per day).
C	=	Concentration of the chemical in the contaminated environmental medium (soil, water) to which the person is exposed. The units are mg/kg for soil and µg/L for water.
IR	=	Intake rate of the contaminated environmental medium. The units are kg/day for soil and L/day for water.

BW = Body weight of the exposed person (kg).
EF = Exposure frequency (days/year).
ED = Exposure duration (years).
AT = Averaging time (days).

2.2 Inhalation Exposures

The inhaled exposure concentration (EC) for chronic exposures is calculated as (USEPA 2009):

$$EC = C_{air} \cdot (ET \cdot EF \cdot ED / AT)$$

where:

EC = Exposure Concentration ($\mu g/m^3$). This is the time-weighted concentration based on the characteristics of the exposure scenario being evaluated.
C_{air} = Concentration of the chemical in air ($\mu g/m^3$) to which the person is exposed.
ET = Exposure time (hours/day).
EF = Exposure frequency (days/year).
ED = Exposure duration (years).
AT = Averaging time (hours).

and

C_{air} = C_{soil} / PEF or VF

where:

C_{soil} = Concentration of the chemical in soil (mg/kg)
PEF = Particulate Emission Factor (m^3/kg)
VF = Volatilization Factor (m^3/kg)

To compare the relative contributions to exposure from the two pathways, non-cancer hazards and cancer risks were calculated as follows:

Non-cancer hazard quotients

HQ = DI / RfD (ingestion pathway)

HQ = EC / RfC (inhalation pathway)

Cancer risks

Risk = DI · SF (ingestion pathway)

Risk = EC · UR (inhalation pathway)

Based on the above equations, the relative magnitude of risks from inhalation exposures can be compared to risks from ingestion exposure by calculating the ratio as follows:

Ratio = Inhalation Risk / Ingestion Risk

Using the exposure parameters for a resident, cancer risks and non-cancer HQ values were calculated for 2,3,7,8-TCDD (herein referred to as dioxin) as an example, assuming an arbitrary soil concentration.

Media	Endpoint	Pathway	Ratio (Inhalation/Ingestion)
Soil	Cancer	Inhalation (particulates)	6E-05 (<0.01%)
		Inhalation (vapor)	4E-02 (4%)
	Non-cancer	Inhalation (particulates)	3E-06 (<0.001%)
		Inhalation (vapor)	2E-03 (0.2%)

As shown in the table above, risks from inhalation exposures are small compared to risks from ingestion exposures (<5%). These findings support designating the inhalation pathways for soil exposures as minor for the purposes of this assessment.

2.3 Dermal Contact with Water

As described in the main text of this HHRA, if groundwater were used in future residential buildings at the OU3 site, residents may be exposed while bathing/showering. The basic equations recommended by USEPA (1989; 2004) for evaluating exposures and risk via dermal contact are described in brief below.

Dermal Exposure

The dermally absorbed dose (DAD) is quantified using an equation of the following general form (USEPA 2004):

$$DAD = DA_{event} \cdot EF \cdot ED \cdot EV \cdot SA / (BW \cdot AT)$$

where:

DAD	=	Dermally absorbed dose (mg of chemical per kg of body weight per day).
DA_{event}	=	Absorbed dose per event (mg of chemical per square centimeter of skin surface area per event).
EF	=	Exposure frequency (days/year).
ED	=	Exposure duration (years).
EV	=	Event frequency (events/day).
SA	=	Surface area (cm^2).
BW	=	Body weight of the exposed person (kg).
AT	=	Averaging time (days).

Non-cancer hazard quotients

$HQ = DAD/RfD_{ABS}$ (dermal pathway; $RfD_{ABS}=RfD \cdot ABS_{GI}$)

Cancer Risk

$Risk = DAD \cdot SF_{ABS}$ (dermal pathway; $SF_{ABS} = SF/ABS_{GI}$)

Using the exposure parameters for a resident, dermal cancer risks and non-cancer HQ values were calculated for antimony as an example, assuming an arbitrary water concentration. The (dermal/ingestion) ratio between the non-cancer HQs for antimony is 8E-05 (0.01%). These findings support designating the dermal pathway for groundwater exposures to hypothetical future commercial workers as minor for the purposes of this assessment.

References

USEPA. 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). United States Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC.

USEPA. 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. United States Environmental Protection Agency, Office of Emergency and Remedial Response. EPA/540/R/99/005. July.

USEPA. 2009. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). Final. United States Environmental Protection Agency, Office of Emergency and Remedial Response. EPA-540-R-070-002. OSWER 9285.7-82. January.

APPENDIX C

ProUCL OUTPUT

Smurfit-Stone/Frenchtown Mill Site
OU3 Human Health Risk Assessment

1				**General Statistics on Uncensored Data**									
2			Date/Time of Computation	ProUCL 5.15/10/2021 11:31:03 AM									
3			**User Selected Options**										
4			From File	OU3 ProUCL Input 05.07.2021.xls									
5			Full Precision	OFF									
6													
7	**From File: OU3 ProUCL Input 05.07.2021.xls**												
8													
9	**General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method**												
10													
11	**Variable**	**NumObs**	**# Missing**	**Num Ds**	**NumNDs**	**% NDs**	**Min ND**	**Max ND**	**KM Mean**	**KM Var**	**KM SD**	**KM CV**	
12	1,4-Dichlorobenzene (nfmw10)	9	0	0	9	100.00%	0.081	0.96	N/A	N/A	N/A	N/A	
13	1,4-Dichlorobenzene (nfmw11)	2	0	0	2	100.00%	0.081	0.16	N/A	N/A	N/A	N/A	
14	1,4-Dichlorobenzene (nfmw19)	4	0	0	4	100.00%	0.16	0.17	N/A	N/A	N/A	N/A	
15	1,4-Dichlorobenzene (nfmw1d)	7	0	4	3	42.86%	0.12	0.95	0.547	0.115	0.34	0.62	
16	1,4-Dichlorobenzene (nfmw1s)	7	0	0	7	100.00%	0.12	4.2	N/A	N/A	N/A	N/A	
17	1,4-Dichlorobenzene (nfmw2)	7	0	7	0	0.00%	N/A	N/A	20.91	84.21	9.176	0.439	
18	1,4-Dichlorobenzene (nfmw20)	4	0	0	4	100.00%	0.16	0.17	N/A	N/A	N/A	N/A	
19	1,4-Dichlorobenzene (nfmw22)	1	0	0	1	100.00%	0.17	0.17	N/A	N/A	N/A	N/A	
20	1,4-Dichlorobenzene (nfmw23)	1	0	0	1	100.00%	0.17	0.17	N/A	N/A	N/A	N/A	
21	1,4-Dichlorobenzene (nfmw7)	2	0	0	2	100.00%	0.081	0.16	N/A	N/A	N/A	N/A	
22	1,4-Dichlorobenzene (nfmw8)	5	0	0	5	100.00%	0.081	0.34	N/A	N/A	N/A	N/A	
23	1,4-Dichlorobenzene (nfmw9)	9	0	6	3	33.33%	0.16	0.95	0.835	0.419	0.647	0.775	
24	1,4-Dichlorobenzene (smw16)	9	0	0	9	100.00%	0.081	9.7	N/A	N/A	N/A	N/A	
25	1,4-Dichlorobenzene (smw16d)	5	0	0	5	100.00%	0.081	0.17	N/A	N/A	N/A	N/A	
26	1,4-Dichlorobenzene (smw17)	5	0	0	5	100.00%	0.081	0.17	N/A	N/A	N/A	N/A	
27	1,4-Dichlorobenzene (smw17d)	5	0	0	5	100.00%	0.081	0.17	N/A	N/A	N/A	N/A	
28	1,4-Dichlorobenzene (smw18)	5	0	0	5	100.00%	0.081	0.17	N/A	N/A	N/A	N/A	
29	1,4-Dichlorobenzene (smw18d)	5	0	0	5	100.00%	0.081	0.17	N/A	N/A	N/A	N/A	
30													
31	**General Statistics for Raw Data Sets using Detected Data Only**												
32													
33	**Variable**	**NumObs**	**# Missing**	**Minimum**	**Maximum**	**Mean**	**Median**	**Var**	**SD**	**MAD/0.675**	**Skewness**	**CV**	
34	1,4-Dichlorobenzene (nfmw10)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
35	1,4-Dichlorobenzene (nfmw11)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
36	1,4-Dichlorobenzene (nfmw19)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
37	1,4-Dichlorobenzene (nfmw1d)	4	0	0.51	1	0.78	0.805	0.0417	0.204	0.17	-0.691	0.262	
38	1,4-Dichlorobenzene (nfmw1s)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
39	1,4-Dichlorobenzene (nfmw2)	7	0	8.4	36.2	20.91	19	84.21	9.176	5.337	0.602	0.439	
40	1,4-Dichlorobenzene (nfmw20)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
41	1,4-Dichlorobenzene (nfmw22)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
42	1,4-Dichlorobenzene (nfmw23)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
43	1,4-Dichlorobenzene (nfmw7)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
44	1,4-Dichlorobenzene (nfmw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
45	1,4-Dichlorobenzene (nfmw9)	6	0	0.36	2.1	1.143	1.085	0.399	0.632	0.689	0.42	0.553	
46	1,4-Dichlorobenzene (smw16)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
47	1,4-Dichlorobenzene (smw16d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
48	1,4-Dichlorobenzene (smw17)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
49	1,4-Dichlorobenzene (smw17d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
50	1,4-Dichlorobenzene (smw18)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
51	1,4-Dichlorobenzene (smw18d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
52													
53	**Percentiles using all Detects (Ds) and Non-Detects (NDs)**												
54													
55	**Variable**	**NumObs**	**# Missing**	**10%ile**	**20%ile**	**25%ile(Q1)**	**50%ile(Q2)**	**75%ile(Q3)**	**80%ile**	**90%ile**	**95%ile**	**99%ile**	
56	1,4-Dichlorobenzene (nfmw10)	9	0	0.112	0.126	0.13	0.17	0.34	0.34	0.464	0.712	0.91	
57	1,4-Dichlorobenzene (nfmw11)	2	0	0.0889	0.0968	0.101	0.121	0.14	0.144	0.152	0.156	0.159	
58	1,4-Dichlorobenzene (nfmw19)	4	0	0.163	0.166	0.168	0.17	0.17	0.17	0.17	0.17	0.17	
59	1,4-Dichlorobenzene (nfmw1d)	7	0	0.252	0.374	0.425	0.77	0.895	0.928	0.97	0.985	0.997	
60	1,4-Dichlorobenzene (nfmw1s)	7	0	0.126	0.138	0.15	0.34	0.65	0.836	2.256	3.228	4.006	
61	1,4-Dichlorobenzene (nfmw2)	7	0	12.6	15.86	16.55	19	24.85	27.52	32.06	34.13	35.79	
62	1,4-Dichlorobenzene (nfmw20)	4	0	0.163	0.166	0.168	0.17	0.17	0.17	0.17	0.17	0.17	
63	1,4-Dichlorobenzene (nfmw22)	1	0	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
64	1,4-Dichlorobenzene (nfmw23)	1	0	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
65	1,4-Dichlorobenzene (nfmw7)	2	0	0.0889	0.0968	0.101	0.121	0.14	0.144	0.152	0.156	0.159	
66	1,4-Dichlorobenzene (nfmw8)	5	0	0.113	0.144	0.16	0.17	0.34	0.34	0.34	0.34	0.34	
67	1,4-Dichlorobenzene (nfmw9)	9	0	0.304	0.352	0.36	0.95	1.2	1.352	1.684	1.892	2.058	
68	1,4-Dichlorobenzene (smw16)	9	0	0.081	0.104	0.12	0.17	0.34	0.34	2.212	5.956	8.951	
69	1,4-Dichlorobenzene (smw16d)	5	0	0.081	0.081	0.081	0.17	0.17	0.17	0.17	0.17	0.17	
70	1,4-Dichlorobenzene (smw17)	5	0	0.081	0.081	0.081	0.17	0.17	0.17	0.17	0.17	0.17	
71	1,4-Dichlorobenzene (smw17d)	5	0	0.081	0.081	0.081	0.17	0.17	0.17	0.17	0.17	0.17	
72	1,4-Dichlorobenzene (smw18)	5	0	0.081	0.081	0.081	0.17	0.17	0.17	0.17	0.17	0.17	
73	1,4-Dichlorobenzene (smw18d)	5	0	0.081	0.081	0.081	0.17	0.17	0.17	0.17	0.17	0.17	

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:12:03 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

1,4-Dichlorobenzene (nfmw10)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	7
Number of Detects	0	Number of Non-Detects	9
Number of Distinct Detects	0	Number of Distinct Non-Detects	7

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable 1,4-Dichlorobenzene (nfmw10) was not processed!

1,4-Dichlorobenzene (nfmw11)

General Statistics

Total Number of Observations	2	Number of Distinct Observations	2
Number of Detects	0	Number of Non-Detects	2
Number of Distinct Detects	0	Number of Distinct Non-Detects	2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable 1,4-Dichlorobenzene (nfmw11) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

1,4-Dichlorobenzene (nfmw19)

General Statistics

Total Number of Observations	4	Number of Distinct Observations	2
Number of Detects	0	Number of Non-Detects	4
Number of Distinct Detects	0	Number of Distinct Non-Detects	2

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable 1,4-Dichlorobenzene (nfmw19) was not processed!

	A	B	C	D	E	F	G	H	I	J	K	L
53	**1,4-Dichlorobenzene (nfmw1d)**											
54												
55	**General Statistics**											
56	Total Number of Observations					7	Number of Distinct Observations					7
57	Number of Detects					4	Number of Non-Detects					3
58	Number of Distinct Detects					4	Number of Distinct Non-Detects					3
59	Minimum Detect					0.51	Minimum Non-Detect					0.12
60	Maximum Detect					1	Maximum Non-Detect					0.95
61	Variance Detects					0.0417	Percent Non-Detects					42.86%
62	Mean Detects					0.78	SD Detects					0.204
63	Median Detects					0.805	CV Detects					0.262
64	Skewness Detects					-0.691	Kurtosis Detects					1.226
65	Mean of Logged Detects					-0.277	SD of Logged Detects					0.286
66												
67	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
68	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
69	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
70	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
71												
72	**Normal GOF Test on Detects Only**											
73	Shapiro Wilk Test Statistic					0.971	**Shapiro Wilk GOF Test**					
74	5% Shapiro Wilk Critical Value					0.748	Detected Data appear Normal at 5% Significance Level					
75	Lilliefors Test Statistic					0.23	**Lilliefors GOF Test**					
76	5% Lilliefors Critical Value					0.375	Detected Data appear Normal at 5% Significance Level					
77	**Detected Data appear Normal at 5% Significance Level**											
78												
79	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
80	KM Mean					0.547	KM Standard Error of Mean					0.158
81	KM SD					0.34	95% KM (BCA) UCL					N/A
82	95% KM (t) UCL					0.855	95% KM (Percentile Bootstrap) UCL					N/A
83	95% KM (z) UCL					0.808	95% KM Bootstrap t UCL					N/A
84	90% KM Chebyshev UCL					1.022	95% KM Chebyshev UCL					1.237
85	97.5% KM Chebyshev UCL					1.536	99% KM Chebyshev UCL					2.122
86												
87	**Gamma GOF Tests on Detected Observations Only**											
88	A-D Test Statistic					0.296	**Anderson-Darling GOF Test**					
89	5% A-D Critical Value					0.657	Detected data appear Gamma Distributed at 5% Significance Level					
90	K-S Test Statistic					0.26	**Kolmogorov-Smirnov GOF**					
91	5% K-S Critical Value					0.394	Detected data appear Gamma Distributed at 5% Significance Level					
92	**Detected data appear Gamma Distributed at 5% Significance Level**											
93												
94	**Gamma Statistics on Detected Data Only**											
95	k hat (MLE)					17.52	k star (bias corrected MLE)					4.548
96	Theta hat (MLE)					0.0445	Theta star (bias corrected MLE)					0.172
97	nu hat (MLE)					140.2	nu star (bias corrected)					36.38
98	Mean (detects)					0.78						
99												
100	**Gamma ROS Statistics using Imputed Non-Detects**											
101	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
102	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
103	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
104	This is especially true when the sample size is small.											
105	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											

106					Minimum	0.404					Mean	0.644
107					Maximum	1					Median	0.58
108					SD	0.23					CV	0.358
109					k hat (MLE)	9.225					k star (bias corrected MLE)	5.366
110					Theta hat (MLE)	0.0698					Theta star (bias corrected MLE)	0.12
111					nu hat (MLE)	129.1					nu star (bias corrected)	75.13
112					Adjusted Level of Significance (β)	0.0158						
113					Approximate Chi Square Value (75.13, α)	56.17					Adjusted Chi Square Value (75.13, β)	51.25
114					95% Gamma Approximate UCL (use when n>=50)	0.861					95% Gamma Adjusted UCL (use when n<50)	N/A
115												
116					**Estimates of Gamma Parameters using KM Estimates**							
117					Mean (KM)	0.547					SD (KM)	0.34
118					Variance (KM)	0.115					SE of Mean (KM)	0.158
119					k hat (KM)	2.599					k star (KM)	1.58
120					nu hat (KM)	36.39					nu star (KM)	22.13
121					theta hat (KM)	0.211					theta star (KM)	0.346
122					80% gamma percentile (KM)	0.842					90% gamma percentile (KM)	1.126
123					95% gamma percentile (KM)	1.401					99% gamma percentile (KM)	2.021
124												
125					**Gamma Kaplan-Meier (KM) Statistics**							
126					Approximate Chi Square Value (22.13, α)	12.43					Adjusted Chi Square Value (22.13, β)	10.31
127					95% Gamma Approximate KM-UCL (use when n>=50)	0.974					95% Gamma Adjusted KM-UCL (use when n<50)	1.175
128												
129					**Lognormal GOF Test on Detected Observations Only**							
130					Shapiro Wilk Test Statistic	0.931					**Shapiro Wilk GOF Test**	
131					5% Shapiro Wilk Critical Value	0.748					Detected Data appear Lognormal at 5% Significance Level	
132					Lilliefors Test Statistic	0.272					**Lilliefors GOF Test**	
133					5% Lilliefors Critical Value	0.375					Detected Data appear Lognormal at 5% Significance Level	
134					**Detected Data appear Lognormal at 5% Significance Level**							
135												
136					**Lognormal ROS Statistics Using Imputed Non-Detects**							
137					Mean in Original Scale	0.649					Mean in Log Scale	-0.483
138					SD in Original Scale	0.223					SD in Log Scale	0.34
139					95% t UCL (assumes normality of ROS data)	0.813					95% Percentile Bootstrap UCL	0.79
140					95% BCA Bootstrap UCL	0.79					95% Bootstrap t UCL	0.855
141					95% H-UCL (Log ROS)	0.895						
142												
143					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
144					KM Mean (logged)	-0.917					KM Geo Mean	0.4
145					KM SD (logged)	0.892					95% Critical H Value (KM-Log)	3.397
146					KM Standard Error of Mean (logged)	0.42					95% H-UCL (KM -Log)	2.048
147					KM SD (logged)	0.892					95% Critical H Value (KM-Log)	3.397
148					KM Standard Error of Mean (logged)	0.42						
149												
150					**DL/2 Statistics**							
151					**DL/2 Normal**						**DL/2 Log-Transformed**	
152					Mean in Original Scale	0.546					Mean in Log Scale	-0.92
153					SD in Original Scale	0.348					SD in Log Scale	1.02
154					95% t UCL (Assumes normality)	0.802					95% H-Stat UCL	3.198
155					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
156												
157					**Nonparametric Distribution Free UCL Statistics**							
158					**Detected Data appear Normal Distributed at 5% Significance Level**							
159												
160					**Suggested UCL to Use**							

	A	B	C	D	E	F	G	H	I	J	K	L
161					95% KM (t) UCL	0.855						
162												
163	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
164	Recommendations are based upon data size, data distribution, and skewness.											
165	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
166	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
167												
168	**1,4-Dichlorobenzene (nfmw1s)**											
169												
170	**General Statistics**											
171					Total Number of Observations	7			Number of Distinct Observations			6
172					Number of Detects	0			Number of Non-Detects			7
173					Number of Distinct Detects	0			Number of Distinct Non-Detects			6
174												
175	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
176	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
177	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
178												
179	**The data set for variable 1,4-Dichlorobenzene (nfmw1s) was not processed!**											
180												
181												
182												
183	**1,4-Dichlorobenzene (nfmw2)**											
184												
185	**General Statistics**											
186					Total Number of Observations	7			Number of Distinct Observations			7
187									Number of Missing Observations			0
188					Minimum	8.4			Mean			20.91
189					Maximum	36.2			Median			19
190					SD	9.176			Std. Error of Mean			3.468
191					Coefficient of Variation	0.439			Skewness			0.602
192												
193	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
194	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
195	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
196	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
197												
198	**Normal GOF Test**											
199					Shapiro Wilk Test Statistic	0.951			**Shapiro Wilk GOF Test**			
200					5% Shapiro Wilk Critical Value	0.803			Data appear Normal at 5% Significance Level			
201					Lilliefors Test Statistic	0.237			**Lilliefors GOF Test**			
202					5% Lilliefors Critical Value	0.304			Data appear Normal at 5% Significance Level			
203	**Data appear Normal at 5% Significance Level**											
204												
205	**Assuming Normal Distribution**											
206	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
207					95% Student's-t UCL	27.65			95% Adjusted-CLT UCL (Chen-1995)			27.46
208									95% Modified-t UCL (Johnson-1978)			27.79
209												

	A	B	C	D	E	F	G	H	I	J	K	L
210	**Gamma GOF Test**											
211	A-D Test Statistic					0.24	**Anderson-Darling Gamma GOF Test**					
212	5% A-D Critical Value					0.71	Detected data appear Gamma Distributed at 5% Significance Level					
213	K-S Test Statistic					0.183	**Kolmogorov-Smirnov Gamma GOF Test**					
214	5% K-S Critical Value					0.313	Detected data appear Gamma Distributed at 5% Significance Level					
215	**Detected data appear Gamma Distributed at 5% Significance Level**											
216												
217	**Gamma Statistics**											
218	k hat (MLE)					5.805	k star (bias corrected MLE)					3.412
219	Theta hat (MLE)					3.603	Theta star (bias corrected MLE)					6.129
220	nu hat (MLE)					81.26	nu star (bias corrected)					47.77
221	MLE Mean (bias corrected)					20.91	MLE Sd (bias corrected)					11.32
222							Approximate Chi Square Value (0.05)					32.91
223	Adjusted Level of Significance					0.0158	Adjusted Chi Square Value					29.23
224												
225	**Assuming Gamma Distribution**											
226	95% Approximate Gamma UCL (use when n>=50))					30.36	95% Adjusted Gamma UCL (use when n<50)					34.18
227												
228	**Lognormal GOF Test**											
229	Shapiro Wilk Test Statistic					0.957	**Shapiro Wilk Lognormal GOF Test**					
230	5% Shapiro Wilk Critical Value					0.803	Data appear Lognormal at 5% Significance Level					
231	Lilliefors Test Statistic					0.179	**Lilliefors Lognormal GOF Test**					
232	5% Lilliefors Critical Value					0.304	Data appear Lognormal at 5% Significance Level					
233	**Data appear Lognormal at 5% Significance Level**											
234												
235	**Lognormal Statistics**											
236	Minimum of Logged Data					2.128	Mean of logged Data					2.952
237	Maximum of Logged Data					3.589	SD of logged Data					0.47
238												
239	**Assuming Lognormal Distribution**											
240	95% H-UCL					33.84	90% Chebyshev (MVUE) UCL					32.26
241	95% Chebyshev (MVUE) UCL					37.35	97.5% Chebyshev (MVUE) UCL					44.41
242	99% Chebyshev (MVUE) UCL					58.3						
243												
244	**Nonparametric Distribution Free UCL Statistics**											
245	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
246												
247	**Nonparametric Distribution Free UCLs**											
248	95% CLT UCL					26.62	95% Jackknife UCL					27.65
249	95% Standard Bootstrap UCL					26.17	95% Bootstrap-t UCL					31.09
250	95% Hall's Bootstrap UCL					52.17	95% Percentile Bootstrap UCL					26.59
251	95% BCA Bootstrap UCL					26.97						
252	90% Chebyshev(Mean, Sd) UCL					31.32	95% Chebyshev(Mean, Sd) UCL					36.03
253	97.5% Chebyshev(Mean, Sd) UCL					42.57	99% Chebyshev(Mean, Sd) UCL					55.42
254												
255	**Suggested UCL to Use**											
256	95% Student's-t UCL					27.65						
257												
258	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
259	Recommendations are based upon data size, data distribution, and skewness.											
260	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
261	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
262												

	A	B	C	D	E	F	G	H	I	J	K	L
263	**1,4-Dichlorobenzene (nfmw20)**											
264												
265	**General Statistics**											
266	Total Number of Observations					4	Number of Distinct Observations					2
267	Number of Detects					0	Number of Non-Detects					4
268	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
269												
270	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
271	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
272	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
273												
274	**The data set for variable 1,4-Dichlorobenzene (nfmw20) was not processed!**											
275												
276												
277	**1,4-Dichlorobenzene (nfmw22)**											
278												
279	**General Statistics**											
280	Total Number of Observations					1	Number of Distinct Observations					1
281	Number of Detects					0	Number of Non-Detects					1
282	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
283												
284	**Warning: This data set only has 1 observations!**											
285	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
286	**The data set for variable 1,4-Dichlorobenzene (nfmw22) was not processed!**											
287												
288	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
289	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
290												
291												
292	**1,4-Dichlorobenzene (nfmw23)**											
293												
294	**General Statistics**											
295	Total Number of Observations					1	Number of Distinct Observations					1
296	Number of Detects					0	Number of Non-Detects					1
297	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
298												
299	**Warning: This data set only has 1 observations!**											
300	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
301	**The data set for variable 1,4-Dichlorobenzene (nfmw23) was not processed!**											
302												
303	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
304	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
305												
306												
307	**1,4-Dichlorobenzene (nfmw7)**											
308												
309	**General Statistics**											
310	Total Number of Observations					2	Number of Distinct Observations					2
311	Number of Detects					0	Number of Non-Detects					2
312	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
313												
314	**Warning: This data set only has 2 observations!**											
315	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
316	**The data set for variable 1,4-Dichlorobenzene (nfmw7) was not processed!**											

	A	B	C	D	E	F	G	H	I	J	K	L
317												
318	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
319	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
320												
321												
322	**1,4-Dichlorobenzene (nfmw8)**											
323												
324	**General Statistics**											
325						Total Number of Observations	5				Number of Distinct Observations	4
326						Number of Detects	0				Number of Non-Detects	5
327						Number of Distinct Detects	0				Number of Distinct Non-Detects	4
328												
329	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
330	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
331	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
332												
333	**The data set for variable 1,4-Dichlorobenzene (nfmw8) was not processed!**											
334												
335												
336	**1,4-Dichlorobenzene (nfmw9)**											
337												
338	**General Statistics**											
339						Total Number of Observations	9				Number of Distinct Observations	9
340						Number of Detects	6				Number of Non-Detects	3
341						Number of Distinct Detects	6				Number of Distinct Non-Detects	3
342						Minimum Detect	0.36				Minimum Non-Detect	0.16
343						Maximum Detect	2.1				Maximum Non-Detect	0.95
344						Variance Detects	0.399				Percent Non-Detects	33.33%
345						Mean Detects	1.143				SD Detects	0.632
346						Median Detects	1.085				CV Detects	0.553
347						Skewness Detects	0.42				Kurtosis Detects	-0.494
348						Mean of Logged Detects	-0.0169				SD of Logged Detects	0.636
349												
350	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
351	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
352	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
353	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
354												
355	**Normal GOF Test on Detects Only**											
356						Shapiro Wilk Test Statistic	0.982				**Shapiro Wilk GOF Test**	
357						5% Shapiro Wilk Critical Value	0.788				Detected Data appear Normal at 5% Significance Level	
358						Lilliefors Test Statistic	0.131				**Lilliefors GOF Test**	
359						5% Lilliefors Critical Value	0.325				Detected Data appear Normal at 5% Significance Level	
360	**Detected Data appear Normal at 5% Significance Level**											
361												
362	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
363						KM Mean	0.835				KM Standard Error of Mean	0.238
364						KM SD	0.647				95% KM (BCA) UCL	1.262
365						95% KM (t) UCL	1.277				95% KM (Percentile Bootstrap) UCL	1.228
366						95% KM (z) UCL	1.226				95% KM Bootstrap t UCL	1.257
367						90% KM Chebyshev UCL	1.548				95% KM Chebyshev UCL	1.872
368						97.5% KM Chebyshev UCL	2.321				99% KM Chebyshev UCL	3.202
369												

370	**Gamma GOF Tests on Detected Observations Only**											
371					A-D Test Statistic	0.153	**Anderson-Darling GOF Test**					
372					5% A-D Critical Value	0.701	Detected data appear Gamma Distributed at 5% Significance Level					
373					K-S Test Statistic	0.125	**Kolmogorov-Smirnov GOF**					
374					5% K-S Critical Value	0.334	Detected data appear Gamma Distributed at 5% Significance Level					
375	**Detected data appear Gamma Distributed at 5% Significance Level**											
376												
377	**Gamma Statistics on Detected Data Only**											
378					k hat (MLE)	3.473	k star (bias corrected MLE)	1.848				
379					Theta hat (MLE)	0.329	Theta star (bias corrected MLE)	0.619				
380					nu hat (MLE)	41.68	nu star (bias corrected)	22.17				
381					Mean (detects)	1.143						
382												
383	**Gamma ROS Statistics using Imputed Non-Detects**											
384	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
385	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
386	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
387	This is especially true when the sample size is small.											
388	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
389					Minimum	0.01	Mean	0.788				
390					Maximum	2.1	Median	0.65				
391					SD	0.733	CV	0.929				
392					k hat (MLE)	0.633	k star (bias corrected MLE)	0.496				
393					Theta hat (MLE)	1.245	Theta star (bias corrected MLE)	1.588				
394					nu hat (MLE)	11.4	nu star (bias corrected)	8.934				
395					Adjusted Level of Significance (β)	0.0231						
396					Approximate Chi Square Value (8.93, α)	3.287	Adjusted Chi Square Value (8.93, β)	2.607				
397					95% Gamma Approximate UCL (use when n>=50)	2.142	95% Gamma Adjusted UCL (use when n<50)	2.701				
398												
399	**Estimates of Gamma Parameters using KM Estimates**											
400					Mean (KM)	0.835	SD (KM)	0.647				
401					Variance (KM)	0.419	SE of Mean (KM)	0.238				
402					k hat (KM)	1.663	k star (KM)	1.183				
403					nu hat (KM)	29.94	nu star (KM)	21.29				
404					theta hat (KM)	0.502	theta star (KM)	0.706				
405					80% gamma percentile (KM)	1.324	90% gamma percentile (KM)	1.844				
406					95% gamma percentile (KM)	2.358	99% gamma percentile (KM)	3.537				
407												
408	**Gamma Kaplan-Meier (KM) Statistics**											
409					Approximate Chi Square Value (21.29, α)	11.81	Adjusted Chi Square Value (21.29, β)	10.35				
410					95% Gamma Approximate KM-UCL (use when n>=50)	1.505	95% Gamma Adjusted KM-UCL (use when n<50)	1.717				
411												
412	**Lognormal GOF Test on Detected Observations Only**											
413					Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk GOF Test**					
414					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level					
415					Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**					
416					5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level					
417	**Detected Data appear Lognormal at 5% Significance Level**											
418												
419	**Lognormal ROS Statistics Using Imputed Non-Detects**											
420					Mean in Original Scale	0.847	Mean in Log Scale	-0.477				
421					SD in Original Scale	0.67	SD in Log Scale	0.866				
422					95% t UCL (assumes normality of ROS data)	1.262	95% Percentile Bootstrap UCL	1.22				
423					95% BCA Bootstrap UCL	1.235	95% Bootstrap t UCL	1.426				
424					95% H-UCL (Log ROS)	2.227						

425												
426	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
427					KM Mean (logged)	-0.561				KM Geo Mean	0.571	
428					KM SD (logged)	0.937				95% Critical H Value (KM-Log)	3.1	
429					KM Standard Error of Mean (logged)	0.351				95% H-UCL (KM -Log)	2.471	
430					KM SD (logged)	0.937				95% Critical H Value (KM-Log)	3.1	
431					KM Standard Error of Mean (logged)	0.351						
432												
433	**DL/2 Statistics**											
434				**DL/2 Normal**						**DL/2 Log-Transformed**		
435					Mean in Original Scale	0.843				Mean in Log Scale	-0.571	
436					SD in Original Scale	0.681				SD in Log Scale	1.07	
437					95% t UCL (Assumes normality)	1.265				95% H-Stat UCL	3.617	
438	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
439												
440	**Nonparametric Distribution Free UCL Statistics**											
441	**Detected Data appear Normal Distributed at 5% Significance Level**											
442												
443	**Suggested UCL to Use**											
444					95% KM (t) UCL	1.277						
445												
446	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
447	Recommendations are based upon data size, data distribution, and skewness.											
448	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
449	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
450												
451	**1,4-Dichlorobenzene (smw16)**											
452												
453	**General Statistics**											
454					Total Number of Observations	9				Number of Distinct Observations	6	
455					Number of Detects	0				Number of Non-Detects	9	
456					Number of Distinct Detects	0				Number of Distinct Non-Detects	6	
457												
458	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
459	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
460	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
461												
462	**The data set for variable 1,4-Dichlorobenzene (smw16) was not processed!**											
463												
464												
465	**1,4-Dichlorobenzene (smw16d)**											
466												
467	**General Statistics**											
468					Total Number of Observations	5				Number of Distinct Observations	2	
469					Number of Detects	0				Number of Non-Detects	5	
470					Number of Distinct Detects	0				Number of Distinct Non-Detects	2	
471												
472	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
473	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
474	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
475												
476	**The data set for variable 1,4-Dichlorobenzene (smw16d) was not processed!**											
477												
478												

	A	B	C	D	E	F	G	H	I	J	K	L
479	**1,4-Dichlorobenzene (smw17)**											
480												
481	**General Statistics**											
482	Total Number of Observations					5	Number of Distinct Observations					2
483	Number of Detects					0	Number of Non-Detects					5
484	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
485												
486	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
487	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
488	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
489												
490	**The data set for variable 1,4-Dichlorobenzene (smw17) was not processed!**											
491												
492												
493	**1,4-Dichlorobenzene (smw17d)**											
494												
495	**General Statistics**											
496	Total Number of Observations					5	Number of Distinct Observations					2
497	Number of Detects					0	Number of Non-Detects					5
498	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
499												
500	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
501	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
502	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
503												
504	**The data set for variable 1,4-Dichlorobenzene (smw17d) was not processed!**											
505												
506												
507	**1,4-Dichlorobenzene (smw18)**											
508												
509	**General Statistics**											
510	Total Number of Observations					5	Number of Distinct Observations					2
511	Number of Detects					0	Number of Non-Detects					5
512	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
513												
514	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
515	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
516	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
517												
518	**The data set for variable 1,4-Dichlorobenzene (smw18) was not processed!**											
519												

	A	B	C	D	E	F	G	H	I	J	K	L
520												
521	**1,4-Dichlorobenzene (smw18d)**											
522												
523	**General Statistics**											
524	Total Number of Observations					5	Number of Distinct Observations					2
525	Number of Detects					0	Number of Non-Detects					5
526	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
527												
528	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
529	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
530	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
531												
532	**The data set for variable 1,4-Dichlorobenzene (smw18d) was not processed!**											
533												
534												

General Statistics on Uncensored Data

Date/Time of Computation	ProUCL 5.15/7/2021 12:35:09 PM
User Selected Options	
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF

From File: OU3 ProUCL Input 05.07.2021.xls

General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method

Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
Aroclor-1260 (atmw6)	1	0	0	1	100.00%	0.027	0.027	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw10)	7	0	0	7	100.00%	0.035	0.36	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw11)	2	0	0	2	100.00%	0.036	0.046	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw19)	3	0	0	3	100.00%	0.035	0.047	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw1d)	7	0	0	7	100.00%	0.028	0.36	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw1s)	5	0	0	5	100.00%	0.028	0.36	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw2)	9	0	3	6	66.67%	0.035	0.051	0.0777	0.00745	0.0863	1.111
Aroclor-1260 (nfmw20)	3	0	0	3	100.00%	0.034	0.048	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw3)	1	0	0	1	100.00%	0.027	0.027	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw4)	1	0	0	1	100.00%	0.029	0.029	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw7)	1	0	0	1	100.00%	0.016	0.016	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw8)	4	0	0	4	100.00%	0.037	0.048	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw9)	6	0	0	6	100.00%	0.034	0.36	N/A	N/A	N/A	N/A
Aroclor-1260 (smw15)	1	0	0	1	100.00%	0.027	0.027	N/A	N/A	N/A	N/A
Aroclor-1260 (smw16)	2	0	0	2	100.00%	0.027	0.034	N/A	N/A	N/A	N/A
Aroclor-1260 (smw16d)	3	0	0	3	100.00%	0.035	0.046	N/A	N/A	N/A	N/A
Aroclor-1260 (smw17)	2	0	2	0	0.00%	N/A	N/A	0.086	2.0000E-6	0.00141	0.0164
Aroclor-1260 (smw17d)	3	0	0	3	100.00%	0.035	0.05	N/A	N/A	N/A	N/A
Aroclor-1260 (smw18)	1	0	0	1	100.00%	0.036	0.036	N/A	N/A	N/A	N/A
Aroclor-1260 (smw18d)	3	0	0	3	100.00%	0.035	0.051	N/A	N/A	N/A	N/A
Aroclor-1260 (smw9)	1	0	0	1	100.00%	0.028	0.028	N/A	N/A	N/A	N/A
Aroclor-1260 (tw2r)	1	0	0	1	100.00%	0.027	0.027	N/A	N/A	N/A	N/A

General Statistics for Raw Data Sets using Detected Data Only

Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
Aroclor-1260 (atmw6)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw10)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw11)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw19)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw1d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw1s)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw2)	3	0	0.059	0.31	0.163	0.12	0.0171	0.131	0.0904	1.319	0.803
Aroclor-1260 (nfmw20)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw3)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw4)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw7)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (nfmw9)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (smw15)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (smw16)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (smw16d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (smw17)	2	0	0.085	0.087	0.086	0.086	2.0000E-6	0.00141	0.00148	N/A	0.0164
Aroclor-1260 (smw17d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (smw18)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (smw18d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (smw9)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260 (tw2r)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Percentiles using all Detects (Ds) and Non-Detects (NDs)

Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Aroclor-1260 (atmw6)	1	0	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Aroclor-1260 (nfmw10)	7	0	0.035	0.0352	0.0355	0.036	0.0785	0.0974	0.21	0.285	0.345
Aroclor-1260 (nfmw11)	2	0	0.037	0.038	0.0385	0.041	0.0435	0.044	0.045	0.0455	0.0459
Aroclor-1260 (nfmw19)	3	0	0.0352	0.0354	0.0355	0.036	0.0415	0.0426	0.0448	0.0459	0.0468
Aroclor-1260 (nfmw1d)	7	0	0.0316	0.0342	0.0345	0.036	0.073	0.0892	0.204	0.282	0.344
Aroclor-1260 (nfmw1s)	5	0	0.0608	0.0936	0.11	0.36	0.36	0.36	0.36	0.36	0.36
Aroclor-1260 (nfmw2)	9	0	0.0358	0.0366	0.037	0.04	0.059	0.0834	0.158	0.234	0.295
Aroclor-1260 (nfmw20)	3	0	0.0344	0.0348	0.035	0.036	0.042	0.0432	0.0456	0.0468	0.0478
Aroclor-1260 (nfmw3)	1	0	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Aroclor-1260 (nfmw4)	1	0	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029
Aroclor-1260 (nfmw7)	1	0	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Aroclor-1260 (nfmw8)	4	0	0.037	0.037	0.037	0.0385	0.042	0.0432	0.0456	0.0468	0.0478
Aroclor-1260 (nfmw9)	6	0	0.035	0.036	0.036	0.0435	0.0878	0.1	0.23	0.295	0.347
Aroclor-1260 (smw15)	1	0	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Aroclor-1260 (smw16)	2	0	0.0277	0.0284	0.0288	0.0305	0.0323	0.0326	0.0333	0.0337	0.0339
Aroclor-1260 (smw16d)	3	0	0.0352	0.0354	0.0355	0.036	0.041	0.042	0.044	0.045	0.0458
Aroclor-1260 (smw17)	2	0	0.0852	0.0854	0.0855	0.086	0.0865	0.0866	0.0868	0.0869	0.087
Aroclor-1260 (smw17d)	3	0	0.0352	0.0354	0.0355	0.036	0.043	0.0444	0.0472	0.0486	0.0497
Aroclor-1260 (smw18)	1	0	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Aroclor-1260 (smw18d)	3	0	0.0352	0.0354	0.0355	0.036	0.0435	0.045	0.048	0.0495	0.0507
Aroclor-1260 (smw9)	1	0	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Aroclor-1260 (tw2r)	1	0	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/7/2021 12:35:54 PM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aroclor-1260 (atmw6)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Aroclor-1260 (atmw6) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Aroclor-1260 (nfmw10)

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	7
Number of Distinct Detects	0	Number of Distinct Non-Detects	5

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Aroclor-1260 (nfmw10) was not processed!

Aroclor-1260 (nfmw11)

General Statistics

Total Number of Observations	2	Number of Distinct Observations	2
Number of Detects	0	Number of Non-Detects	2
Number of Distinct Detects	0	Number of Distinct Non-Detects	2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Aroclor-1260 (nfmw11) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

53												
54	**Aroclor-1260 (nfmw19)**											
55												
56	**General Statistics**											
57						Total Number of Observations	3			Number of Distinct Observations	3	
58						Number of Detects	0			Number of Non-Detects	3	
59						Number of Distinct Detects	0			Number of Distinct Non-Detects	3	
60												
61	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
62	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
63	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
64												
65	**The data set for variable Aroclor-1260 (nfmw19) was not processed!**											
66												
67												
68	**Aroclor-1260 (nfmw1d)**											
69												
70	**General Statistics**											
71						Total Number of Observations	7			Number of Distinct Observations	7	
72						Number of Detects	0			Number of Non-Detects	7	
73						Number of Distinct Detects	0			Number of Distinct Non-Detects	7	
74												
75	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
76	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
77	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
78												
79	**The data set for variable Aroclor-1260 (nfmw1d) was not processed!**											
80												
81												
82	**Aroclor-1260 (nfmw1s)**											
83												
84	**General Statistics**											
85						Total Number of Observations	5			Number of Distinct Observations	3	
86						Number of Detects	0			Number of Non-Detects	5	
87						Number of Distinct Detects	0			Number of Distinct Non-Detects	3	
88												
89	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
90	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
91	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
92												
93	**The data set for variable Aroclor-1260 (nfmw1s) was not processed!**											
94												
95												
96	**Aroclor-1260 (nfmw2)**											
97												
98	**General Statistics**											
99						Total Number of Observations	9			Number of Distinct Observations	9	
100						Number of Detects	3			Number of Non-Detects	6	
101						Number of Distinct Detects	3			Number of Distinct Non-Detects	6	
102						Minimum Detect	0.059			Minimum Non-Detect	0.035	
103						Maximum Detect	0.31			Maximum Non-Detect	0.051	
104						Variance Detects	0.0171			Percent Non-Detects	66.67%	

105					Mean Detects	0.163					SD Detects	0.131
106					Median Detects	0.12					CV Detects	0.803
107					Skewness Detects	1.319					Kurtosis Detects	N/A
108					Mean of Logged Detects	-2.041					SD of Logged Detects	0.832
109												
110					**Warning: Data set has only 3 Detected Values.**							
111					**This is not enough to compute meaningful or reliable statistics and estimates.**							
112												
113												
114					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
115					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
116					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
117					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
118												
119					**Normal GOF Test on Detects Only**							
120					Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**					
121					5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level					
122					Lilliefors Test Statistic	0.295	**Lilliefors GOF Test**					
123					5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level					
124					**Detected Data appear Normal at 5% Significance Level**							
125												
126					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
127					KM Mean	0.0777	KM Standard Error of Mean	0.0352				
128					KM SD	0.0863	95% KM (BCA) UCL	N/A				
129					95% KM (t) UCL	0.143	95% KM (Percentile Bootstrap) UCL	N/A				
130					95% KM (z) UCL	0.136	95% KM Bootstrap t UCL	N/A				
131					90% KM Chebyshev UCL	0.183	95% KM Chebyshev UCL	0.231				
132					97.5% KM Chebyshev UCL	0.298	99% KM Chebyshev UCL	0.428				
133												
134					**Gamma GOF Tests on Detected Observations Only**							
135					**Not Enough Data to Perform GOF Test**							
136												
137					**Gamma Statistics on Detected Data Only**							
138					k hat (MLE)	2.36	k star (bias corrected MLE)	N/A				
139					Theta hat (MLE)	0.0691	Theta star (bias corrected MLE)	N/A				
140					nu hat (MLE)	14.16	nu star (bias corrected)	N/A				
141					Mean (detects)	0.163						
142												
143					**Gamma ROS Statistics using Imputed Non-Detects**							
144					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
145					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
146					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
147					This is especially true when the sample size is small.							
148					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
149					Minimum	0.01	Mean	0.061				
150					Maximum	0.31	Median	0.01				
151					SD	0.101	CV	1.65				
152					k hat (MLE)	0.642	k star (bias corrected MLE)	0.502				
153					Theta hat (MLE)	0.0951	Theta star (bias corrected MLE)	0.122				
154					nu hat (MLE)	11.55	nu star (bias corrected)	9.034				
155					Adjusted Level of Significance (β)	0.0231						
156					Approximate Chi Square Value (9.03, α)	3.348	Adjusted Chi Square Value (9.03, β)	2.66				

157	95% Gamma Approximate UCL (use when n>=50)					0.165	95% Gamma Adjusted UCL (use when n<50)					N/A
158												
159	**Estimates of Gamma Parameters using KM Estimates**											
160	Mean (KM)					0.0777	SD (KM)					0.0863
161	Variance (KM)					0.00745	SE of Mean (KM)					0.0352
162	k hat (KM)					0.81	k star (KM)					0.614
163	nu hat (KM)					14.58	nu star (KM)					11.05
164	theta hat (KM)					0.0959	theta star (KM)					0.127
165	80% gamma percentile (KM)					0.128	90% gamma percentile (KM)					0.201
166	95% gamma percentile (KM)					0.277	99% gamma percentile (KM)					0.461
167												
168	**Gamma Kaplan-Meier (KM) Statistics**											
169	Approximate Chi Square Value (11.05, α)					4.609	Adjusted Chi Square Value (11.05, β)					3.771
170	95% Gamma Approximate KM-UCL (use when n>=50)					0.186	95% Gamma Adjusted KM-UCL (use when n<50)					0.228
171												
172	**Lognormal GOF Test on Detected Observations Only**											
173	Shapiro Wilk Test Statistic					0.993	**Shapiro Wilk GOF Test**					
174	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Lognormal at 5% Significance Level					
175	Lilliefors Test Statistic					0.205	**Lilliefors GOF Test**					
176	5% Lilliefors Critical Value					0.425	Detected Data appear Lognormal at 5% Significance Level					
177	**Detected Data appear Lognormal at 5% Significance Level**											
178												
179	**Lognormal ROS Statistics Using Imputed Non-Detects**											
180	Mean in Original Scale					0.0573	Mean in Log Scale					-4.283
181	SD in Original Scale					0.103	SD in Log Scale					1.733
182	95% t UCL (assumes normality of ROS data)					0.121	95% Percentile Bootstrap UCL					N/A
183	95% BCA Bootstrap UCL					N/A	95% Bootstrap t UCL					N/A
184	95% H-UCL (Log ROS)					1.343						
185												
186	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
187	KM Mean (logged)					-2.915	KM Geo Mean					0.0542
188	KM SD (logged)					0.732	95% Critical H Value (KM-Log)					2.679
189	KM Standard Error of Mean (logged)					0.299	95% H-UCL (KM -Log)					0.142
190	KM SD (logged)					0.732	95% Critical H Value (KM-Log)					2.679
191	KM Standard Error of Mean (logged)					0.299						
192												
193	**DL/2 Statistics**											
194	**DL/2 Normal**						**DL/2 Log-Transformed**					
195	Mean in Original Scale					0.0675	Mean in Log Scale					-3.302
196	SD in Original Scale					0.0971	SD in Log Scale					1.039
197	95% t UCL (Assumes normality)					0.128	95% H-Stat UCL					0.214
198	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
199												
200	**Nonparametric Distribution Free UCL Statistics**											
201	**Detected Data appear Normal Distributed at 5% Significance Level**											
202												
203	**Suggested UCL to Use**											
204	95% KM (t) UCL					0.143						
205												
206	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
207	Recommendations are based upon data size, data distribution, and skewness.											
208	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

	A	B	C	D	E	F	G	H	I	J	K	L
209	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
210												
211	**Aroclor-1260 (nfmw20)**											
212												
213	**General Statistics**											
214	Total Number of Observations					3	Number of Distinct Observations					3
215	Number of Detects					0	Number of Non-Detects					3
216	Number of Distinct Detects					0	Number of Distinct Non-Detects					3
217												
218	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
219	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
220	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
221												
222	**The data set for variable Aroclor-1260 (nfmw20) was not processed!**											
223												
224												
225	**Aroclor-1260 (nfmw3)**											
226												
227	**General Statistics**											
228	Total Number of Observations					1	Number of Distinct Observations					1
229	Number of Detects					0	Number of Non-Detects					1
230	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
231												
232	**Warning: This data set only has 1 observations!**											
233	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
234	**The data set for variable Aroclor-1260 (nfmw3) was not processed!**											
235												
236	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
237	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
238												
239												
240	**Aroclor-1260 (nfmw4)**											
241												
242	**General Statistics**											
243	Total Number of Observations					1	Number of Distinct Observations					1
244	Number of Detects					0	Number of Non-Detects					1
245	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
246												
247	**Warning: This data set only has 1 observations!**											
248	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
249	**The data set for variable Aroclor-1260 (nfmw4) was not processed!**											
250												
251	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
252	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
253												
254												
255	**Aroclor-1260 (nfmw7)**											
256												
257	**General Statistics**											
258	Total Number of Observations					1	Number of Distinct Observations					1
259	Number of Detects					0	Number of Non-Detects					1
260	Number of Distinct Detects					0	Number of Distinct Non-Detects					1

	A	B	C	D	E	F	G	H	I	J	K	L
261												
262	Warning: This data set only has 1 observations!											
263	Data set is too small to compute reliable and meaningful statistics and estimates!											
264	The data set for variable Aroclor-1260 (nfmw7) was not processed!											
265												
266	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
267	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
268												
269												
270	Aroclor-1260 (nfmw8)											
271												
272	General Statistics											
273	Total Number of Observations					4	Number of Distinct Observations					3
274	Number of Detects					0	Number of Non-Detects					4
275	Number of Distinct Detects					0	Number of Distinct Non-Detects					3
276												
277	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
278	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
279	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
280												
281	The data set for variable Aroclor-1260 (nfmw8) was not processed!											
282												
283												
284	Aroclor-1260 (nfmw9)											
285												
286	General Statistics											
287	Total Number of Observations					6	Number of Distinct Observations					5
288	Number of Detects					0	Number of Non-Detects					6
289	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
290												
291	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
292	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
293	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
294												
295	The data set for variable Aroclor-1260 (nfmw9) was not processed!											
296												
297												
298	Aroclor-1260 (smw15)											
299												
300	General Statistics											
301	Total Number of Observations					1	Number of Distinct Observations					1
302	Number of Detects					0	Number of Non-Detects					1
303	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
304												
305	Warning: This data set only has 1 observations!											
306	Data set is too small to compute reliable and meaningful statistics and estimates!											
307	The data set for variable Aroclor-1260 (smw15) was not processed!											
308												
309	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
310	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
311												
312												

	A	B	C	D	E	F	G	H	I	J	K	L
313	**Aroclor-1260 (smw16)**											
314												
315	**General Statistics**											
316					Total Number of Observations	2			Number of Distinct Observations			2
317					Number of Detects	0			Number of Non-Detects			2
318					Number of Distinct Detects	0			Number of Distinct Non-Detects			2
319												
320	**Warning: This data set only has 2 observations!**											
321	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
322	**The data set for variable Aroclor-1260 (smw16) was not processed!**											
323												
324	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
325	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
326												
327												
328	**Aroclor-1260 (smw16d)**											
329												
330	**General Statistics**											
331					Total Number of Observations	3			Number of Distinct Observations			3
332					Number of Detects	0			Number of Non-Detects			3
333					Number of Distinct Detects	0			Number of Distinct Non-Detects			3
334												
335	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
336	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
337	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
338												
339	**The data set for variable Aroclor-1260 (smw16d) was not processed!**											
340												
341												
342												
343	**Aroclor-1260 (smw17)**											
344												
345	**General Statistics**											
346					Total Number of Observations	2			Number of Distinct Observations			2
347									Number of Missing Observations			0
348					Minimum	0.085			Mean			0.086
349					Maximum	0.087			Median			0.086
350												
351	**Warning: This data set only has 2 observations!**											
352	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
353	**The data set for variable Aroclor-1260 (smw17) was not processed!**											
354												
355	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
356	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
357												
358												
359	**Aroclor-1260 (smw17d)**											
360												
361	**General Statistics**											
362					Total Number of Observations	3			Number of Distinct Observations			3
363					Number of Detects	0			Number of Non-Detects			3
364					Number of Distinct Detects	0			Number of Distinct Non-Detects			3

	A	B	C	D	E	F	G	H	I	J	K	L
365												
366	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
367	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
368	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
369												
370	The data set for variable Aroclor-1260 (smw17d) was not processed!											
371												
372												
373	Aroclor-1260 (smw18)											
374												
375	General Statistics											
376	Total Number of Observations					1	Number of Distinct Observations					1
377	Number of Detects					0	Number of Non-Detects					1
378	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
379												
380	Warning: This data set only has 1 observations!											
381	Data set is too small to compute reliable and meaningful statistics and estimates!											
382	The data set for variable Aroclor-1260 (smw18) was not processed!											
383												
384	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
385	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
386												
387												
388	Aroclor-1260 (smw18d)											
389												
390	General Statistics											
391	Total Number of Observations					3	Number of Distinct Observations					3
392	Number of Detects					0	Number of Non-Detects					3
393	Number of Distinct Detects					0	Number of Distinct Non-Detects					3
394												
395	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
396	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
397	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
398												
399	The data set for variable Aroclor-1260 (smw18d) was not processed!											
400												
401												
402	Aroclor-1260 (smw9)											
403												
404	General Statistics											
405	Total Number of Observations					1	Number of Distinct Observations					1
406	Number of Detects					0	Number of Non-Detects					1
407	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
408												
409	Warning: This data set only has 1 observations!											
410	Data set is too small to compute reliable and meaningful statistics and estimates!											
411	The data set for variable Aroclor-1260 (smw9) was not processed!											
412												
413	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
414	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
415												
416												

	A	B	C	D	E	F	G	H	I	J	K	L
417	**Aroclor-1260 (tw2r)**											
418												
419	**General Statistics**											
420	Total Number of Observations					1	Number of Distinct Observations					1
421	Number of Detects					0	Number of Non-Detects					1
422	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
423												
424	**Warning: This data set only has 1 observations!**											
425	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
426	**The data set for variable Aroclor-1260 (tw2r) was not processed!**											
427												
428	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
429	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
430												
431												

General Statistics on Uncensored Data

Date/Time of Computation	ProUCL 5.15/10/2021 11:32:00 AM
User Selected Options	
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF

From File: OU3 ProUCL Input 05.07.2021.xls

General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method

Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
Benzene (nfmw10)	8	0	0	8	100.00%	0.042	0.21	N/A	N/A	N/A	N/A
Benzene (nfmw11)	2	0	0	2	100.00%	0.042	0.21	N/A	N/A	N/A	N/A
Benzene (nfmw19)	4	0	0	4	100.00%	0.1	0.21	N/A	N/A	N/A	N/A
Benzene (nfmw1d)	6	0	0	6	100.00%	0.0941	0.2	N/A	N/A	N/A	N/A
Benzene (nfmw1s)	6	0	0	6	100.00%	0.0941	2.6	N/A	N/A	N/A	N/A
Benzene (nfmw2)	6	0	0	6	100.00%	0.0941	0.12	N/A	N/A	N/A	N/A
Benzene (nfmw20)	4	0	0	4	100.00%	0.1	0.21	N/A	N/A	N/A	N/A
Benzene (nfmw22)	1	0	0	1	100.00%	0.1	0.1	N/A	N/A	N/A	N/A
Benzene (nfmw23)	1	0	0	1	100.00%	0.1	0.1	N/A	N/A	N/A	N/A
Benzene (nfmw7)	2	0	0	2	100.00%	0.042	0.21	N/A	N/A	N/A	N/A
Benzene (nfmw8)	5	0	0	5	100.00%	0.042	0.21	N/A	N/A	N/A	N/A
Benzene (nfmw9)	8	0	7	1	12.50%	0.2	0.2	0.389	0.0259	0.161	0.413
Benzene (smw16)	8	0	0	8	100.00%	0.042	0.24	N/A	N/A	N/A	N/A
Benzene (smw16d)	5	0	0	5	100.00%	0.042	0.1	N/A	N/A	N/A	N/A
Benzene (smw17)	5	0	0	5	100.00%	0.042	0.1	N/A	N/A	N/A	N/A
Benzene (smw17d)	5	0	0	5	100.00%	0.042	0.1	N/A	N/A	N/A	N/A
Benzene (smw18)	5	0	0	5	100.00%	0.042	0.1	N/A	N/A	N/A	N/A
Benzene (smw18d)	5	0	0	5	100.00%	0.042	0.1	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw10)	8	0	0	8	100.00%	0.066	0.34	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw11)	2	0	0	2	100.00%	0.066	0.23	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw19)	4	0	0	4	100.00%	0.17	0.23	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw1d)	6	0	3	3	50.00%	0.117	0.34	0.229	0.00442	0.0665	0.29
Chlorobenzene (nfmw1s)	6	0	0	6	100.00%	0.07	4.3	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw2)	6	0	5	1	16.67%	0.117	0.117	0.295	0.00913	0.0956	0.325
Chlorobenzene (nfmw20)	4	0	0	4	100.00%	0.17	0.23	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw22)	1	0	0	1	100.00%	0.17	0.17	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw23)	1	0	0	1	100.00%	0.17	0.17	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw7)	2	0	0	2	100.00%	0.066	0.23	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw8)	5	0	0	5	100.00%	0.066	0.34	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw9)	8	0	8	0	0.00%	N/A	N/A	69.18	2735	52.3	0.756
Chlorobenzene (smw16)	8	0	0	8	100.00%	0.066	0.34	N/A	N/A	N/A	N/A
Chlorobenzene (smw16d)	5	0	0	5	100.00%	0.066	0.17	N/A	N/A	N/A	N/A
Chlorobenzene (smw17)	5	0	0	5	100.00%	0.066	0.17	N/A	N/A	N/A	N/A
Chlorobenzene (smw17d)	5	0	0	5	100.00%	0.066	0.17	N/A	N/A	N/A	N/A
Chlorobenzene (smw18)	5	0	0	5	100.00%	0.066	0.17	N/A	N/A	N/A	N/A
Chlorobenzene (smw18d)	5	0	0	5	100.00%	0.066	0.17	N/A	N/A	N/A	N/A

General Statistics for Raw Data Sets using Detected Data Only

Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
Benzene (nfmw10)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw11)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw19)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw1d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw1s)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw2)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw20)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw22)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw23)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw7)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (nfmw9)	7	0	0.21	0.64	0.416	0.4	0.0277	0.166	0.237	0.234	0.4
Benzene (smw16)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (smw16d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (smw17)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (smw17d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (smw18)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene (smw18d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw10)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw11)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw19)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw1d)	3	0	0.25	0.29	0.267	0.26	4.3333E-4	0.0208	0.0148	1.293	0.0781
Chlorobenzene (nfmw1s)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw2)	5	0	0.25	0.42	0.33	0.33	0.00425	0.0652	0.0593	0.271	0.198
Chlorobenzene (nfmw20)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw22)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw23)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw7)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (nfmw9)	8	0	10.5	149	69.18	59.5	2735	52.3	66.2	0.413	0.756
Chlorobenzene (smw16)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (smw16d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (smw17)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (smw17d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (smw18)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chlorobenzene (smw18d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	A	B	C	D	E	F	G	H	I	J	K	L	M
89	**Percentiles using all Detects (Ds) and Non-Detects (NDs)**												
90													
91	**Variable**		**NumObs**	**# Missing**	**10%ile**	**20%ile**	**25%ile(Q1)**	**50%ile(Q2)**	**75%ile(Q3)**	**80%ile**	**90%ile**	**95%ile**	**99%ile**
92	Benzene (nfmw10)		8	0	0.0785	0.0965	0.0985	0.16	0.2	0.2	0.203	0.207	0.209
93	Benzene (nfmw11)		2	0	0.0588	0.0756	0.084	0.126	0.168	0.176	0.193	0.202	0.208
94	Benzene (nfmw19)		4	0	0.1	0.1	0.1	0.1	0.128	0.144	0.177	0.194	0.207
95	Benzene (nfmw1d)		6	0	0.0971	0.1	0.1	0.11	0.18	0.2	0.2	0.2	0.2
96	Benzene (nfmw1s)		6	0	0.0971	0.1	0.105	0.16	0.2	0.2	1.4	2	2.48
97	Benzene (nfmw2)		6	0	0.0971	0.1	0.1	0.1	0.1	0.1	0.11	0.115	0.119
98	Benzene (nfmw20)		4	0	0.1	0.1	0.1	0.1	0.128	0.144	0.177	0.194	0.207
99	Benzene (nfmw22)		1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
100	Benzene (nfmw23)		1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
101	Benzene (nfmw7)		2	0	0.0588	0.0756	0.084	0.126	0.168	0.176	0.193	0.202	0.208
102	Benzene (nfmw8)		5	0	0.0652	0.0884	0.1	0.2	0.2	0.202	0.206	0.208	0.21
103	Benzene (nfmw9)		8	0	0.207	0.222	0.233	0.385	0.484	0.545	0.623	0.631	0.638
104	Benzene (smw16)		8	0	0.042	0.0628	0.0811	0.1	0.2	0.2	0.212	0.226	0.237
105	Benzene (smw16d)		5	0	0.042	0.042	0.042	0.1	0.1	0.1	0.1	0.1	0.1
106	Benzene (smw17)		5	0	0.042	0.042	0.042	0.1	0.1	0.1	0.1	0.1	0.1
107	Benzene (smw17d)		5	0	0.042	0.042	0.042	0.1	0.1	0.1	0.1	0.1	0.1
108	Benzene (smw18)		5	0	0.042	0.042	0.042	0.1	0.1	0.1	0.1	0.1	0.1
109	Benzene (smw18d)		5	0	0.042	0.042	0.042	0.1	0.1	0.1	0.1	0.1	0.1
110	Chlorobenzene (nfmw10)		8	0	0.0688	0.0888	0.105	0.2	0.34	0.34	0.34	0.34	0.34
111	Chlorobenzene (nfmw11)		2	0	0.0824	0.0988	0.107	0.148	0.189	0.197	0.214	0.222	0.228
112	Chlorobenzene (nfmw19)		4	0	0.17	0.17	0.17	0.17	0.185	0.194	0.212	0.221	0.228
113	Chlorobenzene (nfmw1d)		6	0	0.184	0.25	0.253	0.275	0.328	0.34	0.34	0.34	0.34
114	Chlorobenzene (nfmw1s)		6	0	0.0935	0.117	0.13	0.255	0.34	0.34	2.32	3.31	4.102
115	Chlorobenzene (nfmw2)		6	0	0.184	0.25	0.26	0.31	0.353	0.36	0.39	0.405	0.417
116	Chlorobenzene (nfmw20)		4	0	0.17	0.17	0.17	0.17	0.185	0.194	0.212	0.221	0.228
117	Chlorobenzene (nfmw22)		1	0	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
118	Chlorobenzene (nfmw23)		1	0	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
119	Chlorobenzene (nfmw7)		2	0	0.0824	0.0988	0.107	0.148	0.189	0.197	0.214	0.222	0.228
120	Chlorobenzene (nfmw8)		5	0	0.108	0.149	0.17	0.23	0.34	0.34	0.34	0.34	0.34
121	Chlorobenzene (nfmw9)		8	0	14.14	20.7	25.08	59.5	110.3	117.6	132.9	141	147.4
122	Chlorobenzene (smw16)		8	0	0.066	0.0864	0.104	0.155	0.213	0.272	0.34	0.34	0.34
123	Chlorobenzene (smw16d)		5	0	0.066	0.066	0.066	0.17	0.17	0.17	0.17	0.17	0.17
124	Chlorobenzene (smw17)		5	0	0.066	0.066	0.066	0.17	0.17	0.17	0.17	0.17	0.17
125	Chlorobenzene (smw17d)		5	0	0.066	0.066	0.066	0.17	0.17	0.17	0.17	0.17	0.17
126	Chlorobenzene (smw18)		5	0	0.066	0.066	0.066	0.17	0.17	0.17	0.17	0.17	0.17
127	Chlorobenzene (smw18d)		5	0	0.066	0.066	0.066	0.17	0.17	0.17	0.17	0.17	0.17

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:12:47 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzene (nfmw10)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
Number of Detects	0	Number of Non-Detects	8
Number of Distinct Detects	0	Number of Distinct Non-Detects	6

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Benzene (nfmw10) was not processed!

Benzene (nfmw11)

General Statistics

Total Number of Observations	2	Number of Distinct Observations	2
Number of Detects	0	Number of Non-Detects	2
Number of Distinct Detects	0	Number of Distinct Non-Detects	2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Benzene (nfmw11) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Benzene (nfmw19)

General Statistics

Total Number of Observations	4	Number of Distinct Observations	2
Number of Detects	0	Number of Non-Detects	4
Number of Distinct Detects	0	Number of Distinct Non-Detects	2

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Benzene (nfmw19) was not processed!

	A	B	C	D	E	F	G	H	I	J	K	L
53	**Benzene (nfmw1d)**											
54												
55	**General Statistics**											
56	Total Number of Observations					6	Number of Distinct Observations					4
57	Number of Detects					0	Number of Non-Detects					6
58	Number of Distinct Detects					0	Number of Distinct Non-Detects					4
59												
60	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
61	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
62	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
63												
64	**The data set for variable Benzene (nfmw1d) was not processed!**											
65												
66												
67	**Benzene (nfmw1s)**											
68												
69	**General Statistics**											
70	Total Number of Observations					6	Number of Distinct Observations					5
71	Number of Detects					0	Number of Non-Detects					6
72	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
73												
74	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
75	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
76	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
77												
78	**The data set for variable Benzene (nfmw1s) was not processed!**											
79												
80												
81	**Benzene (nfmw2)**											
82												
83	**General Statistics**											
84	Total Number of Observations					6	Number of Distinct Observations					3
85	Number of Detects					0	Number of Non-Detects					6
86	Number of Distinct Detects					0	Number of Distinct Non-Detects					3
87												
88	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
89	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
90	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
91												
92	**The data set for variable Benzene (nfmw2) was not processed!**											
93												
94												
95	**Benzene (nfmw20)**											
96												
97	**General Statistics**											
98	Total Number of Observations					4	Number of Distinct Observations					2
99	Number of Detects					0	Number of Non-Detects					4
100	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
101												
102	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
103	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
104	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
105												
106	**The data set for variable Benzene (nfmw20) was not processed!**											

	A	B	C	D	E	F	G	H	I	J	K	L
107												
108												
109	**Benzene (nfmw22)**											
110												
111	**General Statistics**											
112	Total Number of Observations					1	Number of Distinct Observations					1
113	Number of Detects					0	Number of Non-Detects					1
114	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
115												
116	**Warning: This data set only has 1 observations!**											
117	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
118	**The data set for variable Benzene (nfmw22) was not processed!**											
119												
120	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
121	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
122												
123												
124	**Benzene (nfmw23)**											
125												
126	**General Statistics**											
127	Total Number of Observations					1	Number of Distinct Observations					1
128	Number of Detects					0	Number of Non-Detects					1
129	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
130												
131	**Warning: This data set only has 1 observations!**											
132	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
133	**The data set for variable Benzene (nfmw23) was not processed!**											
134												
135	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
136	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
137												
138												
139	**Benzene (nfmw7)**											
140												
141	**General Statistics**											
142	Total Number of Observations					2	Number of Distinct Observations					2
143	Number of Detects					0	Number of Non-Detects					2
144	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
145												
146	**Warning: This data set only has 2 observations!**											
147	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
148	**The data set for variable Benzene (nfmw7) was not processed!**											
149												
150	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
151	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
152												
153												

	A	B	C	D	E	F	G	H	I	J	K	L
154	**Benzene (nfmw8)**											
155												
156	**General Statistics**											
157	Total Number of Observations					5	Number of Distinct Observations					4
158	Number of Detects					0	Number of Non-Detects					5
159	Number of Distinct Detects					0	Number of Distinct Non-Detects					4
160												
161	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
162	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
163	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
164												
165	**The data set for variable Benzene (nfmw8) was not processed!**											
166												
167												
168	**Benzene (nfmw9)**											
169												
170	**General Statistics**											
171	Total Number of Observations					8	Number of Distinct Observations					8
172	Number of Detects					7	Number of Non-Detects					1
173	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
174	Minimum Detect					0.21	Minimum Non-Detect					0.2
175	Maximum Detect					0.64	Maximum Non-Detect					0.2
176	Variance Detects					0.0277	Percent Non-Detects					12.5%
177	Mean Detects					0.416	SD Detects					0.166
178	Median Detects					0.4	CV Detects					0.4
179	Skewness Detects					0.234	Kurtosis Detects					-1.235
180	Mean of Logged Detects					-0.95	SD of Logged Detects					0.426
181												
182	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
183	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
184	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
185	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
186												
187	**Normal GOF Test on Detects Only**											
188	Shapiro Wilk Test Statistic					0.923	**Shapiro Wilk GOF Test**					
189	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Normal at 5% Significance Level					
190	Lilliefors Test Statistic					0.169	**Lilliefors GOF Test**					
191	5% Lilliefors Critical Value					0.304	Detected Data appear Normal at 5% Significance Level					
192	**Detected Data appear Normal at 5% Significance Level**											
193												
194	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
195	KM Mean					0.389	KM Standard Error of Mean					0.0614
196	KM SD					0.161	95% KM (BCA) UCL					0.48
197	95% KM (t) UCL					0.506	95% KM (Percentile Bootstrap) UCL					0.49
198	95% KM (z) UCL					0.49	95% KM Bootstrap t UCL					0.522
199	90% KM Chebyshev UCL					0.574	95% KM Chebyshev UCL					0.657
200	97.5% KM Chebyshev UCL					0.773	99% KM Chebyshev UCL					1.001
201												
202	**Gamma GOF Tests on Detected Observations Only**											
203	A-D Test Statistic					0.297	**Anderson-Darling GOF Test**					
204	5% A-D Critical Value					0.709	Detected data appear Gamma Distributed at 5% Significance Level					
205	K-S Test Statistic					0.174	**Kolmogorov-Smirnov GOF**					
206	5% K-S Critical Value					0.313	Detected data appear Gamma Distributed at 5% Significance Level					
207	**Detected data appear Gamma Distributed at 5% Significance Level**											

208												
209	**Gamma Statistics on Detected Data Only**											
210						k hat (MLE)	6.901			k star (bias corrected MLE)	4.038	
211						Theta hat (MLE)	0.0603			Theta star (bias corrected MLE)	0.103	
212						nu hat (MLE)	96.61			nu star (bias corrected)	56.54	
213						Mean (detects)	0.416					
214												
215	**Gamma ROS Statistics using Imputed Non-Detects**											
216	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
217	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
218	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
219	This is especially true when the sample size is small.											
220	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
221						Minimum	0.0837			Mean	0.375	
222						Maximum	0.64			Median	0.385	
223						SD	0.194			CV	0.517	
224						k hat (MLE)	3.276			k star (bias corrected MLE)	2.131	
225						Theta hat (MLE)	0.114			Theta star (bias corrected MLE)	0.176	
226						nu hat (MLE)	52.42			nu star (bias corrected)	34.09	
227						Adjusted Level of Significance (β)	0.0195					
228						Approximate Chi Square Value (34.09, α)	21.74			Adjusted Chi Square Value (34.09, β)	19.28	
229						95% Gamma Approximate UCL (use when n>=50)	0.588			95% Gamma Adjusted UCL (use when n<50)	0.663	
230												
231	**Estimates of Gamma Parameters using KM Estimates**											
232						Mean (KM)	0.389			SD (KM)	0.161	
233						Variance (KM)	0.0259			SE of Mean (KM)	0.0614	
234						k hat (KM)	5.856			k star (KM)	3.743	
235						nu hat (KM)	93.7			nu star (KM)	59.89	
236						theta hat (KM)	0.0665			theta star (KM)	0.104	
237						80% gamma percentile (KM)	0.541			90% gamma percentile (KM)	0.659	
238						95% gamma percentile (KM)	0.768			99% gamma percentile (KM)	1.002	
239												
240	**Gamma Kaplan-Meier (KM) Statistics**											
241						Approximate Chi Square Value (59.89, α)	43.1			Adjusted Chi Square Value (59.89, β)	39.52	
242						95% Gamma Approximate KM-UCL (use when n>=50)	0.541			95% Gamma Adjusted KM-UCL (use when n<50)	0.59	
243												
244	**Lognormal GOF Test on Detected Observations Only**											
245						Shapiro Wilk Test Statistic	0.926			**Shapiro Wilk GOF Test**		
246						5% Shapiro Wilk Critical Value	0.803			Detected Data appear Lognormal at 5% Significance Level		
247						Lilliefors Test Statistic	0.173			**Lilliefors GOF Test**		
248						5% Lilliefors Critical Value	0.304			Detected Data appear Lognormal at 5% Significance Level		
249	**Detected Data appear Lognormal at 5% Significance Level**											
250												
251	**Lognormal ROS Statistics Using Imputed Non-Detects**											
252						Mean in Original Scale	0.381			Mean in Log Scale	-1.081	
253						SD in Original Scale	0.183			SD in Log Scale	0.541	
254						95% t UCL (assumes normality of ROS data)	0.504			95% Percentile Bootstrap UCL	0.485	
255						95% BCA Bootstrap UCL	0.493			95% Bootstrap t UCL	0.512	
256						95% H-UCL (Log ROS)	0.645					
257												
258	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
259						KM Mean (logged)	-1.033			KM Geo Mean	0.356	
260						KM SD (logged)	0.429			95% Critical H Value (KM-Log)	2.238	
261						KM Standard Error of Mean (logged)	0.164			95% H-UCL (KM -Log)	0.561	

262				KM SD (logged)	0.429				95% Critical H Value (KM-Log)			2.238
263				KM Standard Error of Mean (logged)	0.164							
264												
265					**DL/2 Statistics**							
266				**DL/2 Normal**					**DL/2 Log-Transformed**			
267				Mean in Original Scale	0.377				Mean in Log Scale			-1.119
268				SD in Original Scale	0.19				SD in Log Scale			0.62
269				95% t UCL (Assumes normality)	0.504				95% H-Stat UCL			0.723
270					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
271												
272					**Nonparametric Distribution Free UCL Statistics**							
273					**Detected Data appear Normal Distributed at 5% Significance Level**							
274												
275					**Suggested UCL to Use**							
276				95% KM (t) UCL	0.506							
277												
278					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
279					Recommendations are based upon data size, data distribution, and skewness.							
280					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
281					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
282												
283	**Benzene (smw16)**											
284												
285					**General Statistics**							
286				Total Number of Observations	8				Number of Distinct Observations			5
287				Number of Detects	0				Number of Non-Detects			8
288				Number of Distinct Detects	0				Number of Distinct Non-Detects			5
289												
290					**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**							
291					**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**							
292					**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**							
293												
294					**The data set for variable Benzene (smw16) was not processed!**							
295												
296												
297	**Benzene (smw16d)**											
298												
299					**General Statistics**							
300				Total Number of Observations	5				Number of Distinct Observations			2
301				Number of Detects	0				Number of Non-Detects			5
302				Number of Distinct Detects	0				Number of Distinct Non-Detects			2
303												
304					**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**							
305					**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**							
306					**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**							
307												
308					**The data set for variable Benzene (smw16d) was not processed!**							
309												
310												

	A	B	C	D	E	F	G	H	I	J	K	L
311	**Benzene (smw17)**											
312												
313	**General Statistics**											
314	Total Number of Observations					5	Number of Distinct Observations					2
315	Number of Detects					0	Number of Non-Detects					5
316	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
317												
318	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
319	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
320	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
321												
322	**The data set for variable Benzene (smw17) was not processed!**											
323												
324												
325	**Benzene (smw17d)**											
326												
327	**General Statistics**											
328	Total Number of Observations					5	Number of Distinct Observations					2
329	Number of Detects					0	Number of Non-Detects					5
330	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
331												
332	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
333	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
334	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
335												
336	**The data set for variable Benzene (smw17d) was not processed!**											
337												
338												
339	**Benzene (smw18)**											
340												
341	**General Statistics**											
342	Total Number of Observations					5	Number of Distinct Observations					2
343	Number of Detects					0	Number of Non-Detects					5
344	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
345												
346	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
347	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
348	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
349												
350	**The data set for variable Benzene (smw18) was not processed!**											
351												
352												
353	**Benzene (smw18d)**											
354												
355	**General Statistics**											
356	Total Number of Observations					5	Number of Distinct Observations					2
357	Number of Detects					0	Number of Non-Detects					5
358	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
359												
360	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
361	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
362	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
363												
364	**The data set for variable Benzene (smw18d) was not processed!**											

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:13:20 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Chlorobenzene (nfmw10)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
Number of Detects	0	Number of Non-Detects	8
Number of Distinct Detects	0	Number of Distinct Non-Detects	6

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Chlorobenzene (nfmw10) was not processed!

Chlorobenzene (nfmw11)

General Statistics

Total Number of Observations	2	Number of Distinct Observations	2
Number of Detects	0	Number of Non-Detects	2
Number of Distinct Detects	0	Number of Distinct Non-Detects	2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Chlorobenzene (nfmw11) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Chlorobenzene (nfmw19)

General Statistics

Total Number of Observations	4	Number of Distinct Observations	2
Number of Detects	0	Number of Non-Detects	4
Number of Distinct Detects	0	Number of Distinct Non-Detects	2

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Chlorobenzene (nfmw19) was not processed!

53	**Chlorobenzene (nfmw1d)**											
54												
55	**General Statistics**											
56					Total Number of Observations	6			Number of Distinct Observations	5		
57					Number of Detects	3			Number of Non-Detects	3		
58					Number of Distinct Detects	3			Number of Distinct Non-Detects	2		
59					Minimum Detect	0.25			Minimum Non-Detect	0.117		
60					Maximum Detect	0.29			Maximum Non-Detect	0.34		
61					Variance Detects	4.3333E-4			Percent Non-Detects	50%		
62					Mean Detects	0.267			SD Detects	0.0208		
63					Median Detects	0.26			CV Detects	0.0781		
64					Skewness Detects	1.293			Kurtosis Detects	N/A		
65					Mean of Logged Detects	-1.324			SD of Logged Detects	0.0769		
66												
67	**Warning: Data set has only 3 Detected Values.**											
68	**This is not enough to compute meaningful or reliable statistics and estimates.**											
69												
70												
71	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
72	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
73	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
74	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
75												
76	**Normal GOF Test on Detects Only**											
77					Shapiro Wilk Test Statistic	0.923			**Shapiro Wilk GOF Test**			
78					5% Shapiro Wilk Critical Value	0.767			Detected Data appear Normal at 5% Significance Level			
79					Lilliefors Test Statistic	0.292			**Lilliefors GOF Test**			
80					5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level			
81	**Detected Data appear Normal at 5% Significance Level**											
82												
83	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
84					KM Mean	0.229			KM Standard Error of Mean	0.0407		
85					KM SD	0.0665			95% KM (BCA) UCL	N/A		
86					95% KM (t) UCL	0.311			95% KM (Percentile Bootstrap) UCL	N/A		
87					95% KM (z) UCL	0.296			95% KM Bootstrap t UCL	N/A		
88					90% KM Chebyshev UCL	0.351			95% KM Chebyshev UCL	0.407		
89					97.5% KM Chebyshev UCL	0.483			99% KM Chebyshev UCL	0.634		
90												
91	**Gamma GOF Tests on Detected Observations Only**											
92	**Not Enough Data to Perform GOF Test**											
93												
94	**Gamma Statistics on Detected Data Only**											
95					k hat (MLE)	251.2			k star (bias corrected MLE)	N/A		
96					Theta hat (MLE)	0.00106			Theta star (bias corrected MLE)	N/A		
97					nu hat (MLE)	1507			nu star (bias corrected)	N/A		
98					Mean (detects)	0.267						
99												
100	**Gamma ROS Statistics using Imputed Non-Detects**											
101	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
102	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
103	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
104	This is especially true when the sample size is small.											

	A	B	C	D	E	F	G	H	I	J	K	L
105	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
106					Minimum	0.21				Mean		0.253
107					Maximum	0.29				Median		0.255
108					SD	0.0276				CV		0.109
109					k hat (MLE)	98.13				k star (bias corrected MLE)		49.18
110					Theta hat (MLE)	0.00258				Theta star (bias corrected MLE)		0.00514
111					nu hat (MLE)	1178				nu star (bias corrected)		590.1
112					Adjusted Level of Significance (β)	0.0122						
113					Approximate Chi Square Value (590.13, α)	534.8				Adjusted Chi Square Value (590.13, β)		515.5
114					95% Gamma Approximate UCL (use when n>=50)	0.279				95% Gamma Adjusted UCL (use when n<50)		N/A
115												
116	**Estimates of Gamma Parameters using KM Estimates**											
117					Mean (KM)	0.229				SD (KM)		0.0665
118					Variance (KM)	0.00442				SE of Mean (KM)		0.0407
119					k hat (KM)	11.9				k star (KM)		6.061
120					nu hat (KM)	142.8				nu star (KM)		72.73
121					theta hat (KM)	0.0193				theta star (KM)		0.0378
122					80% gamma percentile (KM)	0.302				90% gamma percentile (KM)		0.354
123					95% gamma percentile (KM)	0.401				99% gamma percentile (KM)		0.499
124												
125	**Gamma Kaplan-Meier (KM) Statistics**											
126					Approximate Chi Square Value (72.73, α)	54.09				Adjusted Chi Square Value (72.73, β)		48.33
127					95% Gamma Approximate KM-UCL (use when n>=50)	0.308				95% Gamma Adjusted KM-UCL (use when n<50)		0.345
128												
129	**Lognormal GOF Test on Detected Observations Only**											
130					Shapiro Wilk Test Statistic	0.931				**Shapiro Wilk GOF Test**		
131					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
132					Lilliefors Test Statistic	0.286				**Lilliefors GOF Test**		
133					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
134	**Detected Data appear Lognormal at 5% Significance Level**											
135												
136	**Lognormal ROS Statistics Using Imputed Non-Detects**											
137					Mean in Original Scale	0.254				Mean in Log Scale		-1.376
138					SD in Original Scale	0.0261				SD in Log Scale		0.104
139					95% t UCL (assumes normality of ROS data)	0.275				95% Percentile Bootstrap UCL		0.269
140					95% BCA Bootstrap UCL	0.269				95% Bootstrap t UCL		0.274
141					95% H-UCL (Log ROS)	0.278						
142												
143	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
144					KM Mean (logged)	-1.529				KM Geo Mean		0.217
145					KM SD (logged)	0.36				95% Critical H Value (KM-Log)		2.336
146					KM Standard Error of Mean (logged)	0.22				95% H-UCL (KM -Log)		0.337
147					KM SD (logged)	0.36				95% Critical H Value (KM-Log)		2.336
148					KM Standard Error of Mean (logged)	0.22						
149												
150	**DL/2 Statistics**											
151	**DL/2 Normal**						**DL/2 Log-Transformed**					
152					Mean in Original Scale	0.2				Mean in Log Scale		-1.726
153					SD in Original Scale	0.0849				SD in Log Scale		0.59
154					95% t UCL (Assumes normality)	0.27				95% H-Stat UCL		0.451
155	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
156												

157	**Nonparametric Distribution Free UCL Statistics**											
158	**Detected Data appear Normal Distributed at 5% Significance Level**											
159												
160	**Suggested UCL to Use**											
161					95% KM (t) UCL	0.311						
162	**Warning: Recommended UCL exceeds the maximum observation**											
163												
164	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
165	Recommendations are based upon data size, data distribution, and skewness.											
166	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
167	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
168												
169	**Chlorobenzene (nfmw1s)**											
170												
171	**General Statistics**											
172					Total Number of Observations	6			Number of Distinct Observations	5		
173					Number of Detects	0			Number of Non-Detects	6		
174					Number of Distinct Detects	0			Number of Distinct Non-Detects	5		
175												
176	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
177	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
178	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
179												
180	**The data set for variable Chlorobenzene (nfmw1s) was not processed!**											
181												
182												
183	**Chlorobenzene (nfmw2)**											
184												
185	**General Statistics**											
186					Total Number of Observations	6			Number of Distinct Observations	6		
187					Number of Detects	5			Number of Non-Detects	1		
188					Number of Distinct Detects	5			Number of Distinct Non-Detects	1		
189					Minimum Detect	0.25			Minimum Non-Detect	0.117		
190					Maximum Detect	0.42			Maximum Non-Detect	0.117		
191					Variance Detects	0.00425			Percent Non-Detects	16.67%		
192					Mean Detects	0.33			SD Detects	0.0652		
193					Median Detects	0.33			CV Detects	0.198		
194					Skewness Detects	0.271			Kurtosis Detects	-0.392		
195					Mean of Logged Detects	-1.124			SD of Logged Detects	0.199		
196												
197	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
198	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
199	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
200	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
201												
202	**Normal GOF Test on Detects Only**											
203					Shapiro Wilk Test Statistic	0.992			**Shapiro Wilk GOF Test**			
204					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
205					Lilliefors Test Statistic	0.13			**Lilliefors GOF Test**			
206					5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			
207	**Detected Data appear Normal at 5% Significance Level**											
208												

	A	B	C	D	E	F	G	H	I	J	K	L
209	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
210					KM Mean	0.295				KM Standard Error of Mean		0.0436
211					KM SD	0.0956				95% KM (BCA) UCL		0.352
212					95% KM (t) UCL	0.382				95% KM (Percentile Bootstrap) UCL		0.358
213					95% KM (z) UCL	0.366				95% KM Bootstrap t UCL		0.351
214					90% KM Chebyshev UCL	0.425				95% KM Chebyshev UCL		0.485
215					97.5% KM Chebyshev UCL	0.567				99% KM Chebyshev UCL		0.729
216												
217	**Gamma GOF Tests on Detected Observations Only**											
218					A-D Test Statistic	0.163	**Anderson-Darling GOF Test**					
219					5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level					
220					K-S Test Statistic	0.144	**Kolmogorov-Smirnov GOF**					
221					5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level					
222	**Detected data appear Gamma Distributed at 5% Significance Level**											
223												
224	**Gamma Statistics on Detected Data Only**											
225					k hat (MLE)	31.94				k star (bias corrected MLE)		12.91
226					Theta hat (MLE)	0.0103				Theta star (bias corrected MLE)		0.0256
227					nu hat (MLE)	319.4				nu star (bias corrected)		129.1
228					Mean (detects)	0.33						
229												
230	**Gamma ROS Statistics using Imputed Non-Detects**											
231	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
232	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
233	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
234	This is especially true when the sample size is small.											
235	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
236					Minimum	0.174				Mean		0.304
237					Maximum	0.42				Median		0.31
238					SD	0.0863				CV		0.284
239					k hat (MLE)	13.42				k star (bias corrected MLE)		6.821
240					Theta hat (MLE)	0.0227				Theta star (bias corrected MLE)		0.0446
241					nu hat (MLE)	161				nu star (bias corrected)		81.86
242					Adjusted Level of Significance (β)	0.0122						
243					Approximate Chi Square Value (81.86, α)	62.01				Adjusted Chi Square Value (81.86, β)		55.81
244					95% Gamma Approximate UCL (use when n>=50)	0.401				95% Gamma Adjusted UCL (use when n<50)		0.446
245												
246	**Estimates of Gamma Parameters using KM Estimates**											
247					Mean (KM)	0.295				SD (KM)		0.0956
248					Variance (KM)	0.00913				SE of Mean (KM)		0.0436
249					k hat (KM)	9.495				k star (KM)		4.858
250					nu hat (KM)	113.9				nu star (KM)		58.3
251					theta hat (KM)	0.031				theta star (KM)		0.0606
252					80% gamma percentile (KM)	0.397				90% gamma percentile (KM)		0.473
253					95% gamma percentile (KM)	0.543				99% gamma percentile (KM)		0.69
254												
255	**Gamma Kaplan-Meier (KM) Statistics**											
256					Approximate Chi Square Value (58.30, α)	41.75				Adjusted Chi Square Value (58.30, β)		36.75
257					95% Gamma Approximate KM-UCL (use when n>=50)	0.411				95% Gamma Adjusted KM-UCL (use when n<50)		0.467
258												
259	**Lognormal GOF Test on Detected Observations Only**											
260					Shapiro Wilk Test Statistic	0.996	**Shapiro Wilk GOF Test**					

261	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Lognormal at 5% Significance Level					
262	Lilliefors Test Statistic					0.132	**Lilliefors GOF Test**					
263	5% Lilliefors Critical Value					0.343	Detected Data appear Lognormal at 5% Significance Level					
264	**Detected Data appear Lognormal at 5% Significance Level**											
265												
266	**Lognormal ROS Statistics Using Imputed Non-Detects**											
267	Mean in Original Scale					0.307	Mean in Log Scale					-1.211
268	SD in Original Scale					0.0808	SD in Log Scale					0.277
269	95% t UCL (assumes normality of ROS data)					0.374	95% Percentile Bootstrap UCL					0.357
270	95% BCA Bootstrap UCL					0.353	95% Bootstrap t UCL					0.372
271	95% H-UCL (Log ROS)					0.406						
272												
273	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
274	KM Mean (logged)					-1.295	KM Geo Mean					0.274
275	KM SD (logged)					0.414	95% Critical H Value (KM-Log)					2.444
276	KM Standard Error of Mean (logged)					0.189	95% H-UCL (KM -Log)					0.469
277	KM SD (logged)					0.414	95% Critical H Value (KM-Log)					2.444
278	KM Standard Error of Mean (logged)					0.189						
279												
280	**DL/2 Statistics**											
281	**DL/2 Normal**						**DL/2 Log-Transformed**					
282	Mean in Original Scale					0.285	Mean in Log Scale					-1.41
283	SD in Original Scale					0.125	SD in Log Scale					0.722
284	95% t UCL (Assumes normality)					0.388	95% H-Stat UCL					0.901
285	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
286												
287	**Nonparametric Distribution Free UCL Statistics**											
288	**Detected Data appear Normal Distributed at 5% Significance Level**											
289												
290	**Suggested UCL to Use**											
291	95% KM (t) UCL					0.382						
292												
293	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
294	Recommendations are based upon data size, data distribution, and skewness.											
295	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
296	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
297												
298	**Chlorobenzene (nfmw20)**											
299												
300	**General Statistics**											
301	Total Number of Observations					4	Number of Distinct Observations					2
302	Number of Detects					0	Number of Non-Detects					4
303	Number of Distinct Detects					0	Number of Distinct Non-Detects					2
304												
305	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
306	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
307	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
308												
309	**The data set for variable Chlorobenzene (nfmw20) was not processed!**											
310												
311												
312	**Chlorobenzene (nfmw22)**											

	A	B	C	D	E	F	G	H	I	J	K	L
313												
314	General Statistics											
315					Total Number of Observations	1				Number of Distinct Observations		1
316					Number of Detects	0				Number of Non-Detects		1
317					Number of Distinct Detects	0				Number of Distinct Non-Detects		1
318												
319	Warning: This data set only has 1 observations!											
320	Data set is too small to compute reliable and meaningful statistics and estimates!											
321	The data set for variable Chlorobenzene (nfmw22) was not processed!											
322												
323	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
324	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
325												
326												
327	Chlorobenzene (nfmw23)											
328												
329	General Statistics											
330					Total Number of Observations	1				Number of Distinct Observations		1
331					Number of Detects	0				Number of Non-Detects		1
332					Number of Distinct Detects	0				Number of Distinct Non-Detects		1
333												
334	Warning: This data set only has 1 observations!											
335	Data set is too small to compute reliable and meaningful statistics and estimates!											
336	The data set for variable Chlorobenzene (nfmw23) was not processed!											
337												
338	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
339	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
340												
341												
342	Chlorobenzene (nfmw7)											
343												
344	General Statistics											
345					Total Number of Observations	2				Number of Distinct Observations		2
346					Number of Detects	0				Number of Non-Detects		2
347					Number of Distinct Detects	0				Number of Distinct Non-Detects		2
348												
349	Warning: This data set only has 2 observations!											
350	Data set is too small to compute reliable and meaningful statistics and estimates!											
351	The data set for variable Chlorobenzene (nfmw7) was not processed!											
352												
353	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
354	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
355												
356												
357	Chlorobenzene (nfmw8)											
358												
359	General Statistics											
360					Total Number of Observations	5				Number of Distinct Observations		4
361					Number of Detects	0				Number of Non-Detects		5
362					Number of Distinct Detects	0				Number of Distinct Non-Detects		4
363												
364	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											

365	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
366	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
367												
368	The data set for variable Chlorobenzene (nfmw8) was not processed!											
369												
370												
371												
372	Chlorobenzene (nfmw9)											
373												
374	General Statistics											
375						Total Number of Observations	8			Number of Distinct Observations	8	
376										Number of Missing Observations	0	
377						Minimum	10.5			Mean	69.18	
378						Maximum	149			Median	59.5	
379						SD	52.3			Std. Error of Mean	18.49	
380						Coefficient of Variation	0.756			Skewness	0.413	
381												
382	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
383	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
384	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
385	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
386												
387	Normal GOF Test											
388						Shapiro Wilk Test Statistic	0.922			Shapiro Wilk GOF Test		
389						5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level		
390						Lilliefors Test Statistic	0.158			Lilliefors GOF Test		
391						5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level		
392	Data appear Normal at 5% Significance Level											
393												
394	Assuming Normal Distribution											
395						95% Normal UCL				95% UCLs (Adjusted for Skewness)		
396						95% Student's-t UCL	104.2			95% Adjusted-CLT UCL (Chen-1995)	102.5	
397										95% Modified-t UCL (Johnson-1978)	104.7	
398												
399	Gamma GOF Test											
400						A-D Test Statistic	0.263			Anderson-Darling Gamma GOF Test		
401						5% A-D Critical Value	0.728			Detected data appear Gamma Distributed at 5% Significance Level		
402						K-S Test Statistic	0.17			Kolmogorov-Smirnov Gamma GOF Test		
403						5% K-S Critical Value	0.299			Detected data appear Gamma Distributed at 5% Significance Level		
404	Detected data appear Gamma Distributed at 5% Significance Level											
405												
406	Gamma Statistics											
407						k hat (MLE)	1.577			k star (bias corrected MLE)	1.069	
408						Theta hat (MLE)	43.87			Theta star (bias corrected MLE)	64.72	
409						nu hat (MLE)	25.23			nu star (bias corrected)	17.1	
410						MLE Mean (bias corrected)	69.18			MLE Sd (bias corrected)	66.91	
411										Approximate Chi Square Value (0.05)	8.744	
412						Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	7.284	
413												
414	Assuming Gamma Distribution											
415						95% Approximate Gamma UCL (use when n>=50))	135.3			95% Adjusted Gamma UCL (use when n<50)	162.4	
416												

417	**Lognormal GOF Test**											
418					Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk Lognormal GOF Test**					
419					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
420					Lilliefors Test Statistic	0.157	**Lilliefors Lognormal GOF Test**					
421					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
422	**Data appear Lognormal at 5% Significance Level**											
423												
424	**Lognormal Statistics**											
425					Minimum of Logged Data	2.351	Mean of logged Data	3.887				
426					Maximum of Logged Data	5.004	SD of logged Data	0.984				
427												
428	**Assuming Lognormal Distribution**											
429					95% H-UCL	279	90% Chebyshev (MVUE) UCL	151.2				
430					95% Chebyshev (MVUE) UCL	186.5	97.5% Chebyshev (MVUE) UCL	235.5				
431					99% Chebyshev (MVUE) UCL	331.8						
432												
433	**Nonparametric Distribution Free UCL Statistics**											
434	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
435												
436	**Nonparametric Distribution Free UCLs**											
437					95% CLT UCL	99.59	95% Jackknife UCL	104.2				
438					95% Standard Bootstrap UCL	97.44	95% Bootstrap-t UCL	109.4				
439					95% Hall's Bootstrap UCL	98.16	95% Percentile Bootstrap UCL	98.05				
440					95% BCA Bootstrap UCL	101.8						
441					90% Chebyshev(Mean, Sd) UCL	124.6	95% Chebyshev(Mean, Sd) UCL	149.8				
442					97.5% Chebyshev(Mean, Sd) UCL	184.6	99% Chebyshev(Mean, Sd) UCL	253.1				
443												
444	**Suggested UCL to Use**											
445					95% Student's-t UCL	104.2						
446												
447	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
448	Recommendations are based upon data size, data distribution, and skewness.											
449	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
450	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
451												
452	**Chlorobenzene (smw16)**											
453												
454	**General Statistics**											
455					Total Number of Observations	8	Number of Distinct Observations	5				
456					Number of Detects	0	Number of Non-Detects	8				
457					Number of Distinct Detects	0	Number of Distinct Non-Detects	5				
458												
459	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
460	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
461	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
462												
463	**The data set for variable Chlorobenzene (smw16) was not processed!**											
464												
465												
466	**Chlorobenzene (smw16d)**											
467												
468	**General Statistics**											

	A	B	C	D	E	F	G	H	I	J	K	L
469					Total Number of Observations	5				Number of Distinct Observations		2
470					Number of Detects	0				Number of Non-Detects		5
471					Number of Distinct Detects	0				Number of Distinct Non-Detects		2
472												
473	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
474	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
475	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
476												
477	**The data set for variable Chlorobenzene (smw16d) was not processed!**											
478												
479												
480	**Chlorobenzene (smw17)**											
481												
482	**General Statistics**											
483					Total Number of Observations	5				Number of Distinct Observations		2
484					Number of Detects	0				Number of Non-Detects		5
485					Number of Distinct Detects	0				Number of Distinct Non-Detects		2
486												
487	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
488	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
489	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
490												
491	**The data set for variable Chlorobenzene (smw17) was not processed!**											
492												
493												
494	**Chlorobenzene (smw17d)**											
495												
496	**General Statistics**											
497					Total Number of Observations	5				Number of Distinct Observations		2
498					Number of Detects	0				Number of Non-Detects		5
499					Number of Distinct Detects	0				Number of Distinct Non-Detects		2
500												
501	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
502	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
503	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
504												
505	**The data set for variable Chlorobenzene (smw17d) was not processed!**											
506												
507												
508	**Chlorobenzene (smw18)**											
509												
510	**General Statistics**											
511					Total Number of Observations	5				Number of Distinct Observations		2
512					Number of Detects	0				Number of Non-Detects		5
513					Number of Distinct Detects	0				Number of Distinct Non-Detects		2
514												
515	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
516	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
517	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
518												
519	**The data set for variable Chlorobenzene (smw18) was not processed!**											
520												

	A	B	C	D	E	F	G	H	I	J	K	L
521												
522	**Chlorobenzene (smw18d)**											
523												
524	**General Statistics**											
525						Total Number of Observations	5				Number of Distinct Observations	2	
526						Number of Detects	0				Number of Non-Detects	5	
527						Number of Distinct Detects	0				Number of Distinct Non-Detects	2	
528												
529	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
530	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
531	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
532												
533	**The data set for variable Chlorobenzene (smw18d) was not processed!**											

	A	B	C	D	E	F	G	H	I	J	K	L	M
1				**General Statistics on Uncensored Data**									
2			Date/Time of Computation	ProUCL 5.15/7/2021 12:32:05 PM									
3			**User Selected Options**										
4			From File	OU3 ProUCL Input 05.07.2021.xls									
5			Full Precision	OFF									
6													
7	**From File: OU3 ProUCL Input 05.07.2021.xls**												
8													
9				**General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method**									
10													
11	**Variable**		**NumObs**	**# Missing**	**Num Ds**	**NumNDs**	**% NDs**	**Min ND**	**Max ND**	**KM Mean**	**KM Var**	**KM SD**	**KM CV**
12	TEQ-ND=1/2DL (atmw6)		8	0	8	0	0.00%	N/A	N/A	1.8151E-6	3.093E-13	5.5618E-7	0.306
13	TEQ-ND=1/2DL (nfmw10)		10	0	10	0	0.00%	N/A	N/A	2.0162E-6	4.358E-13	6.6018E-7	0.327
14	TEQ-ND=1/2DL (nfmw11)		8	0	7	1	12.50%	1.1711E-6	1.1711E-6	1.5390E-6	3.901E-13	6.2457E-7	0.406
15	TEQ-ND=1/2DL (nfmw12)		7	0	2	5	71.43%	1.0794E-6	1.8137E-6	9.7669E-7	9.405E-15	9.6980E-8	0.0993
16	TEQ-ND=1/2DL (nfmw19)		8	0	1	7	87.50%	1.0392E-6	2.1680E-6	1.0955E-6	1.586E-14	1.2593E-7	0.115
17	TEQ-ND=1/2DL (nfmw1d)		11	0	11	0	0.00%	N/A	N/A	1.7376E-6	2.190E-13	4.6797E-7	0.269
18	TEQ-ND=1/2DL (nfmw1s)		7	0	7	0	0.00%	N/A	N/A	2.4883E-6	1.409E-12	1.1869E-6	0.477
19	TEQ-ND=1/2DL (nfmw2)		11	0	7	4	36.36%	1.0590E-6	1.5383E-6	1.3704E-6	1.620E-13	4.0252E-7	0.294
20	TEQ-ND=1/2DL (nfmw20)		8	0	7	1	12.50%	1.1828E-6	1.1828E-6	1.6105E-6	2.758E-13	5.2513E-7	0.326
21	TEQ-ND=1/2DL (nfmw22)		4	0	4	0	0.00%	N/A	N/A	1.9599E-6	8.242E-14	2.8709E-7	0.146
22	TEQ-ND=1/2DL (nfmw23)		4	0	4	0	0.00%	N/A	N/A	2.0196E-6	1.702E-14	1.3046E-7	0.0646
23	TEQ-ND=1/2DL (nfmw3)		9	0	7	2	22.22%	1.1357E-6	1.2498E-6	1.3196E-6	6.814E-14	2.6104E-7	0.198
24	TEQ-ND=1/2DL (nfmw4)		9	0	4	5	55.56%	9.5658E-7	1.2537E-6	1.2414E-6	2.101E-13	4.5835E-7	0.369
25	TEQ-ND=1/2DL (nfmw7)		8	0	6	2	25.00%	1.1532E-6	2.0643E-6	1.4329E-6	7.507E-14	2.7399E-7	0.191
26	TEQ-ND=1/2DL (nfmw8)		8	0	5	3	37.50%	8.4745E-7	2.6364E-6	1.2447E-6	7.749E-14	2.7837E-7	0.224
27	TEQ-ND=1/2DL (nfmw9)		10	0	10	0	0.00%	N/A	N/A	7.4989E-6	2.055E-11	4.5330E-6	0.604
28	TEQ-ND=1/2DL (smw10)		8	0	8	0	0.00%	N/A	N/A	1.9097E-6	2.451E-13	4.9504E-7	0.259
29	TEQ-ND=1/2DL (smw11)		11	0	10	1	9.09%	1.4396E-6	1.4396E-6	2.4154E-6	1.056E-12	1.0274E-6	0.425
30	TEQ-ND=1/2DL (smw12)		8	0	8	0	0.00%	N/A	N/A	2.6068E-6	8.267E-13	9.0923E-7	0.349
31	TEQ-ND=1/2DL (smw13)		10	0	9	1	10.00%	1.1339E-6	1.1339E-6	1.8637E-6	8.836E-13	9.3998E-7	0.504
32	TEQ-ND=1/2DL (smw14)		8	0	7	1	12.50%	1.3169E-6	1.3169E-6	1.6974E-6	4.641E-13	6.8128E-7	0.401
33	TEQ-ND=1/2DL (smw15)		9	0	5	4	44.44%	1.0711E-6	1.2735E-6	1.3249E-6	1.170E-13	3.4207E-7	0.258
34	TEQ-ND=1/2DL (smw16)		12	0	12	0	0.00%	N/A	N/A	1.8563E-6	2.830E-13	5.3198E-7	0.287
35	TEQ-ND=1/2DL (smw16d)		9	0	1	8	88.89%	9.1981E-7	1.8644E-6	9.9224E-7	1.049E-14	1.0242E-7	0.103
36	TEQ-ND=1/2DL (smw17)		11	0	11	0	0.00%	N/A	N/A	5.0773E-6	1.159E-11	3.4040E-6	0.67
37	TEQ-ND=1/2DL (smw17d)		9	0	9	0	0.00%	N/A	N/A	1.2824E-6	1.255E-13	3.5433E-7	0.276
38	TEQ-ND=1/2DL (smw18)		10	0	10	0	0.00%	N/A	N/A	1.8648E-6	1.128E-13	3.3589E-7	0.18
39	TEQ-ND=1/2DL (smw18d)		9	0	9	0	0.00%	N/A	N/A	1.4781E-6	2.336E-13	4.8331E-7	0.327
40	TEQ-ND=1/2DL (smw19)		8	0	7	1	12.50%	1.2045E-6	1.2045E-6	1.6460E-6	1.939E-13	4.4031E-7	0.267
41	TEQ-ND=1/2DL (smw7)		4	0	1	3	75.00%	9.2487E-7	2.8875E-6	1.2691E-6	1.185E-13	3.4427E-7	0.271
42	TEQ-ND=1/2DL (smw8)		5	0	3	2	40.00%	1.1763E-6	1.3498E-6	1.3217E-6	1.730E-13	4.1588E-7	0.315
43	TEQ-ND=1/2DL (smw9)		9	0	8	1	11.11%	1.1186E-6	1.1186E-6	1.5300E-6	2.644E-13	5.1416E-7	0.336
44	TEQ-ND=1/2DL (tw2r)		9	0	9	0	0.00%	N/A	N/A	1.4381E-6	4.807E-13	6.9331E-7	0.482
45	TEQ-ND=1/2DL (tw5r)		5	0	4	1	20.00%	1.0875E-6	1.0875E-6	1.3213E-6	3.027E-14	1.7399E-7	0.132
46	2DL (waste water clarifier well)		1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
47													
48				**General Statistics for Raw Data Sets using Detected Data Only**									
49													
50	**Variable**		**NumObs**	**# Missing**	**Minimum**	**Maximum**	**Mean**	**Median**	**Var**	**SD**	**MAD/0.675**	**Skewness**	**CV**
51	TEQ-ND=1/2DL (atmw6)		8	0	1.0777E-6	2.81E-06	1.8151E-6	1.7609E-6	3.093E-13	5.5618E-7	4.7598E-7	0.742	0.306
52	TEQ-ND=1/2DL (nfmw10)		10	0	1.3253E-6	3.11E-06	2.0162E-6	1.8096E-6	4.358E-13	6.6018E-7	6.3408E-7	0.779	0.327
53	TEQ-ND=1/2DL (nfmw11)		7	0	6.3015E-7	2.41E-06	1.6439E-6	1.9229E-6	4.123E-13	6.4212E-7	6.3719E-7	-0.649	0.391
54	TEQ-ND=1/2DL (nfmw12)		2	0	8.7971E-7	1.07E-06	9.7669E-7	9.7669E-7	1.881E-14	1.3715E-7	1.4378E-7	N/A	0.14
55	TEQ-ND=1/2DL (nfmw19)		1	0	1.3771E-6	1.38E-06	1.3771E-6	1.3771E-6	N/A	N/A	0	N/A	N/A
56	TEQ-ND=1/2DL (nfmw1d)		11	0	1.0163E-6	2.67E-06	1.7376E-6	1.6730E-6	2.190E-13	4.6797E-7	4.5569E-7	0.577	0.269
57	TEQ-ND=1/2DL (nfmw1s)		7	0	1.1685E-6	4.15E-06	2.4883E-6	1.7951E-6	1.409E-12	1.1869E-6	9.2900E-7	0.429	0.477
58	TEQ-ND=1/2DL (nfmw2)		7	0	1.1594E-6	2.41E-06	1.5220E-6	1.2692E-6	2.201E-13	4.6919E-7	1.6278E-7	1.314	0.308
59	TEQ-ND=1/2DL (nfmw20)		7	0	1.1582E-6	2.86E-06	1.6752E-6	1.5414E-6	3.287E-13	5.7333E-7	4.4875E-7	1.75	0.342
60	TEQ-ND=1/2DL (nfmw22)		4	0	1.7184E-6	2.33E-06	1.9599E-6	1.8932E-6	8.242E-14	2.8709E-7	2.3380E-7	0.848	0.146
61	TEQ-ND=1/2DL (nfmw23)		4	0	1.8785E-6	2.14E-06	2.0196E-6	2.0278E-6	1.702E-14	1.3046E-7	1.5156E-7	-0.147	0.0646
62	TEQ-ND=1/2DL (nfmw3)		7	0	1.0118E-6	1.73E-06	1.3900E-6	1.4113E-6	7.495E-14	2.7377E-7	4.0992E-7	0.0468	0.197

	A	B	C	D	E	F	G	H	I	J	K	L	M
63	TEQ-ND=1/2DL (nfmw4)		4	0	9.6997E-7	2.21E-06	1.5810E-6	1.5735E-6	3.504E-13	5.9197E-7	7.2757E-7	0.0349	0.374
64	TEQ-ND=1/2DL (nfmw7)		6	0	1.1747E-6	2.01E-06	1.4795E-6	1.4490E-6	8.685E-14	2.9470E-7	2.1080E-7	1.314	0.199
65	TEQ-ND=1/2DL (nfmw8)		5	0	1.1140E-6	1.70E-06	1.3643E-6	1.2866E-6	6.325E-14	2.5150E-7	2.5588E-7	0.542	0.184
66	TEQ-ND=1/2DL (nfmw9)		10	0	3.1246E-6	1.70E-05	7.4989E-6	6.0272E-6	2.055E-11	4.5330E-6	3.3875E-6	1.118	0.604
67	TEQ-ND=1/2DL (smw10)		8	0	1.5228E-6	3.07E-06	1.9097E-6	1.7465E-6	2.451E-13	4.9504E-7	1.4599E-7	2.279	0.259
68	TEQ-ND=1/2DL (smw11)		10	0	1.4949E-6	5.06E-06	2.5130E-6	2.1061E-6	1.174E-12	1.0834E-6	6.1767E-7	1.639	0.431
69	TEQ-ND=1/2DL (smw12)		8	0	1.6913E-6	4.16E-06	2.6068E-6	2.4822E-6	8.267E-13	9.0923E-7	1.0296E-6	0.565	0.349
70	TEQ-ND=1/2DL (smw13)		9	0	9.9423E-7	3.85E-06	1.9603E-6	1.5021E-6	9.995E-13	9.9973E-7	7.5293E-7	1.035	0.51
71	TEQ-ND=1/2DL (smw14)		7	0	9.5518E-7	2.93E-06	1.8034E-6	1.5749E-6	5.139E-13	7.1689E-7	3.3698E-7	0.818	0.398
72	TEQ-ND=1/2DL (smw15)		5	0	1.0510E-6	1.96E-06	1.5440E-6	1.5796E-6	1.283E-13	3.5813E-7	3.4750E-7	-0.392	0.232
73	TEQ-ND=1/2DL (smw16)		12	0	1.2047E-6	2.61E-06	1.8563E-6	1.8609E-6	2.830E-13	5.3198E-7	7.2642E-7	0.163	0.287
74	TEQ-ND=1/2DL (smw16d)		1	0	1.1371E-6	1.14E-06	1.1371E-6	1.1371E-6	N/A	N/A	0	N/A	N/A
75	TEQ-ND=1/2DL (smw17)		11	0	1.1777E-6	1.15E-05	5.0773E-6	3.9733E-6	1.159E-11	3.4040E-6	2.7168E-6	0.761	0.67
76	TEQ-ND=1/2DL (smw17d)		9	0	1.0152E-6	2.19E-06	1.2824E-6	1.1955E-6	1.255E-13	3.5433E-7	1.2529E-7	2.567	0.276
77	TEQ-ND=1/2DL (smw18)		10	0	1.3799E-6	2.42E-06	1.8648E-6	1.8490E-6	1.128E-13	3.3589E-7	4.1948E-7	0.239	0.18
78	TEQ-ND=1/2DL (smw18d)		9	0	1.1665E-6	2.73E-06	1.4781E-6	1.3109E-6	2.336E-13	4.8331E-7	1.0511E-7	2.694	0.327
79	TEQ-ND=1/2DL (smw19)		7	0	1.1562E-6	2.59E-06	1.7160E-6	1.6141E-6	2.128E-13	4.6129E-7	2.2284E-7	1.149	0.269
80	TEQ-ND=1/2DL (smw7)		1	0	1.6134E-6	1.61E-06	1.6134E-6	1.6134E-6	N/A	N/A	0	N/A	N/A
81	TEQ-ND=1/2DL (smw8)		3	0	1.0176E-6	2.07E-06	1.5245E-6	1.4853E-6	2.783E-13	5.2751E-7	6.9332E-7	0.332	0.346
82	TEQ-ND=1/2DL (smw9)		8	0	1.0489E-6	2.67E-06	1.5901E-6	1.4229E-6	3.027E-13	5.5017E-7	4.0106E-7	1.208	0.346
83	TEQ-ND=1/2DL (tw2r)		9	0	8.0110E-7	3.04E-06	1.4381E-6	1.1643E-6	4.807E-13	6.9331E-7	2.2608E-7	1.844	0.482
84	TEQ-ND=1/2DL (tw5r)		4	0	1.2521E-6	1.62E-06	1.3797E-6	1.3215E-6	2.768E-14	1.6636E-7	6.2375E-8	1.734	0.121
85	2DL (waste water clarifier well)		1	0	1.4269E-6	1.43E-06	1.4269E-6	1.4269E-6	N/A	N/A	0	N/A	N/A
86													
87	**Percentiles using all Detects (Ds) and Non-Detects (NDs)**												
88													
89	**Variable**		**NumObs**	**# Missing**	**10%ile**	**20%ile**	**25%ile(Q1)**	**50%ile(Q2)**	**75%ile(Q3)**	**80%ile**	**90%ile**	**95%ile**	**99%ile**
90	TEQ-ND=1/2DL (atmw6)		8	0	1.3013E-6	1.4313E-6	1.4613E-6	1.7609E-6	1.9774E-6	2.1691E-6	2.5156E-6	2.6643E-6	2.7833E-6
91	TEQ-ND=1/2DL (nfmw10)		10	0	1.3312E-6	1.4152E-6	1.5034E-6	1.8096E-6	2.3355E-6	2.5202E-6	3.0659E-6	3.0885E-6	3.1066E-6
92	TEQ-ND=1/2DL (nfmw11)		8	0	8.7438E-7	1.0559E-6	1.1231E-6	1.7081E-6	2.0023E-6	2.0495E-6	2.1954E-6	2.3027E-6	2.3886E-6
93	TEQ-ND=1/2DL (nfmw12)		7	0	9.9609E-7	1.0748E-6	1.0766E-6	1.0990E-6	1.2299E-6	1.2717E-6	1.5052E-6	1.6594E-6	1.7828E-6
94	TEQ-ND=1/2DL (nfmw19)		8	0	1.0906E-6	1.1458E-6	1.1749E-6	1.2717E-6	1.4262E-6	1.4951E-6	1.7520E-6	1.9600E-6	2.1264E-6
95	TEQ-ND=1/2DL (nfmw1d)		11	0	1.3590E-6	1.4261E-6	1.4390E-6	1.6730E-6	2.0574E-6	2.1344E-6	2.1919E-6	2.4305E-6	2.6213E-6
96	TEQ-ND=1/2DL (nfmw1s)		7	0	1.4417E-6	1.6384E-6	1.6604E-6	1.7951E-6	3.4936E-6	3.6183E-6	3.8793E-6	4.0127E-6	4.1194E-6
97	TEQ-ND=1/2DL (nfmw2)		11	0	1.0882E-6	1.1594E-6	1.1656E-6	1.2692E-6	1.5755E-6	1.6128E-6	1.8440E-6	2.1249E-6	2.3496E-6
98	TEQ-ND=1/2DL (nfmw20)		8	0	1.1754E-6	1.1907E-6	1.1976E-6	1.5221E-6	1.6744E-6	1.7536E-6	2.1487E-6	2.5040E-6	2.7882E-6
99	TEQ-ND=1/2DL (nfmw22)		4	0	1.7287E-6	1.7389E-6	1.7440E-6	1.8932E-6	2.1090E-6	2.1542E-6	2.2445E-6	2.2896E-6	2.3257E-6
100	TEQ-ND=1/2DL (nfmw23)		4	0	1.8969E-6	1.9154E-6	1.9246E-6	2.0278E-6	2.1228E-6	2.1272E-6	2.1358E-6	2.1401E-6	2.1435E-6
101	TEQ-ND=1/2DL (nfmw3)		9	0	1.1102E-6	1.1353E-6	1.1357E-6	1.2784E-6	1.4414E-6	1.5522E-6	1.7215E-6	1.7276E-6	1.7325E-6
102	TEQ-ND=1/2DL (nfmw4)		9	0	9.6729E-7	9.9319E-7	1.0087E-6	1.1188E-6	1.2537E-6	1.5328E-6	2.0026E-6	2.1049E-6	2.1867E-6
103	TEQ-ND=1/2DL (nfmw7)		8	0	1.1682E-6	1.2062E-6	1.2337E-6	1.4490E-6	1.6566E-6	1.8229E-6	2.0284E-6	2.0463E-6	2.0607E-6
104	TEQ-ND=1/2DL (nfmw8)		8	0	1.0340E-6	1.1368E-6	1.1567E-6	1.2682E-6	1.5877E-6	1.6398E-6	1.9805E-6	2.3084E-6	2.5708E-6
105	TEQ-ND=1/2DL (nfmw9)		10	0	3.5788E-6	3.8102E-6	3.9749E-6	6.0272E-6	1.0346E-5	1.1278E-5	1.2398E-5	1.4683E-5	1.6511E-5
106	TEQ-ND=1/2DL (smw10)		8	0	1.6095E-6	1.6478E-6	1.6487E-6	1.7465E-6	1.8859E-6	1.9748E-6	2.3737E-6	2.7204E-6	2.9978E-6
107	TEQ-ND=1/2DL (smw11)		11	0	1.4949E-6	1.6217E-6	1.7496E-6	2.0252E-6	2.8112E-6	3.1674E-6	3.3385E-6	4.2002E-6	4.8895E-6
108	TEQ-ND=1/2DL (smw12)		8	0	1.7281E-6	1.7906E-6	1.8315E-6	2.4822E-6	3.1751E-6	3.2343E-6	3.5592E-6	3.8593E-6	4.0993E-6
109	TEQ-ND=1/2DL (smw13)		10	0	1.1199E-6	1.1619E-6	1.1835E-6	1.3899E-6	2.2364E-6	2.4476E-6	3.2644E-6	3.5550E-6	3.7875E-6
110	TEQ-ND=1/2DL (smw14)		8	0	1.2084E-6	1.3292E-6	1.3400E-6	1.5364E-6	1.9125E-6	2.2610E-6	2.7391E-6	2.8322E-6	2.9067E-6
111	TEQ-ND=1/2DL (smw15)		9	0	1.0671E-6	1.1431E-6	1.1911E-6	1.2735E-6	1.5796E-6	1.6630E-6	1.8216E-6	1.8887E-6	1.9424E-6
112	TEQ-ND=1/2DL (smw16)		12	0	1.2511E-6	1.3064E-6	1.3785E-6	1.8609E-6	2.3370E-6	2.3674E-6	2.5599E-6	2.5929E-6	2.6054E-6
113	TEQ-ND=1/2DL (smw16d)		9	0	1.0221E-6	1.1013E-6	1.1371E-6	1.1808E-6	1.5624E-6	1.6030E-6	1.7041E-6	1.7842E-6	1.8483E-6
114	TEQ-ND=1/2DL (smw17)		11	0	2.1409E-6	2.4134E-6	2.5414E-6	3.9733E-6	7.9573E-6	8.6548E-6	8.7700E-6	1.0148E-5	1.1251E-5
115	TEQ-ND=1/2DL (smw17d)		9	0	1.0431E-6	1.0867E-6	1.1110E-6	1.1955E-6	1.2514E-6	1.2832E-6	1.5029E-6	1.8467E-6	2.1218E-6
116	TEQ-ND=1/2DL (smw18)		10	0	1.5385E-6	1.5720E-6	1.5901E-6	1.8490E-6	2.1381E-6	2.1901E-6	2.2275E-6	2.3234E-6	2.4001E-6
117	TEQ-ND=1/2DL (smw18d)		9	0	1.2253E-6	1.2426E-6	1.2443E-6	1.3109E-6	1.4896E-6	1.4985E-6	1.7555E-6	2.2431E-6	2.6331E-6
118	TEQ-ND=1/2DL (smw19)		8	0	1.1900E-6	1.3082E-6	1.3990E-6	1.5644E-6	1.7505E-6	1.8743E-6	2.1867E-6	2.3861E-6	2.5456E-6
119	TEQ-ND=1/2DL (smw7)		4	0	1.1314E-6	1.3380E-6	1.4413E-6	2.0877E-6	2.6433E-6	2.6921E-6	2.7898E-6	2.8386E-6	2.8777E-6
120	TEQ-ND=1/2DL (smw8)		5	0	1.0811E-6	1.1445E-6	1.1763E-6	1.3498E-6	1.4853E-6	1.6023E-6	1.8364E-6	1.9534E-6	2.0471E-6
121	TEQ-ND=1/2DL (smw9)		9	0	1.1047E-6	1.1405E-6	1.1550E-6	1.2760E-6	1.6961E-6	1.8462E-6	2.1913E-6	2.4309E-6	2.6226E-6
122	TEQ-ND=1/2DL (tw2r)		9	0	9.6966E-7	1.0206E-6	1.0265E-6	1.1643E-6	1.5390E-6	1.7120E-6	2.1859E-6	2.6150E-6	2.9583E-6
123	TEQ-ND=1/2DL (tw5r)		5	0	1.1533E-6	1.2191E-6	1.2521E-6	1.3069E-6	1.3362E-6	1.3937E-6	1.5087E-6	1.5662E-6	1.6122E-6
124	2DL (waste water clarifier well)		1	0	1.4269E-6	1.4269E-6	1.4269E-6	1.4269E-6	1.4269E-6	1.4269E-6	1.4269E-6	1.4269E-6	1.4269E-6

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/7/2021 12:32:59 PM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

TEQ-ND=1/2DL (atmw6)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1.0777E-6	Mean	1.8151E-6
Maximum	2.8130E-6	Median	1.7609E-6
SD	5.5618E-7	Std. Error of Mean	1.9664E-7
Coefficient of Variation	N/A	Skewness	0.742

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.232	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.1877E-6	95% Adjusted-CLT UCL (Chen-1995)	2.1937E-6
		95% Modified-t UCL (Johnson-1978)	2.1963E-6

Gamma GOF Test

A-D Test Statistic	0.216	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.64	k star (bias corrected MLE)	7.985
Theta hat (MLE)	1.4358E-7	Theta star (bias corrected MLE)	2.2732E-7
nu hat (MLE)	202.3	nu star (bias corrected)	127.8
MLE Mean (bias corrected)	1.8151E-6	MLE Sd (bias corrected)	6.4236E-7
		Approximate Chi Square Value (0.05)	102.6
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	96.96

53	**Assuming Gamma Distribution**											
54	95% Approximate Gamma UCL (use when n>=50))				2.2591E-6	95% Adjusted Gamma UCL (use when n<50)					2.3916E-6	
55												
56	**Lognormal GOF Test**											
57	Shapiro Wilk Test Statistic				0.979	**Shapiro Wilk Lognormal GOF Test**						
58	5% Shapiro Wilk Critical Value				0.818	Data appear Lognormal at 5% Significance Level						
59	Lilliefors Test Statistic				0.179	**Lilliefors Lognormal GOF Test**						
60	5% Lilliefors Critical Value				0.283	Data appear Lognormal at 5% Significance Level						
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64	Minimum of Logged Data				-13.74	Mean of logged Data					-13.26	
65	Maximum of Logged Data				-12.78	SD of logged Data					0.302	
66												
67	**Assuming Lognormal Distribution**											
68	95% H-UCL				2.3099E-6	90% Chebyshev (MVUE) UCL					2.3988E-6	
69	95% Chebyshev (MVUE) UCL				2.6633E-6	97.5% Chebyshev (MVUE) UCL					3.0306E-6	
70	99% Chebyshev (MVUE) UCL				3.7520E-6							
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
74												
75	**Nonparametric Distribution Free UCLs**											
76	95% CLT UCL				2.1386E-6	95% Jackknife UCL					2.1877E-6	
77	95% Standard Bootstrap UCL				2.1208E-6	95% Bootstrap-t UCL					2.3382E-6	
78	95% Hall's Bootstrap UCL				2.7946E-6	95% Percentile Bootstrap UCL					2.1382E-6	
79	95% BCA Bootstrap UCL				2.1462E-6							
80	90% Chebyshev(Mean, Sd) UCL				2.4050E-6	95% Chebyshev(Mean, Sd) UCL					2.6722E-6	
81	97.5% Chebyshev(Mean, Sd) UCL				3.0431E-6	99% Chebyshev(Mean, Sd) UCL					3.7717E-6	
82												
83	**Suggested UCL to Use**											
84	95% Student's-t UCL				2.19E-06							
85												
86	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
87	Recommendations are based upon data size, data distribution, and skewness.											
88	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
89	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
90												
91												
92	**TEQ-ND=1/2DL (nfmw10)**											
93												
94	**General Statistics**											
95	Total Number of Observations				10	Number of Distinct Observations					10	
96						Number of Missing Observations					0	
97	Minimum				1.3253E-6	Mean					2.0162E-6	
98	Maximum				3.1111E-6	Median					1.8096E-6	
99	SD				6.6018E-7	Std. Error of Mean					2.0877E-7	
100	Coefficient of Variation				N/A	Skewness					0.779	
101												
102	**Normal GOF Test**											
103	Shapiro Wilk Test Statistic				0.881	**Shapiro Wilk GOF Test**						
104	5% Shapiro Wilk Critical Value				0.842	Data appear Normal at 5% Significance Level						

105				Lilliefors Test Statistic		0.202	**Lilliefors GOF Test**					
106				5% Lilliefors Critical Value		0.262	Data appear Normal at 5% Significance Level					
107	**Data appear Normal at 5% Significance Level**											
108												
109	**Assuming Normal Distribution**											
110	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
111				95% Student's-t UCL		2.3989E-6	95% Adjusted-CLT UCL (Chen-1995)					2.4145E-6
112							95% Modified-t UCL (Johnson-1978)					2.4075E-6
113												
114	**Gamma GOF Test**											
115				A-D Test Statistic		0.388	**Anderson-Darling Gamma GOF Test**					
116				5% A-D Critical Value		0.725	Detected data appear Gamma Distributed at 5% Significance Level					
117				K-S Test Statistic		0.175	**Kolmogorov-Smirnov Gamma GOF Test**					
118				5% K-S Critical Value		0.267	Detected data appear Gamma Distributed at 5% Significance Level					
119	**Detected data appear Gamma Distributed at 5% Significance Level**											
120												
121	**Gamma Statistics**											
122				k hat (MLE)		11.11	k star (bias corrected MLE)					7.841
123				Theta hat (MLE)		1.8154E-7	Theta star (bias corrected MLE)					2.5714E-7
124				nu hat (MLE)		222.1	nu star (bias corrected)					156.8
125				MLE Mean (bias corrected)		2.0162E-6	MLE Sd (bias corrected)					7.2003E-7
126							Approximate Chi Square Value (0.05)					128.9
127				Adjusted Level of Significance		0.0267	Adjusted Chi Square Value					124.5
128												
129	**Assuming Gamma Distribution**											
130				95% Approximate Gamma UCL (use when n>=50))		2.4535E-6	95% Adjusted Gamma UCL (use when n<50)					2.5402E-6
131												
132	**Lognormal GOF Test**											
133				Shapiro Wilk Test Statistic		0.917	**Shapiro Wilk Lognormal GOF Test**					
134				5% Shapiro Wilk Critical Value		0.842	Data appear Lognormal at 5% Significance Level					
135				Lilliefors Test Statistic		0.154	**Lilliefors Lognormal GOF Test**					
136				5% Lilliefors Critical Value		0.262	Data appear Lognormal at 5% Significance Level					
137	**Data appear Lognormal at 5% Significance Level**											
138												
139	**Lognormal Statistics**											
140				Minimum of Logged Data		-13.53	Mean of logged Data					-13.16
141				Maximum of Logged Data		-12.68	SD of logged Data					0.315
142												
143	**Assuming Lognormal Distribution**											
144				95% H-UCL		2.4947E-6	90% Chebyshev (MVUE) UCL					2.6196E-6
145				95% Chebyshev (MVUE) UCL		2.8941E-6	97.5% Chebyshev (MVUE) UCL					3.2751E-6
146				99% Chebyshev (MVUE) UCL		4.0235E-6						
147												
148	**Nonparametric Distribution Free UCL Statistics**											
149	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
150												
151	**Nonparametric Distribution Free UCLs**											
152				95% CLT UCL		2.3596E-6	95% Jackknife UCL					2.3989E-6
153				95% Standard Bootstrap UCL		2.3345E-6	95% Bootstrap-t UCL					2.5337E-6
154				95% Hall's Bootstrap UCL		2.5480E-6	95% Percentile Bootstrap UCL					2.3510E-6
155				95% BCA Bootstrap UCL		2.4040E-6						
156				90% Chebyshev(Mean, Sd) UCL		2.6425E-6	95% Chebyshev(Mean, Sd) UCL					2.9262E-6

157			97.5% Chebyshev(Mean, Sd) UCL			3.3200E-6			99% Chebyshev(Mean, Sd) UCL			4.0934E-6
158												
159	**Suggested UCL to Use**											
160			95% Student's-t UCL			2.40E-06						
161												
162	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
163	Recommendations are based upon data size, data distribution, and skewness.											
164	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
165	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
166												
167	**TEQ-ND=1/2DL (nfmw11)**											
168												
169	**General Statistics**											
170			Total Number of Observations			8			Number of Distinct Observations			8
171			Number of Detects			7			Number of Non-Detects			1
172			Number of Distinct Detects			7			Number of Distinct Non-Detects			1
173			Minimum Detect			6.3015E-7			Minimum Non-Detect			1.1711E-6
174			Maximum Detect			2.4100E-6			Maximum Non-Detect			1.1711E-6
175			Variance Detects			4.123E-13			Percent Non-Detects			12.5%
176			Mean Detects			1.6439E-6			SD Detects			6.4212E-7
177			Median Detects			1.9229E-6			CV Detects			N/A
178			Skewness Detects			-0.649			Kurtosis Detects			-0.848
179			Mean of Logged Detects			-13.41			SD of Logged Detects			0.485
180												
181	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
182	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
183	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
184	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
185												
186	**Normal GOF Test on Detects Only**											
187			Shapiro Wilk Test Statistic			0.93			**Shapiro Wilk GOF Test**			
188			5% Shapiro Wilk Critical Value			0.803			Detected Data appear Normal at 5% Significance Level			
189			Lilliefors Test Statistic			0.239			**Lilliefors GOF Test**			
190			5% Lilliefors Critical Value			0.304			Detected Data appear Normal at 5% Significance Level			
191	**Detected Data appear Normal at 5% Significance Level**											
192												
193	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
194			KM Mean			1.5390E-6			KM Standard Error of Mean			2.4025E-7
195			KM SD			6.2457E-7			95% KM (BCA) UCL			1.9133E-6
196			95% KM (t) UCL			1.9942E-6			95% KM (Percentile Bootstrap) UCL			1.9215E-6
197			95% KM (z) UCL			1.9342E-6			95% KM Bootstrap t UCL			1.9734E-6
198			90% KM Chebyshev UCL			2.2597E-6			95% KM Chebyshev UCL			2.5862E-6
199			97.5% KM Chebyshev UCL			3.0394E-6			99% KM Chebyshev UCL			3.9295E-6
200												
201	**Gamma GOF Tests on Detected Observations Only**											
202			A-D Test Statistic			0.454			**Anderson-Darling GOF Test**			
203			5% A-D Critical Value			0.71			Detected data appear Gamma Distributed at 5% Significance Level			
204			K-S Test Statistic			0.273			**Kolmogorov-Smirnov GOF**			
205			5% K-S Critical Value			0.313			Detected data appear Gamma Distributed at 5% Significance Level			
206	**Detected data appear Gamma Distributed at 5% Significance Level**											
207												
208	**Gamma Statistics on Detected Data Only**											

209					k hat (MLE)	5.926				k star (bias corrected MLE)		3.481
210					Theta hat (MLE)	2.7743E-7				Theta star (bias corrected MLE)		4.7222E-7
211					nu hat (MLE)	82.96				nu star (bias corrected)		48.74
212					Mean (detects)	1.6439E-6						
213												
214	**Gamma ROS Statistics using Imputed Non-Detects**											
215	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
216	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
217	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
218	This is especially true when the sample size is small.											
219	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
220					Minimum	6.3015E-7				Mean		0.00125
221					Maximum	0.01				Median		1.9458E-6
222					SD	0.00353				CV		2.825
223					k hat (MLE)	0.138				k star (bias corrected MLE)		0.17
224					Theta hat (MLE)	0.00905				Theta star (bias corrected MLE)		0.00737
225					nu hat (MLE)	2.213				nu star (bias corrected)		2.717
226					Adjusted Level of Significance (β)	0.0195						
227					Approximate Chi Square Value (2.72, α)	0.294				Adjusted Chi Square Value (2.72, β)		0.169
228					95% Gamma Approximate UCL (use when n>=50)	0.0116				95% Gamma Adjusted UCL (use when n<50)		0.0201
229												
230	**Estimates of Gamma Parameters using KM Estimates**											
231					Mean (KM)	1.5390E-6				SD (KM)		6.2457E-7
232					Variance (KM)	3.901E-13				SE of Mean (KM)		2.4025E-7
233					k hat (KM)	6.072				k star (KM)		3.878
234					nu hat (KM)	97.15				nu star (KM)		62.05
235					theta hat (KM)	2.5347E-7				theta star (KM)		3.9684E-7
236					80% gamma percentile (KM)	2.1295E-6				90% gamma percentile (KM)		2.5866E-6
237					95% gamma percentile (KM)	3.0079E-6				99% gamma percentile (KM)		3.9090E-6
238												
239	**Gamma Kaplan-Meier (KM) Statistics**											
240					Approximate Chi Square Value (62.05, α)	44.93				Adjusted Chi Square Value (62.05, β)		41.27
241					95% Gamma Approximate KM-UCL (use when n>=50)	2.1253E-6				95% Gamma Adjusted KM-UCL (use when n<50)		2.3138E-6
242												
243	**Lognormal GOF Test on Detected Observations Only**											
244					Shapiro Wilk Test Statistic	0.869				**Shapiro Wilk GOF Test**		
245					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
246					Lilliefors Test Statistic	0.264				**Lilliefors GOF Test**		
247					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
248	**Detected Data appear Lognormal at 5% Significance Level**											
249												
250	**Lognormal ROS Statistics Using Imputed Non-Detects**											
251					Mean in Original Scale	1.5454E-6				Mean in Log Scale		-13.48
252					SD in Original Scale	6.5650E-7				SD in Log Scale		0.491
253					95% t UCL (assumes normality of ROS data)	1.9852E-6				95% Percentile Bootstrap UCL		1.8960E-6
254					95% BCA Bootstrap UCL	1.8878E-6				95% Bootstrap t UCL		1.9545E-6
255					95% H-UCL (Log ROS)	2.4461E-6						
256												
257	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
258					KM Mean (logged)	-13.49				KM Geo Mean		1.3894E-6
259					KM SD (logged)	0.478				95% Critical H Value (KM-Log)		2.317
260					KM Standard Error of Mean (logged)	0.186				95% H-UCL (KM -Log)		2.3679E-6

261				KM SD (logged)		0.478			95% Critical H Value (KM-Log)			2.317
262				KM Standard Error of Mean (logged)		0.186						
263												
264						DL/2 Statistics						
265				DL/2 Normal					DL/2 Log-Transformed			
266				Mean in Original Scale		1.5116E-6			Mean in Log Scale			-13.52
267				SD in Original Scale		7.0245E-7			SD in Log Scale			0.559
268				95% t UCL (Assumes normality)		1.9821E-6			95% H-Stat UCL			2.6341E-6
269				DL/2 is not a recommended method, provided for comparisons and historical reasons								
270												
271				Nonparametric Distribution Free UCL Statistics								
272				Detected Data appear Normal Distributed at 5% Significance Level								
273												
274				Suggested UCL to Use								
275				95% KM (t) UCL		1.99E-06						
276												
277				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
278				Recommendations are based upon data size, data distribution, and skewness.								
279				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
280				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
281												
282	TEQ-ND=1/2DL (nfmw12)											
283												
284				General Statistics								
285				Total Number of Observations		7			Number of Distinct Observations			7
286				Number of Detects		2			Number of Non-Detects			5
287				Number of Distinct Detects		2			Number of Distinct Non-Detects			5
288				Minimum Detect		8.7971E-7			Minimum Non-Detect			1.0794E-6
289				Maximum Detect		1.0737E-6			Maximum Non-Detect			1.8137E-6
290				Variance Detects		1.881E-14			Percent Non-Detects			71.43%
291				Mean Detects		9.7669E-7			SD Detects			1.3715E-7
292				Median Detects		9.7669E-7			CV Detects			N/A
293				Skewness Detects		N/A			Kurtosis Detects			N/A
294				Mean of Logged Detects		-13.84			SD of Logged Detects			0.141
295												
296				Warning: Data set has only 2 Detected Values.								
297				This is not enough to compute meaningful or reliable statistics and estimates.								
298												
299												
300				Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use								
301				guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.								
302				For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).								
303				Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1								
304												
305				Normal GOF Test on Detects Only								
306				Not Enough Data to Perform GOF Test								
307												
308				Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs								
309				KM Mean		9.7669E-7			KM Standard Error of Mean			9.6980E-8
310				KM SD		9.6980E-8			95% KM (BCA) UCL			N/A
311				95% KM (t) UCL		1.1651E-6			95% KM (Percentile Bootstrap) UCL			N/A
312				95% KM (z) UCL		1.1362E-6			95% KM Bootstrap t UCL			N/A

	A	B	C	D	E	F	G	H	I	J	K	L
313					90% KM Chebyshev UCL	1.2676E-6				95% KM Chebyshev UCL		1.3994E-6
314					97.5% KM Chebyshev UCL	1.5823E-6				99% KM Chebyshev UCL		1.9416E-6
315												
316					**Gamma GOF Tests on Detected Observations Only**							
317					**Not Enough Data to Perform GOF Test**							
318												
319					**Gamma Statistics on Detected Data Only**							
320					k hat (MLE)	101.1				k star (bias corrected MLE)		N/A
321					Theta hat (MLE)	9.6613E-9				Theta star (bias corrected MLE)		N/A
322					nu hat (MLE)	404.4				nu star (bias corrected)		N/A
323					Mean (detects)	9.7669E-7						
324												
325					**Estimates of Gamma Parameters using KM Estimates**							
326					Mean (KM)	9.7669E-7				SD (KM)		9.6980E-8
327					Variance (KM)	9.405E-15				SE of Mean (KM)		9.6980E-8
328					k hat (KM)	101.4				k star (KM)		58.05
329					nu hat (KM)	1420				nu star (KM)		812.8
330					theta hat (KM)	9.6295E-9				theta star (KM)		1.6824E-8
331					80% gamma percentile (KM)	1.0826E-6				90% gamma percentile (KM)		1.1442E-6
332					95% gamma percentile (KM)	1.1967E-6				99% gamma percentile (KM)		1.2994E-6
333												
334					**Gamma Kaplan-Meier (KM) Statistics**							
335										Adjusted Level of Significance (β)		0.0158
336					Approximate Chi Square Value (812.75, α)	747.6				Adjusted Chi Square Value (812.75, β)		728.6
337					95% Gamma Approximate KM-UCL (use when n>=50)	1.0618E-6				95% Gamma Adjusted KM-UCL (use when n<50)		1.0896E-6
338												
339					**Lognormal GOF Test on Detected Observations Only**							
340					**Not Enough Data to Perform GOF Test**							
341												
342					**Lognormal ROS Statistics Using Imputed Non-Detects**							
343					Mean in Original Scale	9.7325E-7				Mean in Log Scale		-13.84
344					SD in Original Scale	5.6041E-8				SD in Log Scale		0.0575
345					95% t UCL (assumes normality of ROS data)	1.0144E-6				95% Percentile Bootstrap UCL		N/A
346					95% BCA Bootstrap UCL	N/A				95% Bootstrap t UCL		N/A
347					95% H-UCL (Log ROS)	N/A						
348												
349					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
350					KM Mean (logged)	-13.84				KM Geo Mean		9.7187E-7
351					KM SD (logged)	0.0996				95% Critical H Value (KM-Log)		N/A
352					KM Standard Error of Mean (logged)	0.0996				95% H-UCL (KM -Log)		N/A
353					KM SD (logged)	0.0996				95% Critical H Value (KM-Log)		N/A
354					KM Standard Error of Mean (logged)	0.0996						
355												
356					**DL/2 Statistics**							
357					**DL/2 Normal**					**DL/2 Log-Transformed**		
358					Mean in Original Scale	7.3991E-7				Mean in Log Scale		-14.15
359					SD in Original Scale	2.1165E-7				SD in Log Scale		0.279
360					95% t UCL (Assumes normality)	8.9536E-7				95% H-Stat UCL		9.5046E-7
361					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
362												
363					**Nonparametric Distribution Free UCL Statistics**							
364					**Data do not follow a Discernible Distribution at 5% Significance Level**							

	A	B	C	D	E	F	G	H	I	J	K	L
365												
366	**Suggested UCL to Use**											
367					95% KM (t) UCL	1.17E-06				KM H-UCL	N/A	
368					95% KM (BCA) UCL	N/A						
369	**Warning: One or more Recommended UCL(s) not available!**											
370	**Warning: Recommended UCL exceeds the maximum observation**											
371												
372	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
373	Recommendations are based upon data size, data distribution, and skewness.											
374	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
375	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
376												
377	**TEQ-ND=1/2DL (nfmw19)**											
378												
379	**General Statistics**											
380					Total Number of Observations	8				Number of Distinct Observations	8	
381					Number of Detects	1				Number of Non-Detects	7	
382					Number of Distinct Detects	1				Number of Distinct Non-Detects	7	
383												
384	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
385	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
386												
387	**The data set for variable TEQ-ND=1/2DL (nfmw19) was not processed!**											
388												
389												
390												
391	**TEQ-ND=1/2DL (nfmw1d)**											
392												
393	**General Statistics**											
394					Total Number of Observations	11				Number of Distinct Observations	11	
395										Number of Missing Observations	0	
396					Minimum	1.0163E-6				Mean	1.7376E-6	
397					Maximum	2.6690E-6				Median	1.6730E-6	
398					SD	4.6797E-7				Std. Error of Mean	1.4110E-7	
399					Coefficient of Variation	N/A				Skewness	0.577	
400												
401	**Normal GOF Test**											
402					Shapiro Wilk Test Statistic	0.961				**Shapiro Wilk GOF Test**		
403					5% Shapiro Wilk Critical Value	0.85				Data appear Normal at 5% Significance Level		
404					Lilliefors Test Statistic	0.167				**Lilliefors GOF Test**		
405					5% Lilliefors Critical Value	0.251				Data appear Normal at 5% Significance Level		
406	**Data appear Normal at 5% Significance Level**											
407												
408	**Assuming Normal Distribution**											
409	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
410					95% Student's-t UCL	1.9933E-6				95% Adjusted-CLT UCL (Chen-1995)	1.9959E-6	
411										95% Modified-t UCL (Johnson-1978)	1.9974E-6	
412												
413	**Gamma GOF Test**											
414					A-D Test Statistic	0.218				**Anderson-Darling Gamma GOF Test**		
415					5% A-D Critical Value	0.729				Detected data appear Gamma Distributed at 5% Significance Level		
416					K-S Test Statistic	0.135				**Kolmogorov-Smirnov Gamma GOF Test**		

	A	B	C	D	E	F	G	H	I	J	K	L
417					5% K-S Critical Value	0.255	Detected data appear Gamma Distributed at 5% Significance Level					
418	**Detected data appear Gamma Distributed at 5% Significance Level**											
419												
420	**Gamma Statistics**											
421					k hat (MLE)	15.42				k star (bias corrected MLE)		11.27
422					Theta hat (MLE)	1.1270E-7				Theta star (bias corrected MLE)		1.5413E-7
423					nu hat (MLE)	339.2				nu star (bias corrected)		248
424					MLE Mean (bias corrected)	1.7376E-6				MLE Sd (bias corrected)		5.1751E-7
425										Approximate Chi Square Value (0.05)		212.6
426					Adjusted Level of Significance	0.0278				Adjusted Chi Square Value		207.2
427												
428	**Assuming Gamma Distribution**											
429				95% Approximate Gamma UCL (use when n>=50))		2.0275E-6				95% Adjusted Gamma UCL (use when n<50)		2.0799E-6
430												
431	**Lognormal GOF Test**											
432					Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**					
433					5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level					
434					Lilliefors Test Statistic	0.124	**Lilliefors Lognormal GOF Test**					
435					5% Lilliefors Critical Value	0.251	Data appear Lognormal at 5% Significance Level					
436	**Data appear Lognormal at 5% Significance Level**											
437												
438	**Lognormal Statistics**											
439					Minimum of Logged Data	-13.8				Mean of logged Data		-13.3
440					Maximum of Logged Data	-12.83				SD of logged Data		0.27
441												
442	**Assuming Lognormal Distribution**											
443					95% H-UCL	2.0539E-6				90% Chebyshev (MVUE) UCL		2.1644E-6
444					95% Chebyshev (MVUE) UCL	2.3577E-6				97.5% Chebyshev (MVUE) UCL		2.6259E-6
445					99% Chebyshev (MVUE) UCL	3.1527E-6						
446												
447	**Nonparametric Distribution Free UCL Statistics**											
448	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
449												
450	**Nonparametric Distribution Free UCLs**											
451					95% CLT UCL	1.9697E-6				95% Jackknife UCL		1.9933E-6
452					95% Standard Bootstrap UCL	1.9577E-6				95% Bootstrap-t UCL		2.0401E-6
453					95% Hall's Bootstrap UCL	2.0547E-6				95% Percentile Bootstrap UCL		1.9621E-6
454					95% BCA Bootstrap UCL	1.9872E-6						
455					90% Chebyshev(Mean, Sd) UCL	2.1609E-6				95% Chebyshev(Mean, Sd) UCL		2.3526E-6
456					97.5% Chebyshev(Mean, Sd) UCL	2.6187E-6				99% Chebyshev(Mean, Sd) UCL		3.1415E-6
457												
458	**Suggested UCL to Use**											
459					95% Student's-t UCL	1.99E-06						
460												
461	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
462	Recommendations are based upon data size, data distribution, and skewness.											
463	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
464	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
465												
466												
467	**TEQ-ND=1/2DL (nfmw1s)**											
468												

469	**General Statistics**											
470					Total Number of Observations	7			Number of Distinct Observations	7		
471									Number of Missing Observations	0		
472					Minimum	1.1685E-6			Mean	2.4883E-6		
473					Maximum	4.1461E-6			Median	1.7951E-6		
474					SD	1.1869E-6			Std. Error of Mean	4.4860E-7		
475					Coefficient of Variation	N/A			Skewness	0.429		
476												
477	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
478	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
479	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
480	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
481												
482	**Normal GOF Test**											
483					Shapiro Wilk Test Statistic	0.868			**Shapiro Wilk GOF Test**			
484					5% Shapiro Wilk Critical Value	0.803			Data appear Normal at 5% Significance Level			
485					Lilliefors Test Statistic	0.292			**Lilliefors GOF Test**			
486					5% Lilliefors Critical Value	0.304			Data appear Normal at 5% Significance Level			
487	**Data appear Normal at 5% Significance Level**											
488												
489	**Assuming Normal Distribution**											
490	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
491					95% Student's-t UCL	3.3600E-6			95% Adjusted-CLT UCL (Chen-1995)	3.3039E-6		
492									95% Modified-t UCL (Johnson-1978)	3.3721E-6		
493												
494	**Gamma GOF Test**											
495					A-D Test Statistic	0.509			**Anderson-Darling Gamma GOF Test**			
496					5% A-D Critical Value	0.71			Detected data appear Gamma Distributed at 5% Significance Level			
497					K-S Test Statistic	0.28			**Kolmogorov-Smirnov Gamma GOF Test**			
498					5% K-S Critical Value	0.313			Detected data appear Gamma Distributed at 5% Significance Level			
499	**Detected data appear Gamma Distributed at 5% Significance Level**											
500												
501	**Gamma Statistics**											
502					k hat (MLE)	5.117			k star (bias corrected MLE)	3.019		
503					Theta hat (MLE)	4.8625E-7			Theta star (bias corrected MLE)	8.2409E-7		
504					nu hat (MLE)	71.64			nu star (bias corrected)	42.27		
505					MLE Mean (bias corrected)	2.4883E-6			MLE Sd (bias corrected)	1.4320E-6		
506									Approximate Chi Square Value (0.05)	28.37		
507					Adjusted Level of Significance	0.0158			Adjusted Chi Square Value	24.98		
508												
509	**Assuming Gamma Distribution**											
510					95% Approximate Gamma UCL (use when n>=50))	3.7079E-6			95% Adjusted Gamma UCL (use when n<50)	4.2108E-6		
511												
512	**Lognormal GOF Test**											
513					Shapiro Wilk Test Statistic	0.895			**Shapiro Wilk Lognormal GOF Test**			
514					5% Shapiro Wilk Critical Value	0.803			Data appear Lognormal at 5% Significance Level			
515					Lilliefors Test Statistic	0.249			**Lilliefors Lognormal GOF Test**			
516					5% Lilliefors Critical Value	0.304			Data appear Lognormal at 5% Significance Level			
517	**Data appear Lognormal at 5% Significance Level**											
518												
519	**Lognormal Statistics**											
520					Minimum of Logged Data	-13.66			Mean of logged Data	-13		

521				Maximum of Logged Data	-12.39					SD of logged Data	0.488	
522												
523	**Assuming Lognormal Distribution**											
524				95% H-UCL	4.1206E-6					90% Chebyshev (MVUE) UCL	3.8730E-6	
525				95% Chebyshev (MVUE) UCL	4.5001E-6					97.5% Chebyshev (MVUE) UCL	5.3706E-6	
526				99% Chebyshev (MVUE) UCL	7.0804E-6							
527												
528	**Nonparametric Distribution Free UCL Statistics**											
529	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
530												
531	**Nonparametric Distribution Free UCLs**											
532				95% CLT UCL	3.2261E-6					95% Jackknife UCL	3.3600E-6	
533				95% Standard Bootstrap UCL	3.1609E-6					95% Bootstrap-t UCL	3.6064E-6	
534				95% Hall's Bootstrap UCL	3.0414E-6					95% Percentile Bootstrap UCL	3.1844E-6	
535				95% BCA Bootstrap UCL	3.2250E-6							
536				90% Chebyshev(Mean, Sd) UCL	3.8340E-6					95% Chebyshev(Mean, Sd) UCL	4.4436E-6	
537				97.5% Chebyshev(Mean, Sd) UCL	5.2897E-6					99% Chebyshev(Mean, Sd) UCL	6.9517E-6	
538												
539	**Suggested UCL to Use**											
540				95% Student's-t UCL	3.36E-06							
541												
542	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
543	Recommendations are based upon data size, data distribution, and skewness.											
544	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
545	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
546												
547	**TEQ-ND=1/2DL (nfmw2)**											
548												
549	**General Statistics**											
550				Total Number of Observations	11					Number of Distinct Observations	11	
551				Number of Detects	7					Number of Non-Detects	4	
552				Number of Distinct Detects	7					Number of Distinct Non-Detects	4	
553				Minimum Detect	1.1594E-6					Minimum Non-Detect	1.0590E-6	
554				Maximum Detect	2.4058E-6					Maximum Non-Detect	1.5383E-6	
555				Variance Detects	2.201E-13					Percent Non-Detects	36.36%	
556				Mean Detects	1.5220E-6					SD Detects	4.6919E-7	
557				Median Detects	1.2692E-6					CV Detects	N/A	
558				Skewness Detects	1.314					Kurtosis Detects	1.048	
559				Mean of Logged Detects	-13.43					SD of Logged Detects	0.282	
560												
561	**Normal GOF Test on Detects Only**											
562				Shapiro Wilk Test Statistic	0.818					**Shapiro Wilk GOF Test**		
563				5% Shapiro Wilk Critical Value	0.803					Detected Data appear Normal at 5% Significance Level		
564				Lilliefors Test Statistic	0.276					**Lilliefors GOF Test**		
565				5% Lilliefors Critical Value	0.304					Detected Data appear Normal at 5% Significance Level		
566	**Detected Data appear Normal at 5% Significance Level**											
567												
568	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
569				KM Mean	1.3704E-6					KM Standard Error of Mean	1.3163E-7	
570				KM SD	4.0252E-7					95% KM (BCA) UCL	1.5927E-6	
571				95% KM (t) UCL	1.6090E-6					95% KM (Percentile Bootstrap) UCL	1.5771E-6	
572				95% KM (z) UCL	1.5870E-6					95% KM Bootstrap t UCL	1.8256E-6	

	A	B	C	D	E	F	G	H	I	J	K	L
573					90% KM Chebyshev UCL	1.7653E-6				95% KM Chebyshev UCL		1.9442E-6
574					97.5% KM Chebyshev UCL	2.1925E-6				99% KM Chebyshev UCL		2.6801E-6
575												
576					**Gamma GOF Tests on Detected Observations Only**							
577					A-D Test Statistic	0.584	**Anderson-Darling GOF Test**					
578					5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level					
579					K-S Test Statistic	0.287	**Kolmogorov-Smirnov GOF**					
580					5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level					
581					**Detected data appear Gamma Distributed at 5% Significance Level**							
582												
583					**Gamma Statistics on Detected Data Only**							
584					k hat (MLE)	14.01				k star (bias corrected MLE)		8.1
585					Theta hat (MLE)	1.0864E-7				Theta star (bias corrected MLE)		1.8789E-7
586					nu hat (MLE)	196.1				nu star (bias corrected)		113.4
587					Mean (detects)	1.5220E-6						
588												
589					**Gamma ROS Statistics using Imputed Non-Detects**							
590					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
591					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
592					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
593					This is especially true when the sample size is small.							
594					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
595					Minimum	1.1594E-6				Mean		0.00364
596					Maximum	0.01				Median		1.8440E-6
597					SD	0.00504				CV		1.387
598					k hat (MLE)	0.165				k star (bias corrected MLE)		0.18
599					Theta hat (MLE)	0.0221				Theta star (bias corrected MLE)		0.0202
600					nu hat (MLE)	3.622				nu star (bias corrected)		3.967
601					Adjusted Level of Significance (β)	0.0278						
602					Approximate Chi Square Value (3.97, α)	0.709				Adjusted Chi Square Value (3.97, β)		0.519
603					95% Gamma Approximate UCL (use when n>=50)	0.0204				95% Gamma Adjusted UCL (use when n<50)		0.0278
604												
605					**Estimates of Gamma Parameters using KM Estimates**							
606					Mean (KM)	1.3704E-6				SD (KM)		4.0252E-7
607					Variance (KM)	1.620E-13				SE of Mean (KM)		1.3163E-7
608					k hat (KM)	11.59				k star (KM)		8.491
609					nu hat (KM)	255				nu star (KM)		186.8
610					theta hat (KM)	1.1823E-7				theta star (KM)		1.6140E-7
611					80% gamma percentile (KM)	1.7426E-6				90% gamma percentile (KM)		1.9971E-6
612					95% gamma percentile (KM)	2.2244E-6				99% gamma percentile (KM)		2.6941E-6
613												
614					**Gamma Kaplan-Meier (KM) Statistics**							
615					Approximate Chi Square Value (186.80, α)	156.2				Adjusted Chi Square Value (186.80, β)		151.6
616					95% Gamma Approximate KM-UCL (use when n>=50)	1.6391E-6				95% Gamma Adjusted KM-UCL (use when n<50)		1.6884E-6
617												
618					**Lognormal GOF Test on Detected Observations Only**							
619					Shapiro Wilk Test Statistic	0.846	**Shapiro Wilk GOF Test**					
620					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
621					Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**					
622					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
623					**Detected Data appear Lognormal at 5% Significance Level**							
624												

625	**Lognormal ROS Statistics Using Imputed Non-Detects**											
626					Mean in Original Scale	1.3042E-6				Mean in Log Scale	-13.6	
627					SD in Original Scale	4.8157E-7				SD in Log Scale	0.34	
628					95% t UCL (assumes normality of ROS data)	1.5674E-6				95% Percentile Bootstrap UCL	1.5414E-6	
629					95% BCA Bootstrap UCL	1.6008E-6				95% Bootstrap t UCL	1.6872E-6	
630					95% H-UCL (Log ROS)	1.6198E-6						
631												
632	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
633					KM Mean (logged)	-13.54				KM Geo Mean	1.3231E-6	
634					KM SD (logged)	0.252				95% Critical H Value (KM-Log)	1.904	
635					KM Standard Error of Mean (logged)	0.0827				95% H-UCL (KM -Log)	1.5898E-6	
636					KM SD (logged)	0.252				95% Critical H Value (KM-Log)	1.904	
637					KM Standard Error of Mean (logged)	0.0827						
638												
639	**DL/2 Statistics**											
640	**DL/2 Normal**									**DL/2 Log-Transformed**		
641					Mean in Original Scale	1.1941E-6				Mean in Log Scale	-13.75	
642					SD in Original Scale	5.8542E-7				SD in Log Scale	0.5	
643					95% t UCL (Assumes normality)	1.5140E-6				95% H-Stat UCL	1.7095E-6	
644	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
645												
646	**Nonparametric Distribution Free UCL Statistics**											
647	**Detected Data appear Normal Distributed at 5% Significance Level**											
648												
649	**Suggested UCL to Use**											
650					95% KM (t) UCL	1.61E-06						
651												
652	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
653	Recommendations are based upon data size, data distribution, and skewness.											
654	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
655	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
656												
657	**TEQ-ND=1/2DL (nfmw20)**											
658												
659	**General Statistics**											
660					Total Number of Observations	8				Number of Distinct Observations	8	
661					Number of Detects	7				Number of Non-Detects	1	
662					Number of Distinct Detects	7				Number of Distinct Non-Detects	1	
663					Minimum Detect	1.1582E-6				Minimum Non-Detect	1.1828E-6	
664					Maximum Detect	2.8593E-6				Maximum Non-Detect	1.1828E-6	
665					Variance Detects	3.287E-13				Percent Non-Detects	12.5%	
666					Mean Detects	1.6752E-6				SD Detects	5.7333E-7	
667					Median Detects	1.5414E-6				CV Detects	N/A	
668					Skewness Detects	1.75				Kurtosis Detects	3.625	
669					Mean of Logged Detects	-13.34				SD of Logged Detects	0.302	
670												
671	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
672	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
673	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
674	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
675												
676	**Normal GOF Test on Detects Only**											

677				Shapiro Wilk Test Statistic		0.819	**Shapiro Wilk GOF Test**					
678				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Normal at 5% Significance Level					
679				Lilliefors Test Statistic		0.254	**Lilliefors GOF Test**					
680				5% Lilliefors Critical Value		0.304	Detected Data appear Normal at 5% Significance Level					
681	**Detected Data appear Normal at 5% Significance Level**											
682												
683	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
684				KM Mean		1.6105E-6	KM Standard Error of Mean					2.0054E-7
685				KM SD		5.2513E-7	95% KM (BCA) UCL					1.9305E-6
686				95% KM (t) UCL		1.9905E-6	95% KM (Percentile Bootstrap) UCL					1.9405E-6
687				95% KM (z) UCL		1.9404E-6	95% KM Bootstrap t UCL					2.2978E-6
688				90% KM Chebyshev UCL		2.2122E-6	95% KM Chebyshev UCL					2.4847E-6
689				97.5% KM Chebyshev UCL		2.8629E-6	99% KM Chebyshev UCL					3.6059E-6
690												
691	**Gamma GOF Tests on Detected Observations Only**											
692				A-D Test Statistic		0.449	**Anderson-Darling GOF Test**					
693				5% A-D Critical Value		0.708	Detected data appear Gamma Distributed at 5% Significance Level					
694				K-S Test Statistic		0.223	**Kolmogorov-Smirnov GOF**					
695				5% K-S Critical Value		0.312	Detected data appear Gamma Distributed at 5% Significance Level					
696	**Detected data appear Gamma Distributed at 5% Significance Level**											
697												
698	**Gamma Statistics on Detected Data Only**											
699				k hat (MLE)		11.97	k star (bias corrected MLE)					6.937
700				Theta hat (MLE)		1.3992E-7	Theta star (bias corrected MLE)					2.4150E-7
701				nu hat (MLE)		167.6	nu star (bias corrected)					97.11
702				Mean (detects)		1.6752E-6						
703												
704	**Gamma ROS Statistics using Imputed Non-Detects**											
705	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
706	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
707	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
708	This is especially true when the sample size is small.											
709	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
710				Minimum		1.1582E-6	Mean					0.00125
711				Maximum		0.01	Median					1.5796E-6
712				SD		0.00353	CV					2.825
713				k hat (MLE)		0.14	k star (bias corrected MLE)					0.171
714				Theta hat (MLE)		0.00897	Theta star (bias corrected MLE)					0.00734
715				nu hat (MLE)		2.232	nu star (bias corrected)					2.729
716				Adjusted Level of Significance (β)		0.0195						
717				Approximate Chi Square Value (2.73, α)		0.297	Adjusted Chi Square Value (2.73, β)					0.171
718				95% Gamma Approximate UCL (use when n>=50)		0.0115	95% Gamma Adjusted UCL (use when n<50)					0.02
719												
720	**Estimates of Gamma Parameters using KM Estimates**											
721				Mean (KM)		1.6105E-6	SD (KM)					5.2513E-7
722				Variance (KM)		2.758E-13	SE of Mean (KM)					2.0054E-7
723				k hat (KM)		9.406	k star (KM)					5.962
724				nu hat (KM)		150.5	nu star (KM)					95.39
725				theta hat (KM)		1.7122E-7	theta star (KM)					2.7013E-7
726				80% gamma percentile (KM)		2.1236E-6	90% gamma percentile (KM)					2.4924E-6
727				95% gamma percentile (KM)		2.8261E-6	99% gamma percentile (KM)					3.5258E-6
728												

	A	B	C	D	E	F	G	H	I	J	K	L
729	**Gamma Kaplan-Meier (KM) Statistics**											
730	Approximate Chi Square Value (95.39, α)					73.87	Adjusted Chi Square Value (95.39, β)					69.09
731	95% Gamma Approximate KM-UCL (use when n>=50)					2.0799E-6	95% Gamma Adjusted KM-UCL (use when n<50)					2.2238E-6
732												
733	**Lognormal GOF Test on Detected Observations Only**											
734	Shapiro Wilk Test Statistic					0.901	**Shapiro Wilk GOF Test**					
735	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Lognormal at 5% Significance Level					
736	Lilliefors Test Statistic					0.204	**Lilliefors GOF Test**					
737	5% Lilliefors Critical Value					0.304	Detected Data appear Lognormal at 5% Significance Level					
738	**Detected Data appear Lognormal at 5% Significance Level**											
739												
740	**Lognormal ROS Statistics Using Imputed Non-Detects**											
741	Mean in Original Scale					1.5926E-6	Mean in Log Scale					-13.4
742	SD in Original Scale					5.7993E-7	SD in Log Scale					0.324
743	95% t UCL (assumes normality of ROS data)					1.9810E-6	95% Percentile Bootstrap UCL					1.9460E-6
744	95% BCA Bootstrap UCL					2.0303E-6	95% Bootstrap t UCL					2.2179E-6
745	95% H-UCL (Log ROS)					2.0626E-6						
746												
747	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
748	KM Mean (logged)					-13.38	KM Geo Mean					1.5415E-6
749	KM SD (logged)					0.283	95% Critical H Value (KM-Log)					2.037
750	KM Standard Error of Mean (logged)					0.108	95% H-UCL (KM -Log)					1.9957E-6
751	KM SD (logged)					0.283	95% Critical H Value (KM-Log)					2.037
752	KM Standard Error of Mean (logged)					0.108						
753												
754	**DL/2 Statistics**											
755	**DL/2 Normal**						**DL/2 Log-Transformed**					
756	Mean in Original Scale					1.5397E-6	Mean in Log Scale					-13.47
757	SD in Original Scale					6.5465E-7	SD in Log Scale					0.451
758	95% t UCL (Assumes normality)					1.9782E-6	95% H-Stat UCL					2.3103E-6
759	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
760												
761	**Nonparametric Distribution Free UCL Statistics**											
762	**Detected Data appear Normal Distributed at 5% Significance Level**											
763												
764	**Suggested UCL to Use**											
765	95% KM (t) UCL					1.99E-06						
766												
767	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
768	Recommendations are based upon data size, data distribution, and skewness.											
769	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
770	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
771												
772												
773	**TEQ-ND=1/2DL (nfmw22)**											
774												
775	**General Statistics**											
776	Total Number of Observations					4	Number of Distinct Observations					4
777							Number of Missing Observations					0
778	Minimum					1.7184E-6	Mean					1.9599E-6
779	Maximum					2.3347E-6	Median					1.8932E-6
780	SD					2.8709E-7	Std. Error of Mean					1.4354E-7

781				Coefficient of Variation		N/A				Skewness		0.848
782												
783						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
784						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
785						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
786						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
787													
788						**Normal GOF Test**							
789				Shapiro Wilk Test Statistic		0.896			**Shapiro Wilk GOF Test**			
790				5% Shapiro Wilk Critical Value		0.748			Data appear Normal at 5% Significance Level			
791				Lilliefors Test Statistic		0.265			**Lilliefors GOF Test**			
792				5% Lilliefors Critical Value		0.375			Data appear Normal at 5% Significance Level			
793						**Data appear Normal at 5% Significance Level**							
794													
795						**Assuming Normal Distribution**							
796				**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**			
797				95% Student's-t UCL		2.2977E-6			95% Adjusted-CLT UCL (Chen-1995)			2.2610E-6
798									95% Modified-t UCL (Johnson-1978)			2.3078E-6
799												
800						**Gamma GOF Test**							
801				A-D Test Statistic		0.365			**Anderson-Darling Gamma GOF Test**			
802				5% A-D Critical Value		0.656			Detected data appear Gamma Distributed at 5% Significance Level			
803				K-S Test Statistic		0.299			**Kolmogorov-Smirnov Gamma GOF Test**			
804				5% K-S Critical Value		0.394			Detected data appear Gamma Distributed at 5% Significance Level			
805						**Detected data appear Gamma Distributed at 5% Significance Level**							
806													
807						**Gamma Statistics**							
808				k hat (MLE)		64.18			k star (bias corrected MLE)			16.21
809				Theta hat (MLE)		3.0536E-8			Theta star (bias corrected MLE)			1.2089E-7
810				nu hat (MLE)		513.5			nu star (bias corrected)			129.7
811				MLE Mean (bias corrected)		1.9599E-6			MLE Sd (bias corrected)			4.8675E-7
812									Approximate Chi Square Value (0.05)			104.4
813				Adjusted Level of Significance		N/A			Adjusted Chi Square Value			N/A
814												
815						**Assuming Gamma Distribution**							
816				95% Approximate Gamma UCL (use when n>=50))		2.4350E-6			95% Adjusted Gamma UCL (use when n<50)			N/A
817												
818						**Lognormal GOF Test**							
819				Shapiro Wilk Test Statistic		0.902			**Shapiro Wilk Lognormal GOF Test**			
820				5% Shapiro Wilk Critical Value		0.748			Data appear Lognormal at 5% Significance Level			
821				Lilliefors Test Statistic		0.266			**Lilliefors Lognormal GOF Test**			
822				5% Lilliefors Critical Value		0.375			Data appear Lognormal at 5% Significance Level			
823						**Data appear Lognormal at 5% Significance Level**							
824													
825						**Lognormal Statistics**							
826				Minimum of Logged Data		-13.27			Mean of logged Data			-13.15
827				Maximum of Logged Data		-12.97			SD of logged Data			0.143
828												
829						**Assuming Lognormal Distribution**							
830				95% H-UCL		2.3796E-6			90% Chebyshev (MVUE) UCL			2.3800E-6
831				95% Chebyshev (MVUE) UCL		2.5704E-6			97.5% Chebyshev (MVUE) UCL			2.8347E-6
832				99% Chebyshev (MVUE) UCL		3.3538E-6						

833												
834	**Nonparametric Distribution Free UCL Statistics**											
835	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
836												
837	**Nonparametric Distribution Free UCLs**											
838						95% CLT UCL	2.1960E-6			95% Jackknife UCL	2.2977E-6	
839						95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL	N/A	
840						95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL	N/A	
841						95% BCA Bootstrap UCL	N/A					
842						90% Chebyshev(Mean, Sd) UCL	2.3905E-6			95% Chebyshev(Mean, Sd) UCL	2.5856E-6	
843						97.5% Chebyshev(Mean, Sd) UCL	2.8563E-6			99% Chebyshev(Mean, Sd) UCL	3.3881E-6	
844												
845	**Suggested UCL to Use**											
846						95% Student's-t UCL	2.30E-06					
847												
848	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
849	Recommendations are based upon data size, data distribution, and skewness.											
850	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
851	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
852												
853												
854	**TEQ-ND=1/2DL (nfmw23)**											
855												
856	**General Statistics**											
857						Total Number of Observations	4			Number of Distinct Observations	4	
858										Number of Missing Observations	0	
859						Minimum	1.8785E-6			Mean	2.0196E-6	
860						Maximum	2.1444E-6			Median	2.0278E-6	
861						SD	1.3046E-7			Std. Error of Mean	6.5229E-8	
862						Coefficient of Variation	N/A			Skewness	-0.147	
863												
864	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
865	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
866	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
867	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
868												
869	**Normal GOF Test**											
870						Shapiro Wilk Test Statistic	0.882			**Shapiro Wilk GOF Test**		
871						5% Shapiro Wilk Critical Value	0.748			Data appear Normal at 5% Significance Level		
872						Lilliefors Test Statistic	0.269			**Lilliefors GOF Test**		
873						5% Lilliefors Critical Value	0.375			Data appear Normal at 5% Significance Level		
874	**Data appear Normal at 5% Significance Level**											
875												
876	**Assuming Normal Distribution**											
877	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
878						95% Student's-t UCL	2.1731E-6			95% Adjusted-CLT UCL (Chen-1995)	2.1218E-6	
879										95% Modified-t UCL (Johnson-1978)	2.1723E-6	
880												
881	**Gamma GOF Test**											
882						A-D Test Statistic	0.414			**Anderson-Darling Gamma GOF Test**		
883						5% A-D Critical Value	0.657			Detected data appear Gamma Distributed at 5% Significance Level		
884						K-S Test Statistic	0.303			**Kolmogorov-Smirnov Gamma GOF Test**		

885	5% K-S Critical Value					0.394	Detected data appear Gamma Distributed at 5% Significance Level					
886	**Detected data appear Gamma Distributed at 5% Significance Level**											
887												
888	**Gamma Statistics**											
889	k hat (MLE)					318.1	k star (bias corrected MLE)					79.7
890	Theta hat (MLE)					6.3487E-9	Theta star (bias corrected MLE)					2.5342E-8
891	nu hat (MLE)					2545	nu star (bias corrected)					637.6
892	MLE Mean (bias corrected)					2.0196E-6	MLE Sd (bias corrected)					2.2623E-7
893							Approximate Chi Square Value (0.05)					580
894	Adjusted Level of Significance					N/A	Adjusted Chi Square Value					N/A
895												
896	**Assuming Gamma Distribution**											
897	95% Approximate Gamma UCL (use when n>=50))					2.2201E-6	95% Adjusted Gamma UCL (use when n<50)					N/A
898												
899	**Lognormal GOF Test**											
900	Shapiro Wilk Test Statistic					0.883	**Shapiro Wilk Lognormal GOF Test**					
901	5% Shapiro Wilk Critical Value					0.748	Data appear Lognormal at 5% Significance Level					
902	Lilliefors Test Statistic					0.271	**Lilliefors Lognormal GOF Test**					
903	5% Lilliefors Critical Value					0.375	Data appear Lognormal at 5% Significance Level					
904	**Data appear Lognormal at 5% Significance Level**											
905												
906	**Lognormal Statistics**											
907	Minimum of Logged Data					-13.19	Mean of logged Data					-13.11
908	Maximum of Logged Data					-13.05	SD of logged Data					0.0648
909												
910	**Assuming Lognormal Distribution**											
911	95% H-UCL					N/A	90% Chebyshev (MVUE) UCL					2.2160E-6
912	95% Chebyshev (MVUE) UCL					2.3049E-6	97.5% Chebyshev (MVUE) UCL					2.4283E-6
913	99% Chebyshev (MVUE) UCL					2.6708E-6						
914												
915	**Nonparametric Distribution Free UCL Statistics**											
916	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
917												
918	**Nonparametric Distribution Free UCLs**											
919	95% CLT UCL					2.1269E-6	95% Jackknife UCL					2.1731E-6
920	95% Standard Bootstrap UCL					N/A	95% Bootstrap-t UCL					N/A
921	95% Hall's Bootstrap UCL					N/A	95% Percentile Bootstrap UCL					N/A
922	95% BCA Bootstrap UCL					N/A						
923	90% Chebyshev(Mean, Sd) UCL					2.2153E-6	95% Chebyshev(Mean, Sd) UCL					2.3039E-6
924	97.5% Chebyshev(Mean, Sd) UCL					2.4270E-6	99% Chebyshev(Mean, Sd) UCL					2.6686E-6
925												
926	**Suggested UCL to Use**											
927	95% Student's-t UCL					2.17E-06						
928												
929	**Recommended UCL exceeds the maximum observation**											
930												
931	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
932	Recommendations are based upon data size, data distribution, and skewness.											
933	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
934	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
935												
936	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											

	A	B	C	D	E	F	G	H	I	J	K	L
937	reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.											
938												
939	TEQ-ND=1/2DL (nfmw3)											
940												
941	General Statistics											
942					Total Number of Observations	9			Number of Distinct Observations	9		
943					Number of Detects	7			Number of Non-Detects	2		
944					Number of Distinct Detects	7			Number of Distinct Non-Detects	2		
945					Minimum Detect	1.0118E-6			Minimum Non-Detect	1.1357E-6		
946					Maximum Detect	1.7337E-6			Maximum Non-Detect	1.2498E-6		
947					Variance Detects	7.495E-14			Percent Non-Detects	22.22%		
948					Mean Detects	1.3900E-6			SD Detects	2.7377E-7		
949					Median Detects	1.4113E-6			CV Detects	N/A		
950					Skewness Detects	0.0468			Kurtosis Detects	-1.209		
951					Mean of Logged Detects	-13.5			SD of Logged Detects	0.201		
952												
953	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
954	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
955	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
956	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
957												
958	Normal GOF Test on Detects Only											
959					Shapiro Wilk Test Statistic	0.939			Shapiro Wilk GOF Test			
960					5% Shapiro Wilk Critical Value	0.803			Detected Data appear Normal at 5% Significance Level			
961					Lilliefors Test Statistic	0.171			Lilliefors GOF Test			
962					5% Lilliefors Critical Value	0.304			Detected Data appear Normal at 5% Significance Level			
963	Detected Data appear Normal at 5% Significance Level											
964												
965	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
966					KM Mean	1.3196E-6			KM Standard Error of Mean	9.5135E-8		
967					KM SD	2.6104E-7			95% KM (BCA) UCL	1.4769E-6		
968					95% KM (t) UCL	1.4965E-6			95% KM (Percentile Bootstrap) UCL	1.4674E-6		
969					95% KM (z) UCL	1.4761E-6			95% KM Bootstrap t UCL	1.5298E-6		
970					90% KM Chebyshev UCL	1.6050E-6			95% KM Chebyshev UCL	1.7343E-6		
971					97.5% KM Chebyshev UCL	1.9137E-6			99% KM Chebyshev UCL	2.2662E-6		
972												
973	Gamma GOF Tests on Detected Observations Only											
974					A-D Test Statistic	0.255			Anderson-Darling GOF Test			
975					5% A-D Critical Value	0.707			Detected data appear Gamma Distributed at 5% Significance Level			
976					K-S Test Statistic	0.181			Kolmogorov-Smirnov GOF			
977					5% K-S Critical Value	0.311			Detected data appear Gamma Distributed at 5% Significance Level			
978	Detected data appear Gamma Distributed at 5% Significance Level											
979												
980	Gamma Statistics on Detected Data Only											
981					k hat (MLE)	29.48			k star (bias corrected MLE)	16.94		
982					Theta hat (MLE)	4.7155E-8			Theta star (bias corrected MLE)	8.2057E-8		
983					nu hat (MLE)	412.7			nu star (bias corrected)	237.2		
984					Mean (detects)	1.3900E-6						
985												
986	Gamma ROS Statistics using Imputed Non-Detects											
987	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
988	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											

	A	B	C	D	E	F	G	H	I	J	K	L
989	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
990	This is especially true when the sample size is small.											
991	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
992					Minimum	1.0118E-6				Mean		0.00222
993					Maximum	0.01				Median		1.4414E-6
994					SD	0.00441				CV		1.983
995					k hat (MLE)	0.143				k star (bias corrected MLE)		0.169
996					Theta hat (MLE)	0.0156				Theta star (bias corrected MLE)		0.0131
997					nu hat (MLE)	2.572				nu star (bias corrected)		3.048
998					Adjusted Level of Significance (β)	0.0231						
999					Approximate Chi Square Value (3.05, α)	0.387				Adjusted Chi Square Value (3.05, β)		0.245
1000					95% Gamma Approximate UCL (use when n>=50)	0.0175				95% Gamma Adjusted UCL (use when n<50)		0.0277
1001												
1002	**Estimates of Gamma Parameters using KM Estimates**											
1003					Mean (KM)	1.3196E-6				SD (KM)		2.6104E-7
1004					Variance (KM)	6.814E-14				SE of Mean (KM)		9.5135E-8
1005					k hat (KM)	25.56				k star (KM)		17.11
1006					nu hat (KM)	460				nu star (KM)		308
1007					theta hat (KM)	5.1636E-8				theta star (KM)		7.7118E-8
1008					80% gamma percentile (KM)	1.5779E-6				90% gamma percentile (KM)		1.7414E-6
1009					95% gamma percentile (KM)	1.8844E-6				99% gamma percentile (KM)		2.1727E-6
1010												
1011	**Gamma Kaplan-Meier (KM) Statistics**											
1012					Approximate Chi Square Value (308.01, α)	268.4				Adjusted Chi Square Value (308.01, β)		260.5
1013					95% Gamma Approximate KM-UCL (use when n>=50)	1.5146E-6				95% Gamma Adjusted KM-UCL (use when n<50)		1.5601E-6
1014												
1015	**Lognormal GOF Test on Detected Observations Only**											
1016					Shapiro Wilk Test Statistic	0.944				**Shapiro Wilk GOF Test**		
1017					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
1018					Lilliefors Test Statistic	0.159				**Lilliefors GOF Test**		
1019					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
1020	**Detected Data appear Lognormal at 5% Significance Level**											
1021												
1022	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1023					Mean in Original Scale	1.3195E-6				Mean in Log Scale		-13.56
1024					SD in Original Scale	2.7532E-7				SD in Log Scale		0.204
1025					95% t UCL (assumes normality of ROS data)	1.4901E-6				95% Percentile Bootstrap UCL		1.4663E-6
1026					95% BCA Bootstrap UCL	1.4761E-6				95% Bootstrap t UCL		1.5148E-6
1027					95% H-UCL (Log ROS)	1.5179E-6						
1028												
1029	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1030					KM Mean (logged)	-13.56				KM Geo Mean		1.2946E-6
1031					KM SD (logged)	0.195				95% Critical H Value (KM-Log)		1.903
1032					KM Standard Error of Mean (logged)	0.0714				95% H-UCL (KM -Log)		1.5039E-6
1033					KM SD (logged)	0.195				95% Critical H Value (KM-Log)		1.903
1034					KM Standard Error of Mean (logged)	0.0714						
1035												
1036	**DL/2 Statistics**											
1037	**DL/2 Normal**						**DL/2 Log-Transformed**					
1038					Mean in Original Scale	1.2136E-6				Mean in Log Scale		-13.69
1039					SD in Original Scale	4.2295E-7				SD in Log Scale		0.406
1040					95% t UCL (Assumes normality)	1.4758E-6				95% H-Stat UCL		1.6778E-6

	A	B	C	D	E	F	G	H	I	J	K	L
1041	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1042												
1043	**Nonparametric Distribution Free UCL Statistics**											
1044	**Detected Data appear Normal Distributed at 5% Significance Level**											
1045												
1046	**Suggested UCL to Use**											
1047	95% KM (t) UCL	1.50E-06										
1048												
1049	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1050	Recommendations are based upon data size, data distribution, and skewness.											
1051	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1052	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1053												
1054	**TEQ-ND=1/2DL (nfmw4)**											
1055												
1056	**General Statistics**											
1057	Total Number of Observations	9				Number of Distinct Observations	9					
1058	Number of Detects	4				Number of Non-Detects	5					
1059	Number of Distinct Detects	4				Number of Distinct Non-Detects	5					
1060	Minimum Detect	9.6997E-7				Minimum Non-Detect	9.5658E-7					
1061	Maximum Detect	2.2071E-6				Maximum Non-Detect	1.2537E-6					
1062	Variance Detects	3.504E-13				Percent Non-Detects	55.56%					
1063	Mean Detects	1.5810E-6				SD Detects	5.9197E-7					
1064	Median Detects	1.5735E-6				CV Detects	N/A					
1065	Skewness Detects	0.0349				Kurtosis Detects	-4.433					
1066	Mean of Logged Detects	-13.41				SD of Logged Detects	0.392					
1067												
1068	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1069	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1070	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1071	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1072												
1073	**Normal GOF Test on Detects Only**											
1074	Shapiro Wilk Test Statistic	0.908				**Shapiro Wilk GOF Test**						
1075	5% Shapiro Wilk Critical Value	0.748				Detected Data appear Normal at 5% Significance Level						
1076	Lilliefors Test Statistic	0.243				**Lilliefors GOF Test**						
1077	5% Lilliefors Critical Value	0.375				Detected Data appear Normal at 5% Significance Level						
1078	**Detected Data appear Normal at 5% Significance Level**											
1079												
1080	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1081	KM Mean	1.2414E-6				KM Standard Error of Mean	1.7685E-7					
1082	KM SD	4.5835E-7				95% KM (BCA) UCL	N/A					
1083	95% KM (t) UCL	1.5702E-6				95% KM (Percentile Bootstrap) UCL	N/A					
1084	95% KM (z) UCL	1.5323E-6				95% KM Bootstrap t UCL	N/A					
1085	90% KM Chebyshev UCL	1.7719E-6				95% KM Chebyshev UCL	2.0123E-6					
1086	97.5% KM Chebyshev UCL	2.3458E-6				99% KM Chebyshev UCL	3.0010E-6					
1087												
1088	**Gamma GOF Tests on Detected Observations Only**											
1089	A-D Test Statistic	0.361				**Anderson-Darling GOF Test**						
1090	5% A-D Critical Value	0.657				Detected data appear Gamma Distributed at 5% Significance Level						
1091	K-S Test Statistic	0.278				**Kolmogorov-Smirnov GOF**						
1092	5% K-S Critical Value	0.395				Detected data appear Gamma Distributed at 5% Significance Level						

1093	**Detected data appear Gamma Distributed at 5% Significance Level**											
1094												
1095	**Gamma Statistics on Detected Data Only**											
1096					k hat (MLE)	9.095			k star (bias corrected MLE)	2.44		
1097					Theta hat (MLE)	1.7384E-7			Theta star (bias corrected MLE)	6.4785E-7		
1098					nu hat (MLE)	72.76			nu star (bias corrected)	19.52		
1099					Mean (detects)	1.5810E-6						
1100												
1101	**Gamma ROS Statistics using Imputed Non-Detects**											
1102	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1103	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1104	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1105	This is especially true when the sample size is small.											
1106	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1107					Minimum	9.6997E-7			Mean	0.00556		
1108					Maximum	0.01			Median	0.01		
1109					SD	0.00527			CV	0.948		
1110					k hat (MLE)	0.218			k star (bias corrected MLE)	0.22		
1111					Theta hat (MLE)	0.0255			Theta star (bias corrected MLE)	0.0253		
1112					nu hat (MLE)	3.927			nu star (bias corrected)	3.952		
1113					Adjusted Level of Significance (β)	0.0231						
1114					Approximate Chi Square Value (3.95, α)	0.703			Adjusted Chi Square Value (3.95, β)	0.467		
1115					95% Gamma Approximate UCL (use when n>=50)	0.0312			95% Gamma Adjusted UCL (use when n<50)	N/A		
1116												
1117	**Estimates of Gamma Parameters using KM Estimates**											
1118					Mean (KM)	1.2414E-6			SD (KM)	4.5835E-7		
1119					Variance (KM)	2.101E-13			SE of Mean (KM)	1.7685E-7		
1120					k hat (KM)	7.335			k star (KM)	4.964		
1121					nu hat (KM)	132			nu star (KM)	89.36		
1122					theta hat (KM)	1.6924E-7			theta star (KM)	2.5007E-7		
1123					80% gamma percentile (KM)	1.6700E-6			90% gamma percentile (KM)	1.9873E-6		
1124					95% gamma percentile (KM)	2.2766E-6			99% gamma percentile (KM)	2.8882E-6		
1125												
1126	**Gamma Kaplan-Meier (KM) Statistics**											
1127					Approximate Chi Square Value (89.36, α)	68.56			Adjusted Chi Square Value (89.36, β)	64.73		
1128					95% Gamma Approximate KM-UCL (use when n>=50)	1.6179E-6			95% Gamma Adjusted KM-UCL (use when n<50)	1.7136E-6		
1129												
1130	**Lognormal GOF Test on Detected Observations Only**											
1131					Shapiro Wilk Test Statistic	0.911			**Shapiro Wilk GOF Test**			
1132					5% Shapiro Wilk Critical Value	0.748			Detected Data appear Lognormal at 5% Significance Level			
1133					Lilliefors Test Statistic	0.252			**Lilliefors GOF Test**			
1134					5% Lilliefors Critical Value	0.375			Detected Data appear Lognormal at 5% Significance Level			
1135	**Detected Data appear Lognormal at 5% Significance Level**											
1136												
1137	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1138					Mean in Original Scale	1.0922E-6			Mean in Log Scale	-13.84		
1139					SD in Original Scale	5.9307E-7			SD in Log Scale	0.483		
1140					95% t UCL (assumes normality of ROS data)	1.4598E-6			95% Percentile Bootstrap UCL	1.4151E-6		
1141					95% BCA Bootstrap UCL	1.4719E-6			95% Bootstrap t UCL	2.0150E-6		
1142					95% H-UCL (Log ROS)	1.6018E-6						
1143												
1144	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											

1145				KM Mean (logged)	-13.65				KM Geo Mean	1.1748E-6		
1146				KM SD (logged)	0.314				95% Critical H Value (KM-Log)	2.027		
1147				KM Standard Error of Mean (logged)	0.121				95% H-UCL (KM -Log)	1.5452E-6		
1148				KM SD (logged)	0.314				95% Critical H Value (KM-Log)	2.027		
1149				KM Standard Error of Mean (logged)	0.121							
1150												
1151					DL/2 Statistics							
1152				DL/2 Normal					DL/2 Log-Transformed			
1153				Mean in Original Scale	1.0050E-6				Mean in Log Scale	-13.98		
1154				SD in Original Scale	6.5703E-7				SD in Log Scale	0.591		
1155				95% t UCL (Assumes normality)	1.4122E-6				95% H-Stat UCL	1.6772E-6		
1156				DL/2 is not a recommended method, provided for comparisons and historical reasons								
1157												
1158					Nonparametric Distribution Free UCL Statistics							
1159					Detected Data appear Normal Distributed at 5% Significance Level							
1160												
1161					Suggested UCL to Use							
1162				95% KM (t) UCL	1.57E-06							
1163												
1164					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1165					Recommendations are based upon data size, data distribution, and skewness.							
1166					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1167					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1168												
1169	TEQ-ND=1/2DL (nfmw7)											
1170												
1171					General Statistics							
1172				Total Number of Observations	8				Number of Distinct Observations	8		
1173				Number of Detects	6				Number of Non-Detects	2		
1174				Number of Distinct Detects	6				Number of Distinct Non-Detects	2		
1175				Minimum Detect	1.1747E-6				Minimum Non-Detect	1.1532E-6		
1176				Maximum Detect	2.0130E-6				Maximum Non-Detect	2.0643E-6		
1177				Variance Detects	8.685E-14				Percent Non-Detects	25%		
1178				Mean Detects	1.4795E-6				SD Detects	2.9470E-7		
1179				Median Detects	1.4490E-6				CV Detects	N/A		
1180				Skewness Detects	1.314				Kurtosis Detects	2.316		
1181				Mean of Logged Detects	-13.44				SD of Logged Detects	0.188		
1182												
1183					Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use							
1184					guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.							
1185					For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).							
1186					Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1							
1187												
1188					Normal GOF Test on Detects Only							
1189				Shapiro Wilk Test Statistic	0.888				Shapiro Wilk GOF Test			
1190				5% Shapiro Wilk Critical Value	0.788				Detected Data appear Normal at 5% Significance Level			
1191				Lilliefors Test Statistic	0.255				Lilliefors GOF Test			
1192				5% Lilliefors Critical Value	0.325				Detected Data appear Normal at 5% Significance Level			
1193					Detected Data appear Normal at 5% Significance Level							
1194												
1195					Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs							
1196				KM Mean	1.4329E-6				KM Standard Error of Mean	1.1344E-7		

1197					KM SD	2.7399E-7				95% KM (BCA) UCL		1.6100E-6
1198					95% KM (t) UCL	1.6478E-6				95% KM (Percentile Bootstrap) UCL		1.6090E-6
1199					95% KM (z) UCL	1.6195E-6				95% KM Bootstrap t UCL		1.7383E-6
1200					90% KM Chebyshev UCL	1.7732E-6				95% KM Chebyshev UCL		1.9273E-6
1201					97.5% KM Chebyshev UCL	2.1413E-6				99% KM Chebyshev UCL		2.5616E-6
1202												
1203					**Gamma GOF Tests on Detected Observations Only**							
1204					A-D Test Statistic	0.344	**Anderson-Darling GOF Test**					
1205					5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level					
1206					K-S Test Statistic	0.223	**Kolmogorov-Smirnov GOF**					
1207					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
1208					**Detected data appear Gamma Distributed at 5% Significance Level**							
1209												
1210					**Gamma Statistics on Detected Data Only**							
1211					k hat (MLE)	32.9	k star (bias corrected MLE)					16.56
1212					Theta hat (MLE)	4.4964E-8	Theta star (bias corrected MLE)					8.9324E-8
1213					nu hat (MLE)	394.8	nu star (bias corrected)					198.8
1214					Mean (detects)	1.4795E-6						
1215												
1216					**Gamma ROS Statistics using Imputed Non-Detects**							
1217					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1218					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1219					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1220					This is especially true when the sample size is small.							
1221					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1222					Minimum	1.1747E-6	Mean					0.0025
1223					Maximum	0.01	Median					1.4993E-6
1224					SD	0.00463	CV					1.851
1225					k hat (MLE)	0.147	k star (bias corrected MLE)					0.175
1226					Theta hat (MLE)	0.017	Theta star (bias corrected MLE)					0.0143
1227					nu hat (MLE)	2.354	nu star (bias corrected)					2.804
1228					Adjusted Level of Significance (β)	0.0195						
1229					Approximate Chi Square Value (2.80, α)	0.317	Adjusted Chi Square Value (2.80, β)					0.182
1230					95% Gamma Approximate UCL (use when n>=50)	0.0221	95% Gamma Adjusted UCL (use when n<50)					0.0385
1231												
1232					**Estimates of Gamma Parameters using KM Estimates**							
1233					Mean (KM)	1.4329E-6	SD (KM)					2.7399E-7
1234					Variance (KM)	7.507E-14	SE of Mean (KM)					1.1344E-7
1235					k hat (KM)	27.35	k star (KM)					17.18
1236					nu hat (KM)	437.6	nu star (KM)					274.8
1237					theta hat (KM)	5.2392E-8	theta star (KM)					8.3420E-8
1238					80% gamma percentile (KM)	1.7128E-6	90% gamma percentile (KM)					1.8899E-6
1239					95% gamma percentile (KM)	2.0449E-6	99% gamma percentile (KM)					2.3572E-6
1240												
1241					**Gamma Kaplan-Meier (KM) Statistics**							
1242					Approximate Chi Square Value (274.82, α)	237.4	Adjusted Chi Square Value (274.82, β)					228.6
1243					95% Gamma Approximate KM-UCL (use when n>=50)	1.6585E-6	95% Gamma Adjusted KM-UCL (use when n<50)					1.7225E-6
1244												
1245					**Lognormal GOF Test on Detected Observations Only**							
1246					Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**					
1247					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level					
1248					Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**					

1249	5% Lilliefors Critical Value					0.325	Detected Data appear Lognormal at 5% Significance Level					
1250	**Detected Data appear Lognormal at 5% Significance Level**											
1251												
1252	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1253	Mean in Original Scale					1.3953E-6	Mean in Log Scale					-13.5
1254	SD in Original Scale					3.1824E-7	SD in Log Scale					0.228
1255	95% t UCL (assumes normality of ROS data)					1.6085E-6	95% Percentile Bootstrap UCL					1.5734E-6
1256	95% BCA Bootstrap UCL					1.5713E-6	95% Bootstrap t UCL					1.6334E-6
1257	95% H-UCL (Log ROS)					1.6592E-6						
1258												
1259	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1260	KM Mean (logged)					-13.47	KM Geo Mean					1.4092E-6
1261	KM SD (logged)					0.179	95% Critical H Value (KM-Log)					1.921
1262	KM Standard Error of Mean (logged)					0.074	95% H-UCL (KM -Log)					1.6303E-6
1263	KM SD (logged)					0.179	95% Critical H Value (KM-Log)					1.921
1264	KM Standard Error of Mean (logged)					0.074						
1265												
1266	**DL/2 Statistics**											
1267	**DL/2 Normal**						**DL/2 Log-Transformed**					
1268	Mean in Original Scale					1.3107E-6	Mean in Log Scale					-13.6
1269	SD in Original Scale					4.1776E-7	SD in Log Scale					0.369
1270	95% t UCL (Assumes normality)					1.5905E-6	95% H-Stat UCL					1.7955E-6
1271	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1272												
1273	**Nonparametric Distribution Free UCL Statistics**											
1274	**Detected Data appear Normal Distributed at 5% Significance Level**											
1275												
1276	**Suggested UCL to Use**											
1277	95% KM (t) UCL					1.65E-06						
1278												
1279	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1280	Recommendations are based upon data size, data distribution, and skewness.											
1281	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1282	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1283												
1284	**TEQ-ND=1/2DL (nfmw8)**											
1285												
1286	**General Statistics**											
1287	Total Number of Observations					8	Number of Distinct Observations					8
1288	Number of Detects					5	Number of Non-Detects					3
1289	Number of Distinct Detects					5	Number of Distinct Non-Detects					3
1290	Minimum Detect					1.1140E-6	Minimum Non-Detect					8.4745E-7
1291	Maximum Detect					1.6994E-6	Maximum Non-Detect					2.6364E-6
1292	Variance Detects					6.325E-14	Percent Non-Detects					37.5%
1293	Mean Detects					1.3643E-6	SD Detects					2.5150E-7
1294	Median Detects					1.2866E-6	CV Detects					N/A
1295	Skewness Detects					0.542	Kurtosis Detects					-2.012
1296	Mean of Logged Detects					-13.52	SD of Logged Detects					0.181
1297												
1298	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1299	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1300	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											

1301	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1302												
1303	**Normal GOF Test on Detects Only**											
1304					Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk GOF Test**					
1305					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level					
1306					Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**					
1307					5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level					
1308	**Detected Data appear Normal at 5% Significance Level**											
1309												
1310	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1311					KM Mean	1.2447E-6	KM Standard Error of Mean	1.2047E-7				
1312					KM SD	2.7837E-7	95% KM (BCA) UCL	1.4269E-6				
1313					95% KM (t) UCL	1.4730E-6	95% KM (Percentile Bootstrap) UCL	1.4201E-6				
1314					95% KM (z) UCL	1.4429E-6	95% KM Bootstrap t UCL	1.4684E-6				
1315					90% KM Chebyshev UCL	1.6061E-6	95% KM Chebyshev UCL	1.7699E-6				
1316					97.5% KM Chebyshev UCL	1.9971E-6	99% KM Chebyshev UCL	2.4434E-6				
1317												
1318	**Gamma GOF Tests on Detected Observations Only**											
1319					A-D Test Statistic	0.329	**Anderson-Darling GOF Test**					
1320					5% A-D Critical Value	0.678	Detected data appear Gamma Distributed at 5% Significance Level					
1321					K-S Test Statistic	0.219	**Kolmogorov-Smirnov GOF**					
1322					5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level					
1323	**Detected data appear Gamma Distributed at 5% Significance Level**											
1324												
1325	**Gamma Statistics on Detected Data Only**											
1326					k hat (MLE)	37.74	k star (bias corrected MLE)	15.23				
1327					Theta hat (MLE)	3.6150E-8	Theta star (bias corrected MLE)	8.9585E-8				
1328					nu hat (MLE)	377.4	nu star (bias corrected)	152.3				
1329					Mean (detects)	1.3643E-6						
1330												
1331	**Gamma ROS Statistics using Imputed Non-Detects**											
1332	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1333	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1334	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1335	This is especially true when the sample size is small.											
1336	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1337					Minimum	1.1140E-6	Mean	0.00375				
1338					Maximum	0.01	Median	1.6249E-6				
1339					SD	0.00517	CV	1.38				
1340					k hat (MLE)	0.165	k star (bias corrected MLE)	0.187				
1341					Theta hat (MLE)	0.0227	Theta star (bias corrected MLE)	0.0201				
1342					nu hat (MLE)	2.642	nu star (bias corrected)	2.984				
1343					Adjusted Level of Significance (β)	0.0195						
1344					Approximate Chi Square Value (2.98, α)	0.368	Adjusted Chi Square Value (2.98, β)	0.211				
1345					95% Gamma Approximate UCL (use when n>=50)	0.0304	95% Gamma Adjusted UCL (use when n<50)	0.053				
1346												
1347	**Estimates of Gamma Parameters using KM Estimates**											
1348					Mean (KM)	1.2447E-6	SD (KM)	2.7837E-7				
1349					Variance (KM)	7.749E-14	SE of Mean (KM)	1.2047E-7				
1350					k hat (KM)	19.99	k star (KM)	12.58				
1351					nu hat (KM)	319.9	nu star (KM)	201.3				
1352					theta hat (KM)	6.2255E-8	theta star (KM)	9.8948E-8				

1353					80% gamma percentile (KM)	1.5264E-6					90% gamma percentile (KM)	1.7103E-6
1354					95% gamma percentile (KM)	1.8725E-6					99% gamma percentile (KM)	2.2029E-6
1355												
1356					**Gamma Kaplan-Meier (KM) Statistics**							
1357					Approximate Chi Square Value (201.27, α)	169.4					Adjusted Chi Square Value (201.27, β)	162
1358					95% Gamma Approximate KM-UCL (use when n>=50)	1.4785E-6					95% Gamma Adjusted KM-UCL (use when n<50)	1.5460E-6
1359												
1360					**Lognormal GOF Test on Detected Observations Only**							
1361					Shapiro Wilk Test Statistic	0.923					**Shapiro Wilk GOF Test**	
1362					5% Shapiro Wilk Critical Value	0.762					Detected Data appear Lognormal at 5% Significance Level	
1363					Lilliefors Test Statistic	0.199					**Lilliefors GOF Test**	
1364					5% Lilliefors Critical Value	0.343					Detected Data appear Lognormal at 5% Significance Level	
1365					**Detected Data appear Lognormal at 5% Significance Level**							
1366												
1367					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1368					Mean in Original Scale	1.2474E-6					Mean in Log Scale	-13.61
1369					SD in Original Scale	2.6605E-7					SD in Log Scale	0.21
1370					95% t UCL (assumes normality of ROS data)	1.4256E-6					95% Percentile Bootstrap UCL	1.3982E-6
1371					95% BCA Bootstrap UCL	1.3946E-6					95% Bootstrap t UCL	1.4913E-6
1372					95% H-UCL (Log ROS)	1.4610E-6						
1373												
1374					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1375					KM Mean (logged)	-13.62					KM Geo Mean	1.2135E-6
1376					KM SD (logged)	0.227					95% Critical H Value (KM-Log)	1.972
1377					KM Standard Error of Mean (logged)	0.0994					95% H-UCL (KM -Log)	1.4745E-6
1378					KM SD (logged)	0.227					95% Critical H Value (KM-Log)	1.972
1379					KM Standard Error of Mean (logged)	0.0994						
1380												
1381					**DL/2 Statistics**							
1382					**DL/2 Normal**						**DL/2 Log-Transformed**	
1383					Mean in Original Scale	1.1485E-6					Mean in Log Scale	-13.76
1384					SD in Original Scale	4.3326E-7					SD in Log Scale	0.476
1385					95% t UCL (Assumes normality)	1.4388E-6					95% H-Stat UCL	1.7923E-6
1386					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1387												
1388					**Nonparametric Distribution Free UCL Statistics**							
1389					**Detected Data appear Normal Distributed at 5% Significance Level**							
1390												
1391					**Suggested UCL to Use**							
1392					95% KM (t) UCL	1.47E-06						
1393												
1394					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1395					Recommendations are based upon data size, data distribution, and skewness.							
1396					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1397					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1398												
1399												
1400	**TEQ-ND=1/2DL (nfmw9)**											
1401												
1402					**General Statistics**							
1403					Total Number of Observations	10					Number of Distinct Observations	10
1404											Number of Missing Observations	0

1405					Minimum	3.1246E-6					Mean	7.4989E-6
1406					Maximum	1.6968E-5					Median	6.0272E-6
1407					SD	4.5330E-6					Std. Error of Mean	1.4335E-6
1408					Coefficient of Variation	N/A					Skewness	1.118
1409												
1410	**Normal GOF Test**											
1411					Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk GOF Test**					
1412					5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level					
1413					Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**					
1414					5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level					
1415	**Data appear Normal at 5% Significance Level**											
1416												
1417	**Assuming Normal Distribution**											
1418	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1419					95% Student's-t UCL	1.0127E-5					95% Adjusted-CLT UCL (Chen-1995)	1.0398E-5
1420											95% Modified-t UCL (Johnson-1978)	1.0211E-5
1421												
1422	**Gamma GOF Test**											
1423					A-D Test Statistic	0.354	**Anderson-Darling Gamma GOF Test**					
1424					5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level					
1425					K-S Test Statistic	0.171	**Kolmogorov-Smirnov Gamma GOF Test**					
1426					5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level					
1427	**Detected data appear Gamma Distributed at 5% Significance Level**											
1428												
1429	**Gamma Statistics**											
1430					k hat (MLE)	3.435					k star (bias corrected MLE)	2.471
1431					Theta hat (MLE)	2.1834E-6					Theta star (bias corrected MLE)	3.0349E-6
1432					nu hat (MLE)	68.69					nu star (bias corrected)	49.42
1433					MLE Mean (bias corrected)	7.4989E-6					MLE Sd (bias corrected)	4.7706E-6
1434											Approximate Chi Square Value (0.05)	34.28
1435					Adjusted Level of Significance	0.0267					Adjusted Chi Square Value	32.1
1436												
1437	**Assuming Gamma Distribution**											
1438					95% Approximate Gamma UCL (use when n>=50))	1.0811E-5					95% Adjusted Gamma UCL (use when n<50)	1.1545E-5
1439												
1440	**Lognormal GOF Test**											
1441					Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk Lognormal GOF Test**					
1442					5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level					
1443					Lilliefors Test Statistic	0.155	**Lilliefors Lognormal GOF Test**					
1444					5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level					
1445	**Data appear Lognormal at 5% Significance Level**											
1446												
1447	**Lognormal Statistics**											
1448					Minimum of Logged Data	-12.68					Mean of logged Data	-11.95
1449					Maximum of Logged Data	-10.98					SD of logged Data	0.574
1450												
1451	**Assuming Lognormal Distribution**											
1452					95% H-UCL	1.1853E-5					90% Chebyshev (MVUE) UCL	1.1604E-5
1453					95% Chebyshev (MVUE) UCL	1.3485E-5					97.5% Chebyshev (MVUE) UCL	1.6095E-5
1454					99% Chebyshev (MVUE) UCL	2.1222E-5						
1455												
1456	**Nonparametric Distribution Free UCL Statistics**											

	A	B	C	D	E	F	G	H	I	J	K	L
1457	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1458												
1459	**Nonparametric Distribution Free UCLs**											
1460					95% CLT UCL	9.8568E-6				95% Jackknife UCL	1.0127E-5	
1461					95% Standard Bootstrap UCL	9.7159E-6				95% Bootstrap-t UCL	1.1262E-5	
1462					95% Hall's Bootstrap UCL	1.0238E-5				95% Percentile Bootstrap UCL	9.9570E-6	
1463					95% BCA Bootstrap UCL	1.0123E-5						
1464					90% Chebyshev(Mean, Sd) UCL	1.1799E-5				95% Chebyshev(Mean, Sd) UCL	1.3747E-5	
1465					97.5% Chebyshev(Mean, Sd) UCL	1.6451E-5				99% Chebyshev(Mean, Sd) UCL	2.1762E-5	
1466												
1467	**Suggested UCL to Use**											
1468					95% Student's-t UCL	1.01E-05						
1469												
1470	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1471	Recommendations are based upon data size, data distribution, and skewness.											
1472	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1473	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1474												
1475												
1476	**TEQ-ND=1/2DL (smw10)**											
1477												
1478	**General Statistics**											
1479					Total Number of Observations	8				Number of Distinct Observations	8	
1480										Number of Missing Observations	0	
1481					Minimum	1.5228E-6				Mean	1.9097E-6	
1482					Maximum	3.0671E-6				Median	1.7465E-6	
1483					SD	4.9504E-7				Std. Error of Mean	1.7502E-7	
1484					Coefficient of Variation	N/A				Skewness	2.279	
1485												
1486	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1487	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1488	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1489	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1490												
1491	**Normal GOF Test**											
1492					Shapiro Wilk Test Statistic	0.709				**Shapiro Wilk GOF Test**		
1493					5% Shapiro Wilk Critical Value	0.818				Data Not Normal at 5% Significance Level		
1494					Lilliefors Test Statistic	0.32				**Lilliefors GOF Test**		
1495					5% Lilliefors Critical Value	0.283				Data Not Normal at 5% Significance Level		
1496	**Data Not Normal at 5% Significance Level**											
1497												
1498	**Assuming Normal Distribution**											
1499	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
1500					95% Student's-t UCL	2.2413E-6				95% Adjusted-CLT UCL (Chen-1995)	2.3483E-6	
1501										95% Modified-t UCL (Johnson-1978)	2.2648E-6	
1502												
1503	**Gamma GOF Test**											
1504					A-D Test Statistic	0.903				**Anderson-Darling Gamma GOF Test**		
1505					5% A-D Critical Value	0.716				Data Not Gamma Distributed at 5% Significance Level		
1506					K-S Test Statistic	0.306				**Kolmogorov-Smirnov Gamma GOF Test**		
1507					5% K-S Critical Value	0.294				Data Not Gamma Distributed at 5% Significance Level		
1508	**Data Not Gamma Distributed at 5% Significance Level**											

1509												
1510	**Gamma Statistics**											
1511					k hat (MLE)	21.3			k star (bias corrected MLE)	13.39		
1512					Theta hat (MLE)	8.9667E-8			Theta star (bias corrected MLE)	1.4257E-7		
1513					nu hat (MLE)	340.8			nu star (bias corrected)	214.3		
1514					MLE Mean (bias corrected)	1.9097E-6			MLE Sd (bias corrected)	5.2180E-7		
1515									Approximate Chi Square Value (0.05)	181.4		
1516					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	173.8		
1517												
1518	**Assuming Gamma Distribution**											
1519					95% Approximate Gamma UCL (use when n>=50))	2.2558E-6			95% Adjusted Gamma UCL (use when n<50)	2.3554E-6		
1520												
1521	**Lognormal GOF Test**											
1522					Shapiro Wilk Test Statistic	0.782			**Shapiro Wilk Lognormal GOF Test**			
1523					5% Shapiro Wilk Critical Value	0.818			Data Not Lognormal at 5% Significance Level			
1524					Lilliefors Test Statistic	0.292			**Lilliefors Lognormal GOF Test**			
1525					5% Lilliefors Critical Value	0.283			Data Not Lognormal at 5% Significance Level			
1526	**Data Not Lognormal at 5% Significance Level**											
1527												
1528	**Lognormal Statistics**											
1529					Minimum of Logged Data	-13.39			Mean of logged Data	-13.19		
1530					Maximum of Logged Data	-12.69			SD of logged Data	0.22		
1531												
1532	**Assuming Lognormal Distribution**											
1533					95% H-UCL	2.2507E-6			90% Chebyshev (MVUE) UCL	2.3514E-6		
1534					95% Chebyshev (MVUE) UCL	2.5536E-6			97.5% Chebyshev (MVUE) UCL	2.8342E-6		
1535					99% Chebyshev (MVUE) UCL	3.3854E-6						
1536												
1537	**Nonparametric Distribution Free UCL Statistics**											
1538	**Data do not follow a Discernible Distribution (0.05)**											
1539												
1540	**Nonparametric Distribution Free UCLs**											
1541					95% CLT UCL	2.1976E-6			95% Jackknife UCL	2.2413E-6		
1542					95% Standard Bootstrap UCL	2.1735E-6			95% Bootstrap-t UCL	3.1017E-6		
1543					95% Hall's Bootstrap UCL	3.7001E-6			95% Percentile Bootstrap UCL	2.2174E-6		
1544					95% BCA Bootstrap UCL	2.3511E-6						
1545					90% Chebyshev(Mean, Sd) UCL	2.4348E-6			95% Chebyshev(Mean, Sd) UCL	2.6726E-6		
1546					97.5% Chebyshev(Mean, Sd) UCL	3.0027E-6			99% Chebyshev(Mean, Sd) UCL	3.6512E-6		
1547												
1548	**Suggested UCL to Use**											
1549					95% Student's-t UCL	2.2413E-6			or 95% Modified-t UCL	2.26E-06		
1550												
1551	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1552	Recommendations are based upon data size, data distribution, and skewness.											
1553	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1554	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1555												
1556	**TEQ-ND=1/2DL (smw11)**											
1557												
1558	**General Statistics**											
1559					Total Number of Observations	11			Number of Distinct Observations	11		
1560					Number of Detects	10			Number of Non-Detects	1		

1561	Number of Distinct Detects					10	Number of Distinct Non-Detects					1
1562	Minimum Detect					1.4949E-6	Minimum Non-Detect					1.4396E-6
1563	Maximum Detect					5.0618E-6	Maximum Non-Detect					1.4396E-6
1564	Variance Detects					1.174E-12	Percent Non-Detects					9.091%
1565	Mean Detects					2.5130E-6	SD Detects					1.0834E-6
1566	Median Detects					2.1061E-6	CV Detects					N/A
1567	Skewness Detects					1.639	Kurtosis Detects					2.779
1568	Mean of Logged Detects					-12.96	SD of Logged Detects					0.375
1569												
1570	**Normal GOF Test on Detects Only**											
1571	Shapiro Wilk Test Statistic					0.831	**Shapiro Wilk GOF Test**					
1572	5% Shapiro Wilk Critical Value					0.842	Detected Data Not Normal at 5% Significance Level					
1573	Lilliefors Test Statistic					0.221	**Lilliefors GOF Test**					
1574	5% Lilliefors Critical Value					0.262	Detected Data appear Normal at 5% Significance Level					
1575	**Detected Data appear Approximate Normal at 5% Significance Level**											
1576												
1577	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1578	KM Mean					2.4154E-6	KM Standard Error of Mean					3.2653E-7
1579	KM SD					1.0274E-6	95% KM (BCA) UCL					3.0041E-6
1580	95% KM (t) UCL					3.0072E-6	95% KM (Percentile Bootstrap) UCL					2.9720E-6
1581	95% KM (z) UCL					2.9525E-6	95% KM Bootstrap t UCL					3.4399E-6
1582	90% KM Chebyshev UCL					3.3950E-6	95% KM Chebyshev UCL					3.8387E-6
1583	97.5% KM Chebyshev UCL					4.4546E-6	99% KM Chebyshev UCL					5.6643E-6
1584												
1585	**Gamma GOF Tests on Detected Observations Only**											
1586	A-D Test Statistic					0.461	**Anderson-Darling GOF Test**					
1587	5% A-D Critical Value					0.727	Detected data appear Gamma Distributed at 5% Significance Level					
1588	K-S Test Statistic					0.197	**Kolmogorov-Smirnov GOF**					
1589	5% K-S Critical Value					0.267	Detected data appear Gamma Distributed at 5% Significance Level					
1590	**Detected data appear Gamma Distributed at 5% Significance Level**											
1591												
1592	**Gamma Statistics on Detected Data Only**											
1593	k hat (MLE)					7.404	k star (bias corrected MLE)					5.25
1594	Theta hat (MLE)					3.3940E-7	Theta star (bias corrected MLE)					4.7870E-7
1595	nu hat (MLE)					148.1	nu star (bias corrected)					105
1596	Mean (detects)					2.5130E-6						
1597												
1598	**Gamma ROS Statistics using Imputed Non-Detects**											
1599	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1600	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1601	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1602	This is especially true when the sample size is small.											
1603	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1604	Minimum					1.4949E-6	Mean					9.1138E-4
1605	Maximum					0.01	Median					2.1871E-6
1606	SD					0.00301	CV					3.307
1607	k hat (MLE)					0.148	k star (bias corrected MLE)					0.168
1608	Theta hat (MLE)					0.00616	Theta star (bias corrected MLE)					0.00542
1609	nu hat (MLE)					3.256	nu star (bias corrected)					3.702
1610	Adjusted Level of Significance (β)					0.0278						
1611	Approximate Chi Square Value (3.70, α)					0.607	Adjusted Chi Square Value (3.70, β)					0.439
1612	95% Gamma Approximate UCL (use when n>=50)					0.00555	95% Gamma Adjusted UCL (use when n<50)					0.00768

	A	B	C	D	E	F	G	H	I	J	K	L
1613												
1614	**Estimates of Gamma Parameters using KM Estimates**											
1615					Mean (KM)	2.4154E-6				SD (KM)		1.0274E-6
1616					Variance (KM)	1.056E-12				SE of Mean (KM)		3.2653E-7
1617					k hat (KM)	5.527				k star (KM)		4.08
1618					nu hat (KM)	121.6				nu star (KM)		89.77
1619					theta hat (KM)	4.3700E-7				theta star (KM)		5.9195E-7
1620					80% gamma percentile (KM)	3.3226E-6				90% gamma percentile (KM)		4.0180E-6
1621					95% gamma percentile (KM)	4.6575E-6				99% gamma percentile (KM)		6.0219E-6
1622												
1623	**Gamma Kaplan-Meier (KM) Statistics**											
1624					Approximate Chi Square Value (89.77, α)	68.92				Adjusted Chi Square Value (89.77, β)		65.95
1625					95% Gamma Approximate KM-UCL (use when n>=50)	3.1459E-6				95% Gamma Adjusted KM-UCL (use when n<50)		3.2877E-6
1626												
1627	**Lognormal GOF Test on Detected Observations Only**											
1628					Shapiro Wilk Test Statistic	0.927				**Shapiro Wilk GOF Test**		
1629					5% Shapiro Wilk Critical Value	0.842				Detected Data appear Lognormal at 5% Significance Level		
1630					Lilliefors Test Statistic	0.174				**Lilliefors GOF Test**		
1631					5% Lilliefors Critical Value	0.262				Detected Data appear Lognormal at 5% Significance Level		
1632	**Detected Data appear Lognormal at 5% Significance Level**											
1633												
1634	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1635					Mean in Original Scale	2.3701E-6				Mean in Log Scale		-13.05
1636					SD in Original Scale	1.1318E-6				SD in Log Scale		0.45
1637					95% t UCL (assumes normality of ROS data)	2.9886E-6				95% Percentile Bootstrap UCL		2.9153E-6
1638					95% BCA Bootstrap UCL	3.0843E-6				95% Bootstrap t UCL		3.2868E-6
1639					95% H-UCL (Log ROS)	3.2266E-6						
1640												
1641	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1642					KM Mean (logged)	-13.01				KM Geo Mean		2.2435E-6
1643					KM SD (logged)	0.367				95% Critical H Value (KM-Log)		2.018
1644					KM Standard Error of Mean (logged)	0.117				95% H-UCL (KM -Log)		3.0342E-6
1645					KM SD (logged)	0.367				95% Critical H Value (KM-Log)		2.018
1646					KM Standard Error of Mean (logged)	0.117						
1647												
1648	**DL/2 Statistics**											
1649	**DL/2 Normal**						**DL/2 Log-Transformed**					
1650					Mean in Original Scale	2.3500E-6				Mean in Log Scale		-13.07
1651					SD in Original Scale	1.1613E-6				SD in Log Scale		0.504
1652					95% t UCL (Assumes normality)	2.9846E-6				95% H-Stat UCL		3.3844E-6
1653	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1654												
1655	**Nonparametric Distribution Free UCL Statistics**											
1656	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
1657												
1658	**Suggested UCL to Use**											
1659					95% KM (t) UCL	3.01E-06						
1660												
1661	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
1662	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
1663												
1664	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
1665	Recommendations are based upon data size, data distribution, and skewness.											
1666	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1667	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1668												
1669												
1670	**TEQ-ND=1/2DL (smw12)**											
1671												
1672	**General Statistics**											
1673					Total Number of Observations	8				Number of Distinct Observations	8	
1674										Number of Missing Observations	0	
1675					Minimum	1.6913E-6				Mean	2.6068E-6	
1676					Maximum	4.1594E-6				Median	2.4822E-6	
1677					SD	9.0923E-7				Std. Error of Mean	3.2146E-7	
1678					Coefficient of Variation	N/A				Skewness	0.565	
1679												
1680	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1681	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1682	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1683	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1684												
1685	**Normal GOF Test**											
1686					Shapiro Wilk Test Statistic	0.884	**Shapiro Wilk GOF Test**					
1687					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1688					Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**					
1689					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1690	**Data appear Normal at 5% Significance Level**											
1691												
1692	**Assuming Normal Distribution**											
1693	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1694					95% Student's-t UCL	3.2159E-6				95% Adjusted-CLT UCL (Chen-1995)	3.2041E-6	
1695										95% Modified-t UCL (Johnson-1978)	3.2265E-6	
1696												
1697	**Gamma GOF Test**											
1698					A-D Test Statistic	0.504	**Anderson-Darling Gamma GOF Test**					
1699					5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level					
1700					K-S Test Statistic	0.248	**Kolmogorov-Smirnov Gamma GOF Test**					
1701					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1702	**Detected data appear Gamma Distributed at 5% Significance Level**											
1703												
1704	**Gamma Statistics**											
1705					k hat (MLE)	9.706				k star (bias corrected MLE)	6.149	
1706					Theta hat (MLE)	2.6858E-7				Theta star (bias corrected MLE)	4.2391E-7	
1707					nu hat (MLE)	155.3				nu star (bias corrected)	98.39	
1708					MLE Mean (bias corrected)	2.6068E-6				MLE Sd (bias corrected)	1.0512E-6	
1709										Approximate Chi Square Value (0.05)	76.51	
1710					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	71.64	
1711												
1712	**Assuming Gamma Distribution**											
1713					95% Approximate Gamma UCL (use when n>=50))	3.3524E-6				95% Adjusted Gamma UCL (use when n<50)	3.5802E-6	
1714												
1715	**Lognormal GOF Test**											
1716					Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk Lognormal GOF Test**					

1717				5% Shapiro Wilk Critical Value		0.818		Data appear Lognormal at 5% Significance Level				
1718				Lilliefors Test Statistic		0.227		**Lilliefors Lognormal GOF Test**				
1719				5% Lilliefors Critical Value		0.283		Data appear Lognormal at 5% Significance Level				
1720	**Data appear Lognormal at 5% Significance Level**											
1721												
1722	**Lognormal Statistics**											
1723				Minimum of Logged Data		-13.29		Mean of logged Data		-12.91		
1724				Maximum of Logged Data		-12.39		SD of logged Data		0.345		
1725												
1726	**Assuming Lognormal Distribution**											
1727				95% H-UCL		3.4587E-6		90% Chebyshev (MVUE) UCL		3.5624E-6		
1728				95% Chebyshev (MVUE) UCL		3.9961E-6		97.5% Chebyshev (MVUE) UCL		4.5980E-6		
1729				99% Chebyshev (MVUE) UCL		5.7804E-6						
1730												
1731	**Nonparametric Distribution Free UCL Statistics**											
1732	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1733												
1734	**Nonparametric Distribution Free UCLs**											
1735				95% CLT UCL		3.1356E-6		95% Jackknife UCL		3.2159E-6		
1736				95% Standard Bootstrap UCL		3.1028E-6		95% Bootstrap-t UCL		3.2891E-6		
1737				95% Hall's Bootstrap UCL		3.0937E-6		95% Percentile Bootstrap UCL		3.1202E-6		
1738				95% BCA Bootstrap UCL		3.1592E-6						
1739				90% Chebyshev(Mean, Sd) UCL		3.5712E-6		95% Chebyshev(Mean, Sd) UCL		4.0080E-6		
1740				97.5% Chebyshev(Mean, Sd) UCL		4.6143E-6		99% Chebyshev(Mean, Sd) UCL		5.8053E-6		
1741												
1742	**Suggested UCL to Use**											
1743				95% Student's-t UCL		3.22E-06						
1744												
1745	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1746	Recommendations are based upon data size, data distribution, and skewness.											
1747	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1748	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1749												
1750	**TEQ-ND=1/2DL (smw13)**											
1751												
1752	**General Statistics**											
1753				Total Number of Observations		10		Number of Distinct Observations		10		
1754				Number of Detects		9		Number of Non-Detects		1		
1755				Number of Distinct Detects		9		Number of Distinct Non-Detects		1		
1756				Minimum Detect		9.9423E-7		Minimum Non-Detect		1.1339E-6		
1757				Maximum Detect		3.8456E-6		Maximum Non-Detect		1.1339E-6		
1758				Variance Detects		9.995E-13		Percent Non-Detects		10%		
1759				Mean Detects		1.9603E-6		SD Detects		9.9973E-7		
1760				Median Detects		1.5021E-6		CV Detects		N/A		
1761				Skewness Detects		1.035		Kurtosis Detects		-0.0619		
1762				Mean of Logged Detects		-13.25		SD of Logged Detects		0.478		
1763												
1764	**Normal GOF Test on Detects Only**											
1765				Shapiro Wilk Test Statistic		0.862		**Shapiro Wilk GOF Test**				
1766				5% Shapiro Wilk Critical Value		0.829		Detected Data appear Normal at 5% Significance Level				
1767				Lilliefors Test Statistic		0.232		**Lilliefors GOF Test**				
1768				5% Lilliefors Critical Value		0.274		Detected Data appear Normal at 5% Significance Level				

1769	**Detected Data appear Normal at 5% Significance Level**											
1770												
1771	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1772	KM Mean					1.8637E-6	KM Standard Error of Mean					3.1528E-7
1773	KM SD					9.3998E-7	95% KM (BCA) UCL					2.4121E-6
1774	95% KM (t) UCL					2.4416E-6	95% KM (Percentile Bootstrap) UCL					2.4137E-6
1775	95% KM (z) UCL					2.3823E-6	95% KM Bootstrap t UCL					2.7654E-6
1776	90% KM Chebyshev UCL					2.8095E-6	95% KM Chebyshev UCL					3.2379E-6
1777	97.5% KM Chebyshev UCL					3.8326E-6	99% KM Chebyshev UCL					5.0007E-6
1778												
1779	**Gamma GOF Tests on Detected Observations Only**											
1780	A-D Test Statistic					0.459	**Anderson-Darling GOF Test**					
1781	5% A-D Critical Value					0.723	Detected data appear Gamma Distributed at 5% Significance Level					
1782	K-S Test Statistic					0.214	**Kolmogorov-Smirnov GOF**					
1783	5% K-S Critical Value					0.28	Detected data appear Gamma Distributed at 5% Significance Level					
1784	**Detected data appear Gamma Distributed at 5% Significance Level**											
1785												
1786	**Gamma Statistics on Detected Data Only**											
1787	k hat (MLE)					4.887	k star (bias corrected MLE)					3.332
1788	Theta hat (MLE)					4.0110E-7	Theta star (bias corrected MLE)					5.8828E-7
1789	nu hat (MLE)					87.97	nu star (bias corrected)					59.98
1790	Mean (detects)					1.9603E-6						
1791												
1792	**Gamma ROS Statistics using Imputed Non-Detects**											
1793	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1794	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1795	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1796	This is especially true when the sample size is small.											
1797	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1798	Minimum					9.9423E-7	Mean					0.001
1799	Maximum					0.01	Median					1.8346E-6
1800	SD					0.00316	CV					3.156
1801	k hat (MLE)					0.141	k star (bias corrected MLE)					0.166
1802	Theta hat (MLE)					0.00708	Theta star (bias corrected MLE)					0.00605
1803	nu hat (MLE)					2.83	nu star (bias corrected)					3.314
1804	Adjusted Level of Significance (β)					0.0267						
1805	Approximate Chi Square Value (3.31, α)					0.471	Adjusted Chi Square Value (3.31, β)					0.327
1806	95% Gamma Approximate UCL (use when n>=50)					0.00704	95% Gamma Adjusted UCL (use when n<50)					0.0102
1807												
1808	**Estimates of Gamma Parameters using KM Estimates**											
1809	Mean (KM)					1.8637E-6	SD (KM)					9.3998E-7
1810	Variance (KM)					8.836E-13	SE of Mean (KM)					3.1528E-7
1811	k hat (KM)					3.931	k star (KM)					2.818
1812	nu hat (KM)					78.62	nu star (KM)					56.37
1813	theta hat (KM)					4.7410E-7	theta star (KM)					6.6127E-7
1814	80% gamma percentile (KM)					2.6782E-6	90% gamma percentile (KM)					3.3518E-6
1815	95% gamma percentile (KM)					3.9824E-6	99% gamma percentile (KM)					5.3539E-6
1816												
1817	**Gamma Kaplan-Meier (KM) Statistics**											
1818	Approximate Chi Square Value (56.37, α)					40.11	Adjusted Chi Square Value (56.37, β)					37.74
1819	95% Gamma Approximate KM-UCL (use when n>=50)					2.6190E-6	95% Gamma Adjusted KM-UCL (use when n<50)					2.7836E-6
1820												

1821	**Lognormal GOF Test on Detected Observations Only**											
1822					Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk GOF Test**					
1823					5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level					
1824					Lilliefors Test Statistic	0.194	**Lilliefors GOF Test**					
1825					5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level					
1826	**Detected Data appear Lognormal at 5% Significance Level**											
1827												
1828	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1829					Mean in Original Scale	1.8432E-6				Mean in Log Scale	-13.33	
1830					SD in Original Scale	1.0126E-6				SD in Log Scale	0.517	
1831					95% t UCL (assumes normality of ROS data)	2.4302E-6				95% Percentile Bootstrap UCL	2.3778E-6	
1832					95% BCA Bootstrap UCL	2.4398E-6				95% Bootstrap t UCL	2.7514E-6	
1833					95% H-UCL (Log ROS)	2.7384E-6						
1834												
1835	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1836					KM Mean (logged)	-13.31				KM Geo Mean	1.6653E-6	
1837					KM SD (logged)	0.461				95% Critical H Value (KM-Log)	2.166	
1838					KM Standard Error of Mean (logged)	0.154				95% H-UCL (KM -Log)	2.5819E-6	
1839					KM SD (logged)	0.461				95% Critical H Value (KM-Log)	2.166	
1840					KM Standard Error of Mean (logged)	0.154						
1841												
1842	**DL/2 Statistics**											
1843	**DL/2 Normal**						**DL/2 Log-Transformed**					
1844					Mean in Original Scale	1.8209E-6				Mean in Log Scale	-13.36	
1845					SD in Original Scale	1.0405E-6				SD in Log Scale	0.576	
1846					95% t UCL (Assumes normality)	2.4241E-6				95% H-Stat UCL	2.9065E-6	
1847	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1848												
1849	**Nonparametric Distribution Free UCL Statistics**											
1850	**Detected Data appear Normal Distributed at 5% Significance Level**											
1851												
1852	**Suggested UCL to Use**											
1853					95% KM (t) UCL	2.44E-06						
1854												
1855	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1856	Recommendations are based upon data size, data distribution, and skewness.											
1857	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1858	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1859												
1860	**TEQ-ND=1/2DL (smw14)**											
1861												
1862	**General Statistics**											
1863					Total Number of Observations	8				Number of Distinct Observations	8	
1864					Number of Detects	7				Number of Non-Detects	1	
1865					Number of Distinct Detects	7				Number of Distinct Non-Detects	1	
1866					Minimum Detect	9.5518E-7				Minimum Non-Detect	1.3169E-6	
1867					Maximum Detect	2.9253E-6				Maximum Non-Detect	1.3169E-6	
1868					Variance Detects	5.139E-13				Percent Non-Detects	12.5%	
1869					Mean Detects	1.8034E-6				SD Detects	7.1689E-7	
1870					Median Detects	1.5749E-6				CV Detects	N/A	
1871					Skewness Detects	0.818				Kurtosis Detects	-0.641	
1872					Mean of Logged Detects	-13.29				SD of Logged Detects	0.388	

1873												
1874	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1875	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1876	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1877	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1878												
1879	**Normal GOF Test on Detects Only**											
1880						Shapiro Wilk Test Statistic	0.882	**Shapiro Wilk GOF Test**				
1881						5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level				
1882						Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**				
1883						5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level				
1884	**Detected Data appear Normal at 5% Significance Level**											
1885												
1886	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1887						KM Mean	1.6974E-6	KM Standard Error of Mean	2.6017E-7			
1888						KM SD	6.8128E-7	95% KM (BCA) UCL	2.1552E-6			
1889						95% KM (t) UCL	2.1903E-6	95% KM (Percentile Bootstrap) UCL	2.1321E-6			
1890						95% KM (z) UCL	2.1253E-6	95% KM Bootstrap t UCL	2.7083E-6			
1891						90% KM Chebyshev UCL	2.4779E-6	95% KM Chebyshev UCL	2.8314E-6			
1892						97.5% KM Chebyshev UCL	3.3221E-6	99% KM Chebyshev UCL	4.2860E-6			
1893												
1894	**Gamma GOF Tests on Detected Observations Only**											
1895						A-D Test Statistic	0.402	**Anderson-Darling GOF Test**				
1896						5% A-D Critical Value	0.709	Detected data appear Gamma Distributed at 5% Significance Level				
1897						K-S Test Statistic	0.255	**Kolmogorov-Smirnov GOF**				
1898						5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level				
1899	**Detected data appear Gamma Distributed at 5% Significance Level**											
1900												
1901	**Gamma Statistics on Detected Data Only**											
1902						k hat (MLE)	7.829	k star (bias corrected MLE)	4.569			
1903						Theta hat (MLE)	2.3034E-7	Theta star (bias corrected MLE)	3.9469E-7			
1904						nu hat (MLE)	109.6	nu star (bias corrected)	63.97			
1905						Mean (detects)	1.8034E-6					
1906												
1907	**Gamma ROS Statistics using Imputed Non-Detects**											
1908	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1909	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1910	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1911	This is especially true when the sample size is small.											
1912	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1913						Minimum	9.5518E-7	Mean	0.00125			
1914						Maximum	0.01	Median	1.6192E-6			
1915						SD	0.00353	CV	2.824			
1916						k hat (MLE)	0.141	k star (bias corrected MLE)	0.171			
1917						Theta hat (MLE)	0.00891	Theta star (bias corrected MLE)	0.00731			
1918						nu hat (MLE)	2.248	nu star (bias corrected)	2.738			
1919						Adjusted Level of Significance (β)	0.0195					
1920						Approximate Chi Square Value (2.74, α)	0.299	Adjusted Chi Square Value (2.74, β)	0.172			
1921						95% Gamma Approximate UCL (use when n>=50)	0.0115	95% Gamma Adjusted UCL (use when n<50)	0.0199			
1922												
1923	**Estimates of Gamma Parameters using KM Estimates**											
1924						Mean (KM)	1.6974E-6	SD (KM)	6.8128E-7			

1925					Variance (KM)	4.641E-13				SE of Mean (KM)		2.6017E-7
1926					k hat (KM)	6.207				k star (KM)		3.963
1927					nu hat (KM)	99.32				nu star (KM)		63.41
1928					theta hat (KM)	2.7344E-7				theta star (KM)		4.2831E-7
1929					80% gamma percentile (KM)	2.3428E-6				90% gamma percentile (KM)		2.8403E-6
1930					95% gamma percentile (KM)	3.2984E-6				99% gamma percentile (KM)		4.2771E-6
1931												
1932					**Gamma Kaplan-Meier (KM) Statistics**							
1933					Approximate Chi Square Value (63.41, α)	46.09				Adjusted Chi Square Value (63.41, β)		42.38
1934					95% Gamma Approximate KM-UCL (use when n>=50)	2.3352E-6				95% Gamma Adjusted KM-UCL (use when n<50)		2.5396E-6
1935												
1936					**Lognormal GOF Test on Detected Observations Only**							
1937					Shapiro Wilk Test Statistic	0.934				**Shapiro Wilk GOF Test**		
1938					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
1939					Lilliefors Test Statistic	0.23				**Lilliefors GOF Test**		
1940					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
1941					**Detected Data appear Lognormal at 5% Significance Level**							
1942												
1943					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1944					Mean in Original Scale	1.6915E-6				Mean in Log Scale		-13.37
1945					SD in Original Scale	7.3531E-7				SD in Log Scale		0.421
1946					95% t UCL (assumes normality of ROS data)	2.1840E-6				95% Percentile Bootstrap UCL		2.1066E-6
1947					95% BCA Bootstrap UCL	2.1584E-6				95% Bootstrap t UCL		2.5476E-6
1948					95% H-UCL (Log ROS)	2.4344E-6						
1949												
1950					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1951					KM Mean (logged)	-13.36				KM Geo Mean		1.5733E-6
1952					KM SD (logged)	0.385				95% Critical H Value (KM-Log)		2.174
1953					KM Standard Error of Mean (logged)	0.147				95% H-UCL (KM -Log)		2.3255E-6
1954					KM SD (logged)	0.385				95% Critical H Value (KM-Log)		2.174
1955					KM Standard Error of Mean (logged)	0.147						
1956												
1957					**DL/2 Statistics**							
1958					**DL/2 Normal**					**DL/2 Log-Transformed**		
1959					Mean in Original Scale	1.6603E-6				Mean in Log Scale		-13.41
1960					SD in Original Scale	7.7741E-7				SD in Log Scale		0.49
1961					95% t UCL (Assumes normality)	2.1810E-6				95% H-Stat UCL		2.6102E-6
1962					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1963												
1964					**Nonparametric Distribution Free UCL Statistics**							
1965					**Detected Data appear Normal Distributed at 5% Significance Level**							
1966												
1967					**Suggested UCL to Use**							
1968					95% KM (t) UCL	2.19E-06						
1969												
1970					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1971					Recommendations are based upon data size, data distribution, and skewness.							
1972					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1973					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1974												
1975	**TEQ-ND=1/2DL (smw15)**											
1976												

1977	**General Statistics**											
1978					Total Number of Observations	9			Number of Distinct Observations	9		
1979					Number of Detects	5			Number of Non-Detects	4		
1980					Number of Distinct Detects	5			Number of Distinct Non-Detects	4		
1981					Minimum Detect	1.0510E-6			Minimum Non-Detect	1.0711E-6		
1982					Maximum Detect	1.9558E-6			Maximum Non-Detect	1.2735E-6		
1983					Variance Detects	1.283E-13			Percent Non-Detects	44.44%		
1984					Mean Detects	1.5440E-6			SD Detects	3.5813E-7		
1985					Median Detects	1.5796E-6			CV Detects	N/A		
1986					Skewness Detects	-0.392			Kurtosis Detects	-0.937		
1987					Mean of Logged Detects	-13.4			SD of Logged Detects	0.246		
1988												
1989	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1990	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1991	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1992	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1993												
1994	**Normal GOF Test on Detects Only**											
1995					Shapiro Wilk Test Statistic	0.978			**Shapiro Wilk GOF Test**			
1996					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
1997					Lilliefors Test Statistic	0.152			**Lilliefors GOF Test**			
1998					5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			
1999	**Detected Data appear Normal at 5% Significance Level**											
2000												
2001	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2002					KM Mean	1.3249E-6			KM Standard Error of Mean	1.2748E-7		
2003					KM SD	3.4207E-7			95% KM (BCA) UCL	1.5402E-6		
2004					95% KM (t) UCL	1.5619E-6			95% KM (Percentile Bootstrap) UCL	1.5327E-6		
2005					95% KM (z) UCL	1.5345E-6			95% KM Bootstrap t UCL	1.5048E-6		
2006					90% KM Chebyshev UCL	1.7073E-6			95% KM Chebyshev UCL	1.8805E-6		
2007					97.5% KM Chebyshev UCL	2.1210E-6			99% KM Chebyshev UCL	2.5933E-6		
2008												
2009	**Gamma GOF Tests on Detected Observations Only**											
2010					A-D Test Statistic	0.22			**Anderson-Darling GOF Test**			
2011					5% A-D Critical Value	0.679			Detected data appear Gamma Distributed at 5% Significance Level			
2012					K-S Test Statistic	0.18			**Kolmogorov-Smirnov GOF**			
2013					5% K-S Critical Value	0.357			Detected data appear Gamma Distributed at 5% Significance Level			
2014	**Detected data appear Gamma Distributed at 5% Significance Level**											
2015												
2016	**Gamma Statistics on Detected Data Only**											
2017					k hat (MLE)	21.66			k star (bias corrected MLE)	8.799		
2018					Theta hat (MLE)	7.1267E-8			Theta star (bias corrected MLE)	1.7547E-7		
2019					nu hat (MLE)	216.6			nu star (bias corrected)	87.99		
2020					Mean (detects)	1.5440E-6						
2021												
2022	**Gamma ROS Statistics using Imputed Non-Detects**											
2023	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2024	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2025	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2026	This is especially true when the sample size is small.											
2027	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2028					Minimum	1.0510E-6			Mean	0.00445		

2029					Maximum	0.01					Median	1.9558E-6
2030					SD	0.00527					CV	1.185
2031					k hat (MLE)	0.183					k star (bias corrected MLE)	0.196
2032					Theta hat (MLE)	0.0243					Theta star (bias corrected MLE)	0.0227
2033					nu hat (MLE)	3.293					nu star (bias corrected)	3.529
2034					Adjusted Level of Significance (β)	0.0231						
2035					Approximate Chi Square Value (3.53, α)	0.545					Adjusted Chi Square Value (3.53, β)	0.353
2036					95% Gamma Approximate UCL (use when n>=50)	0.0288					95% Gamma Adjusted UCL (use when n<50)	0.0444
2037												
2038					**Estimates of Gamma Parameters using KM Estimates**							
2039					Mean (KM)	1.3249E-6					SD (KM)	3.4207E-7
2040					Variance (KM)	1.170E-13					SE of Mean (KM)	1.2748E-7
2041					k hat (KM)	15					k star (KM)	10.07
2042					nu hat (KM)	270					nu star (KM)	181.3
2043					theta hat (KM)	8.8319E-8					theta star (KM)	1.3150E-7
2044					80% gamma percentile (KM)	1.6574E-6					90% gamma percentile (KM)	1.8800E-6
2045					95% gamma percentile (KM)	2.0777E-6					99% gamma percentile (KM)	2.4835E-6
2046												
2047					**Gamma Kaplan-Meier (KM) Statistics**							
2048					Approximate Chi Square Value (181.34, α)	151.2					Adjusted Chi Square Value (181.34, β)	145.4
2049					95% Gamma Approximate KM-UCL (use when n>=50)	1.5890E-6					95% Gamma Adjusted KM-UCL (use when n<50)	1.6525E-6
2050												
2051					**Lognormal GOF Test on Detected Observations Only**							
2052					Shapiro Wilk Test Statistic	0.957					**Shapiro Wilk GOF Test**	
2053					5% Shapiro Wilk Critical Value	0.762					Detected Data appear Lognormal at 5% Significance Level	
2054					Lilliefors Test Statistic	0.174					**Lilliefors GOF Test**	
2055					5% Lilliefors Critical Value	0.343					Detected Data appear Lognormal at 5% Significance Level	
2056					**Detected Data appear Lognormal at 5% Significance Level**							
2057												
2058					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2059					Mean in Original Scale	1.3179E-6					Mean in Log Scale	-13.57
2060					SD in Original Scale	3.6876E-7					SD in Log Scale	0.264
2061					95% t UCL (assumes normality of ROS data)	1.5465E-6					95% Percentile Bootstrap UCL	1.5208E-6
2062					95% BCA Bootstrap UCL	1.5299E-6					95% Bootstrap t UCL	1.6084E-6
2063					95% H-UCL (Log ROS)	1.5882E-6						
2064												
2065					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2066					KM Mean (logged)	-13.57					KM Geo Mean	1.2846E-6
2067					KM SD (logged)	0.243					95% Critical H Value (KM-Log)	1.95
2068					KM Standard Error of Mean (logged)	0.0906					95% H-UCL (KM -Log)	1.5648E-6
2069					KM SD (logged)	0.243					95% Critical H Value (KM-Log)	1.95
2070					KM Standard Error of Mean (logged)	0.0906						
2071												
2072					**DL/2 Statistics**							
2073					**DL/2 Normal**						**DL/2 Log-Transformed**	
2074					Mean in Original Scale	1.1206E-6					Mean in Log Scale	-13.82
2075					SD in Original Scale	5.6292E-7					SD in Log Scale	0.526
2076					95% t UCL (Assumes normality)	1.4695E-6					95% H-Stat UCL	1.7417E-6
2077					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2078												
2079					**Nonparametric Distribution Free UCL Statistics**							
2080					**Detected Data appear Normal Distributed at 5% Significance Level**							

	A	B	C	D	E	F	G	H	I	J	K	L
2081												
2082	**Suggested UCL to Use**											
2083					95% KM (t) UCL	1.56E-06						
2084												
2085	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2086	Recommendations are based upon data size, data distribution, and skewness.											
2087	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2088	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2089												
2090												
2091	**TEQ-ND=1/2DL (smw16)**											
2092												
2093	**General Statistics**											
2094					Total Number of Observations	12				Number of Distinct Observations	12	
2095										Number of Missing Observations	0	
2096					Minimum	1.2047E-6				Mean	1.8563E-6	
2097					Maximum	2.6085E-6				Median	1.8609E-6	
2098					SD	5.3198E-7				Std. Error of Mean	1.5357E-7	
2099					Coefficient of Variation	N/A				Skewness	0.163	
2100												
2101	**Normal GOF Test**											
2102					Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**					
2103					5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level					
2104					Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**					
2105					5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level					
2106	**Data appear Normal at 5% Significance Level**											
2107												
2108	**Assuming Normal Distribution**											
2109	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2110					95% Student's-t UCL	2.1321E-6				95% Adjusted-CLT UCL (Chen-1995)	2.1166E-6	
2111										95% Modified-t UCL (Johnson-1978)	2.1333E-6	
2112												
2113	**Gamma GOF Test**											
2114					A-D Test Statistic	0.492	**Anderson-Darling Gamma GOF Test**					
2115					5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level					
2116					K-S Test Statistic	0.164	**Kolmogorov-Smirnov Gamma GOF Test**					
2117					5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level					
2118	**Detected data appear Gamma Distributed at 5% Significance Level**											
2119												
2120	**Gamma Statistics**											
2121					k hat (MLE)	13.06				k star (bias corrected MLE)	9.847	
2122					Theta hat (MLE)	1.4219E-7				Theta star (bias corrected MLE)	1.8852E-7	
2123					nu hat (MLE)	313.3				nu star (bias corrected)	236.3	
2124					MLE Mean (bias corrected)	1.8563E-6				MLE Sd (bias corrected)	5.9156E-7	
2125										Approximate Chi Square Value (0.05)	201.7	
2126					Adjusted Level of Significance	0.029				Adjusted Chi Square Value	196.9	
2127												
2128	**Assuming Gamma Distribution**											
2129					95% Approximate Gamma UCL (use when n>=50))	2.1746E-6				95% Adjusted Gamma UCL (use when n<50)	2.2284E-6	
2130												
2131	**Lognormal GOF Test**											
2132					Shapiro Wilk Test Statistic	0.9	**Shapiro Wilk Lognormal GOF Test**					

2133			5% Shapiro Wilk Critical Value			0.859	Data appear Lognormal at 5% Significance Level					
2134			Lilliefors Test Statistic			0.158	**Lilliefors Lognormal GOF Test**					
2135			5% Lilliefors Critical Value			0.243	Data appear Lognormal at 5% Significance Level					
2136	**Data appear Lognormal at 5% Significance Level**											
2137												
2138	**Lognormal Statistics**											
2139			Minimum of Logged Data			-13.63	Mean of logged Data					-13.24
2140			Maximum of Logged Data			-12.86	SD of logged Data					0.293
2141												
2142	**Assuming Lognormal Distribution**											
2143			95% H-UCL			2.2087E-6	90% Chebyshev (MVUE) UCL					2.3325E-6
2144			95% Chebyshev (MVUE) UCL			2.5479E-6	97.5% Chebyshev (MVUE) UCL					2.8468E-6
2145			99% Chebyshev (MVUE) UCL			3.4339E-6						
2146												
2147	**Nonparametric Distribution Free UCL Statistics**											
2148	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2149												
2150	**Nonparametric Distribution Free UCLs**											
2151			95% CLT UCL			2.1089E-6	95% Jackknife UCL					2.1321E-6
2152			95% Standard Bootstrap UCL			2.0960E-6	95% Bootstrap-t UCL					2.1386E-6
2153			95% Hall's Bootstrap UCL			2.0888E-6	95% Percentile Bootstrap UCL					2.0982E-6
2154			95% BCA Bootstrap UCL			2.0954E-6						
2155			90% Chebyshev(Mean, Sd) UCL			2.3170E-6	95% Chebyshev(Mean, Sd) UCL					2.5257E-6
2156			97.5% Chebyshev(Mean, Sd) UCL			2.8153E-6	99% Chebyshev(Mean, Sd) UCL					3.3843E-6
2157												
2158	**Suggested UCL to Use**											
2159			95% Student's-t UCL			2.13E-06						
2160												
2161	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2162	Recommendations are based upon data size, data distribution, and skewness.											
2163	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2164	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2165												
2166	**TEQ-ND=1/2DL (smw16d)**											
2167												
2168	**General Statistics**											
2169			Total Number of Observations			9	Number of Distinct Observations					9
2170			Number of Detects			1	Number of Non-Detects					8
2171			Number of Distinct Detects			1	Number of Distinct Non-Detects					8
2172												
2173	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
2174	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
2175												
2176	**The data set for variable TEQ-ND=1/2DL (smw16d) was not processed!**											
2177												
2178												
2179												
2180	**TEQ-ND=1/2DL (smw17)**											
2181												
2182	**General Statistics**											
2183			Total Number of Observations			11	Number of Distinct Observations					11
2184							Number of Missing Observations					0

2185					Minimum	1.1777E-6					Mean	5.0773E-6
2186					Maximum	1.1526E-5					Median	3.9733E-6
2187					SD	3.4040E-6					Std. Error of Mean	1.0263E-6
2188					Coefficient of Variation	N/A					Skewness	0.761
2189												
2190	**Normal GOF Test**											
2191					Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk GOF Test**					
2192					5% Shapiro Wilk Critical Value	0.85	Data appear Normal at 5% Significance Level					
2193					Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**					
2194					5% Lilliefors Critical Value	0.251	Data appear Normal at 5% Significance Level					
2195	**Data appear Normal at 5% Significance Level**											
2196												
2197	**Assuming Normal Distribution**											
2198	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2199					95% Student's-t UCL	6.9375E-6					95% Adjusted-CLT UCL (Chen-1995)	7.0172E-6
2200											95% Modified-t UCL (Johnson-1978)	6.9768E-6
2201												
2202	**Gamma GOF Test**											
2203					A-D Test Statistic	0.362	**Anderson-Darling Gamma GOF Test**					
2204					5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level					
2205					K-S Test Statistic	0.167	**Kolmogorov-Smirnov Gamma GOF Test**					
2206					5% K-S Critical Value	0.258	Detected data appear Gamma Distributed at 5% Significance Level					
2207	**Detected data appear Gamma Distributed at 5% Significance Level**											
2208												
2209	**Gamma Statistics**											
2210					k hat (MLE)	2.439					k star (bias corrected MLE)	1.835
2211					Theta hat (MLE)	2.0816E-6					Theta star (bias corrected MLE)	2.7676E-6
2212					nu hat (MLE)	53.66					nu star (bias corrected)	40.36
2213					MLE Mean (bias corrected)	5.0773E-6					MLE Sd (bias corrected)	3.7486E-6
2214											Approximate Chi Square Value (0.05)	26.8
2215					Adjusted Level of Significance	0.0278					Adjusted Chi Square Value	25.01
2216												
2217	**Assuming Gamma Distribution**											
2218					95% Approximate Gamma UCL (use when n>=50))	7.6455E-6					95% Adjusted Gamma UCL (use when n<50)	8.1924E-6
2219												
2220	**Lognormal GOF Test**											
2221					Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**					
2222					5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level					
2223					Lilliefors Test Statistic	0.154	**Lilliefors Lognormal GOF Test**					
2224					5% Lilliefors Critical Value	0.251	Data appear Lognormal at 5% Significance Level					
2225	**Data appear Lognormal at 5% Significance Level**											
2226												
2227	**Lognormal Statistics**											
2228					Minimum of Logged Data	-13.65					Mean of logged Data	-12.41
2229					Maximum of Logged Data	-11.37					SD of logged Data	0.713
2230												
2231	**Assuming Lognormal Distribution**											
2232					95% H-UCL	9.2227E-6					90% Chebyshev (MVUE) UCL	8.5487E-6
2233					95% Chebyshev (MVUE) UCL	1.0102E-5					97.5% Chebyshev (MVUE) UCL	1.2258E-5
2234					99% Chebyshev (MVUE) UCL	1.6492E-5						
2235												
2236	**Nonparametric Distribution Free UCL Statistics**											

	A	B	C	D	E	F	G	H	I	J	K	L
2237	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2238												
2239	**Nonparametric Distribution Free UCLs**											
2240					95% CLT UCL	6.7655E-6				95% Jackknife UCL	6.9375E-6	
2241					95% Standard Bootstrap UCL	6.6691E-6				95% Bootstrap-t UCL	7.2913E-6	
2242					95% Hall's Bootstrap UCL	6.7688E-6				95% Percentile Bootstrap UCL	6.7401E-6	
2243					95% BCA Bootstrap UCL	6.9957E-6						
2244					90% Chebyshev(Mean, Sd) UCL	8.1564E-6				95% Chebyshev(Mean, Sd) UCL	9.5511E-6	
2245					97.5% Chebyshev(Mean, Sd) UCL	1.1487E-5				99% Chebyshev(Mean, Sd) UCL	1.5289E-5	
2246												
2247	**Suggested UCL to Use**											
2248					95% Student's-t UCL	6.94E-06						
2249												
2250	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2251	Recommendations are based upon data size, data distribution, and skewness.											
2252	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2253	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2254												
2255												
2256	**TEQ-ND=1/2DL (smw17d)**											
2257												
2258	**General Statistics**											
2259					Total Number of Observations	9				Number of Distinct Observations	9	
2260										Number of Missing Observations	0	
2261					Minimum	1.0152E-6				Mean	1.2824E-6	
2262					Maximum	2.1905E-6				Median	1.1955E-6	
2263					SD	3.5433E-7				Std. Error of Mean	1.1811E-7	
2264					Coefficient of Variation	N/A				Skewness	2.567	
2265												
2266	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2267	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2268	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2269	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2270												
2271	**Normal GOF Test**											
2272					Shapiro Wilk Test Statistic	0.656				**Shapiro Wilk GOF Test**		
2273					5% Shapiro Wilk Critical Value	0.829				Data Not Normal at 5% Significance Level		
2274					Lilliefors Test Statistic	0.334				**Lilliefors GOF Test**		
2275					5% Lilliefors Critical Value	0.274				Data Not Normal at 5% Significance Level		
2276	**Data Not Normal at 5% Significance Level**											
2277												
2278	**Assuming Normal Distribution**											
2279	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
2280					95% Student's-t UCL	1.5020E-6				95% Adjusted-CLT UCL (Chen-1995)	1.5847E-6	
2281										95% Modified-t UCL (Johnson-1978)	1.5189E-6	
2282												
2283	**Gamma GOF Test**											
2284					A-D Test Statistic	1.112				**Anderson-Darling Gamma GOF Test**		
2285					5% A-D Critical Value	0.721				Data Not Gamma Distributed at 5% Significance Level		
2286					K-S Test Statistic	0.294				**Kolmogorov-Smirnov Gamma GOF Test**		
2287					5% K-S Critical Value	0.279				Data Not Gamma Distributed at 5% Significance Level		
2288	**Data Not Gamma Distributed at 5% Significance Level**											

2289												
2290	**Gamma Statistics**											
2291					k hat (MLE)	19.36			k star (bias corrected MLE)	12.98		
2292					Theta hat (MLE)	6.6238E-8			Theta star (bias corrected MLE)	9.8790E-8		
2293					nu hat (MLE)	348.5			nu star (bias corrected)	233.7		
2294					MLE Mean (bias corrected)	1.2824E-6			MLE Sd (bias corrected)	3.5593E-7		
2295									Approximate Chi Square Value (0.05)	199.3		
2296					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	192.6		
2297												
2298	**Assuming Gamma Distribution**											
2299					95% Approximate Gamma UCL (use when n>=50))	1.5037E-6			95% Adjusted Gamma UCL (use when n<50)	1.5560E-6		
2300												
2301	**Lognormal GOF Test**											
2302					Shapiro Wilk Test Statistic	0.745			**Shapiro Wilk Lognormal GOF Test**			
2303					5% Shapiro Wilk Critical Value	0.829			Data Not Lognormal at 5% Significance Level			
2304					Lilliefors Test Statistic	0.279			**Lilliefors Lognormal GOF Test**			
2305					5% Lilliefors Critical Value	0.274			Data Not Lognormal at 5% Significance Level			
2306	**Data Not Lognormal at 5% Significance Level**											
2307												
2308	**Lognormal Statistics**											
2309					Minimum of Logged Data	-13.8			Mean of logged Data	-13.59		
2310					Maximum of Logged Data	-13.03			SD of logged Data	0.227		
2311												
2312	**Assuming Lognormal Distribution**											
2313					95% H-UCL	1.4971E-6			90% Chebyshev (MVUE) UCL	1.5692E-6		
2314					95% Chebyshev (MVUE) UCL	1.7010E-6			97.5% Chebyshev (MVUE) UCL	1.8840E-6		
2315					99% Chebyshev (MVUE) UCL	2.2433E-6						
2316												
2317	**Nonparametric Distribution Free UCL Statistics**											
2318	**Data do not follow a Discernible Distribution (0.05)**											
2319												
2320	**Nonparametric Distribution Free UCLs**											
2321					95% CLT UCL	1.4767E-6			95% Jackknife UCL	1.5020E-6		
2322					95% Standard Bootstrap UCL	1.4747E-6			95% Bootstrap-t UCL	1.8851E-6		
2323					95% Hall's Bootstrap UCL	2.3763E-6			95% Percentile Bootstrap UCL	1.5023E-6		
2324					95% BCA Bootstrap UCL	1.5704E-6						
2325					90% Chebyshev(Mean, Sd) UCL	1.6367E-6			95% Chebyshev(Mean, Sd) UCL	1.7972E-6		
2326					97.5% Chebyshev(Mean, Sd) UCL	2.0200E-6			99% Chebyshev(Mean, Sd) UCL	2.4576E-6		
2327												
2328	**Suggested UCL to Use**											
2329					95% Student's-t UCL	1.5020E-6			or 95% Modified-t UCL	1.52E-06		
2330												
2331	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2332	Recommendations are based upon data size, data distribution, and skewness.											
2333	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2334	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2335												
2336												
2337	**TEQ-ND=1/2DL (smw18)**											
2338												
2339	**General Statistics**											
2340					Total Number of Observations	10			Number of Distinct Observations	10		

2341										Number of Missing Observations		0
2342					Minimum	1.3799E-6				Mean		1.8648E-6
2343					Maximum	2.4193E-6				Median		1.8490E-6
2344					SD	3.3589E-7				Std. Error of Mean		1.0622E-7
2345					Coefficient of Variation	N/A				Skewness		0.239
2346												
2347	**Normal GOF Test**											
2348					Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**					
2349					5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level					
2350					Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**					
2351					5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level					
2352	**Data appear Normal at 5% Significance Level**											
2353												
2354	**Assuming Normal Distribution**											
2355	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2356					95% Student's-t UCL	2.0595E-6				95% Adjusted-CLT UCL (Chen-1995)		2.0481E-6
2357										95% Modified-t UCL (Johnson-1978)		2.0609E-6
2358												
2359	**Gamma GOF Test**											
2360					A-D Test Statistic	0.228	**Anderson-Darling Gamma GOF Test**					
2361					5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level					
2362					K-S Test Statistic	0.16	**Kolmogorov-Smirnov Gamma GOF Test**					
2363					5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level					
2364	**Detected data appear Gamma Distributed at 5% Significance Level**											
2365												
2366	**Gamma Statistics**											
2367					k hat (MLE)	34.28				k star (bias corrected MLE)		24.06
2368					Theta hat (MLE)	5.4395E-8				Theta star (bias corrected MLE)		7.7491E-8
2369					nu hat (MLE)	685.7				nu star (bias corrected)		481.3
2370					MLE Mean (bias corrected)	1.8648E-6				MLE Sd (bias corrected)		3.8014E-7
2371										Approximate Chi Square Value (0.05)		431.4
2372					Adjusted Level of Significance	0.0267				Adjusted Chi Square Value		423.2
2373												
2374	**Assuming Gamma Distribution**											
2375					95% Approximate Gamma UCL (use when n>=50))	2.0804E-6				95% Adjusted Gamma UCL (use when n<50)		2.1208E-6
2376												
2377	**Lognormal GOF Test**											
2378					Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**					
2379					5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level					
2380					Lilliefors Test Statistic	0.144	**Lilliefors Lognormal GOF Test**					
2381					5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level					
2382	**Data appear Lognormal at 5% Significance Level**											
2383												
2384	**Lognormal Statistics**											
2385					Minimum of Logged Data	-13.49				Mean of logged Data		-13.21
2386					Maximum of Logged Data	-12.93				SD of logged Data		0.181
2387												
2388	**Assuming Lognormal Distribution**											
2389					95% H-UCL	2.0901E-6				90% Chebyshev (MVUE) UCL		2.1856E-6
2390					95% Chebyshev (MVUE) UCL	2.3308E-6				97.5% Chebyshev (MVUE) UCL		2.5324E-6
2391					99% Chebyshev (MVUE) UCL	2.9285E-6						
2392												

	A	B	C	D	E	F	G	H	I	J	K	L
2393	**Nonparametric Distribution Free UCL Statistics**											
2394	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2395												
2396	**Nonparametric Distribution Free UCLs**											
2397					95% CLT UCL	2.0395E-6				95% Jackknife UCL	2.0595E-6	
2398					95% Standard Bootstrap UCL	2.0280E-6				95% Bootstrap-t UCL	2.0764E-6	
2399					95% Hall's Bootstrap UCL	2.0316E-6				95% Percentile Bootstrap UCL	2.0281E-6	
2400					95% BCA Bootstrap UCL	2.0383E-6						
2401					90% Chebyshev(Mean, Sd) UCL	2.1835E-6				95% Chebyshev(Mean, Sd) UCL	2.3278E-6	
2402					97.5% Chebyshev(Mean, Sd) UCL	2.5281E-6				99% Chebyshev(Mean, Sd) UCL	2.9217E-6	
2403												
2404	**Suggested UCL to Use**											
2405					95% Student's-t UCL	2.06E-06						
2406												
2407	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2408	Recommendations are based upon data size, data distribution, and skewness.											
2409	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2410	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2411												
2412												
2413	**TEQ-ND=1/2DL (smw18d)**											
2414												
2415	**General Statistics**											
2416					Total Number of Observations	9				Number of Distinct Observations	9	
2417										Number of Missing Observations	0	
2418					Minimum	1.1665E-6				Mean	1.4781E-6	
2419					Maximum	2.7306E-6				Median	1.3109E-6	
2420					SD	4.8331E-7				Std. Error of Mean	1.6110E-7	
2421					Coefficient of Variation	N/A				Skewness	2.694	
2422												
2423	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2424	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2425	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2426	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2427												
2428	**Normal GOF Test**											
2429					Shapiro Wilk Test Statistic	0.605				**Shapiro Wilk GOF Test**		
2430					5% Shapiro Wilk Critical Value	0.829				Data Not Normal at 5% Significance Level		
2431					Lilliefors Test Statistic	0.361				**Lilliefors GOF Test**		
2432					5% Lilliefors Critical Value	0.274				Data Not Normal at 5% Significance Level		
2433	**Data Not Normal at 5% Significance Level**											
2434												
2435	**Assuming Normal Distribution**											
2436	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
2437					95% Student's-t UCL	1.7777E-6				95% Adjusted-CLT UCL (Chen-1995)	1.8977E-6	
2438										95% Modified-t UCL (Johnson-1978)	1.8018E-6	
2439												
2440	**Gamma GOF Test**											
2441					A-D Test Statistic	1.333				**Anderson-Darling Gamma GOF Test**		
2442					5% A-D Critical Value	0.721				Data Not Gamma Distributed at 5% Significance Level		
2443					K-S Test Statistic	0.32				**Kolmogorov-Smirnov Gamma GOF Test**		
2444					5% K-S Critical Value	0.279				Data Not Gamma Distributed at 5% Significance Level		

	A	B	C	D	E	F	G	H	I	J	K	L
2445	**Data Not Gamma Distributed at 5% Significance Level**											
2446												
2447	**Gamma Statistics**											
2448					k hat (MLE)	14.64			k star (bias corrected MLE)	9.834		
2449					Theta hat (MLE)	1.0097E-7			Theta star (bias corrected MLE)	1.5031E-7		
2450					nu hat (MLE)	263.5			nu star (bias corrected)	177		
2451					MLE Mean (bias corrected)	1.4781E-6			MLE Sd (bias corrected)	4.7135E-7		
2452									Approximate Chi Square Value (0.05)	147.2		
2453					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	141.5		
2454												
2455	**Assuming Gamma Distribution**											
2456				95% Approximate Gamma UCL (use when n>=50))		1.7770E-6			95% Adjusted Gamma UCL (use when n<50)	1.8489E-6		
2457												
2458	**Lognormal GOF Test**											
2459					Shapiro Wilk Test Statistic	0.691			**Shapiro Wilk Lognormal GOF Test**			
2460					5% Shapiro Wilk Critical Value	0.829			Data Not Lognormal at 5% Significance Level			
2461					Lilliefors Test Statistic	0.301			**Lilliefors Lognormal GOF Test**			
2462					5% Lilliefors Critical Value	0.274			Data Not Lognormal at 5% Significance Level			
2463	**Data Not Lognormal at 5% Significance Level**											
2464												
2465	**Lognormal Statistics**											
2466					Minimum of Logged Data	-13.66			Mean of logged Data	-13.46		
2467					Maximum of Logged Data	-12.81			SD of logged Data	0.257		
2468												
2469	**Assuming Lognormal Distribution**											
2470					95% H-UCL	1.7650E-6			90% Chebyshev (MVUE) UCL	1.8506E-6		
2471					95% Chebyshev (MVUE) UCL	2.0227E-6			97.5% Chebyshev (MVUE) UCL	2.2617E-6		
2472					99% Chebyshev (MVUE) UCL	2.7311E-6						
2473												
2474	**Nonparametric Distribution Free UCL Statistics**											
2475	**Data do not follow a Discernible Distribution (0.05)**											
2476												
2477	**Nonparametric Distribution Free UCLs**											
2478					95% CLT UCL	1.7431E-6			95% Jackknife UCL	1.7777E-6		
2479					95% Standard Bootstrap UCL	1.7307E-6			95% Bootstrap-t UCL	2.5089E-6		
2480					95% Hall's Bootstrap UCL	2.6861E-6			95% Percentile Bootstrap UCL	1.7772E-6		
2481					95% BCA Bootstrap UCL	1.9397E-6						
2482					90% Chebyshev(Mean, Sd) UCL	1.9614E-6			95% Chebyshev(Mean, Sd) UCL	2.1803E-6		
2483					97.5% Chebyshev(Mean, Sd) UCL	2.4842E-6			99% Chebyshev(Mean, Sd) UCL	3.0811E-6		
2484												
2485	**Suggested UCL to Use**											
2486					95% Student's-t UCL	1.7777E-6			or 95% Modified-t UCL	1.80E-06		
2487												
2488	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2489	Recommendations are based upon data size, data distribution, and skewness.											
2490	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2491	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2492												
2493	**TEQ-ND=1/2DL (smw19)**											
2494												
2495	**General Statistics**											
2496					Total Number of Observations	8			Number of Distinct Observations	8		

2497					Number of Detects	7					Number of Non-Detects	1
2498					Number of Distinct Detects	7					Number of Distinct Non-Detects	1
2499					Minimum Detect	1.1562E-6					Minimum Non-Detect	1.2045E-6
2500					Maximum Detect	2.5855E-6					Maximum Non-Detect	1.2045E-6
2501					Variance Detects	2.128E-13					Percent Non-Detects	12.5%
2502					Mean Detects	1.7160E-6					SD Detects	4.6129E-7
2503					Median Detects	1.6141E-6					CV Detects	N/A
2504					Skewness Detects	1.149					Kurtosis Detects	1.645
2505					Mean of Logged Detects	-13.3					SD of Logged Detects	0.255
2506												
2507					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2508					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2509					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2510					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2511												
2512					**Normal GOF Test on Detects Only**							
2513					Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk GOF Test**					
2514					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level					
2515					Lilliefors Test Statistic	0.261	**Lilliefors GOF Test**					
2516					5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level					
2517					**Detected Data appear Normal at 5% Significance Level**							
2518												
2519					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
2520					KM Mean	1.6460E-6					KM Standard Error of Mean	1.6815E-7
2521					KM SD	4.4031E-7					95% KM (BCA) UCL	1.9134E-6
2522					95% KM (t) UCL	1.9646E-6					95% KM (Percentile Bootstrap) UCL	1.9201E-6
2523					95% KM (z) UCL	1.9226E-6					95% KM Bootstrap t UCL	2.1069E-6
2524					90% KM Chebyshev UCL	2.1505E-6					95% KM Chebyshev UCL	2.3790E-6
2525					97.5% KM Chebyshev UCL	2.6961E-6					99% KM Chebyshev UCL	3.3191E-6
2526												
2527					**Gamma GOF Tests on Detected Observations Only**							
2528					A-D Test Statistic	0.309	**Anderson-Darling GOF Test**					
2529					5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level					
2530					K-S Test Statistic	0.236	**Kolmogorov-Smirnov GOF**					
2531					5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level					
2532					**Detected data appear Gamma Distributed at 5% Significance Level**							
2533												
2534					**Gamma Statistics on Detected Data Only**							
2535					k hat (MLE)	17.59					k star (bias corrected MLE)	10.14
2536					Theta hat (MLE)	9.7581E-8					Theta star (bias corrected MLE)	1.6916E-7
2537					nu hat (MLE)	246.2					nu star (bias corrected)	142
2538					Mean (detects)	1.7160E-6						
2539												
2540					**Gamma ROS Statistics using Imputed Non-Detects**							
2541					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2542					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2543					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2544					This is especially true when the sample size is small.							
2545					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2546					Minimum	1.1562E-6					Mean	0.00125
2547					Maximum	0.01					Median	1.6381E-6
2548					SD	0.00353					CV	2.825

	A	B	C	D	E	F	G	H	I	J	K	L
2549					k hat (MLE)	0.14				k star (bias corrected MLE)		0.171
2550					Theta hat (MLE)	0.00892				Theta star (bias corrected MLE)		0.00732
2551					nu hat (MLE)	2.244				nu star (bias corrected)		2.736
2552					Adjusted Level of Significance (β)	0.0195						
2553					Approximate Chi Square Value (2.74, α)	0.299				Adjusted Chi Square Value (2.74, β)		0.172
2554					95% Gamma Approximate UCL (use when n>=50)	0.0115				95% Gamma Adjusted UCL (use when n<50)		0.0199
2555												
2556					**Estimates of Gamma Parameters using KM Estimates**							
2557					Mean (KM)	1.6460E-6				SD (KM)		4.4031E-7
2558					Variance (KM)	1.939E-13				SE of Mean (KM)		1.6815E-7
2559					k hat (KM)	13.98				k star (KM)		8.818
2560					nu hat (KM)	223.6				nu star (KM)		141.1
2561					theta hat (KM)	1.1778E-7				theta star (KM)		1.8667E-7
2562					80% gamma percentile (KM)	2.0854E-6				90% gamma percentile (KM)		2.3843E-6
2563					95% gamma percentile (KM)	2.6510E-6				99% gamma percentile (KM)		3.2012E-6
2564												
2565					**Gamma Kaplan-Meier (KM) Statistics**							
2566					Approximate Chi Square Value (141.09, α)	114.6				Adjusted Chi Square Value (141.09, β)		108.6
2567					95% Gamma Approximate KM-UCL (use when n>=50)	2.0258E-6				95% Gamma Adjusted KM-UCL (use when n<50)		2.1383E-6
2568												
2569					**Lognormal GOF Test on Detected Observations Only**							
2570					Shapiro Wilk Test Statistic	0.96				**Shapiro Wilk GOF Test**		
2571					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
2572					Lilliefors Test Statistic	0.219				**Lilliefors GOF Test**		
2573					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
2574					**Detected Data appear Lognormal at 5% Significance Level**							
2575												
2576					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2577					Mean in Original Scale	1.6401E-6				Mean in Log Scale		-13.36
2578					SD in Original Scale	4.7807E-7				SD in Log Scale		0.277
2579					95% t UCL (assumes normality of ROS data)	1.9603E-6				95% Percentile Bootstrap UCL		1.9084E-6
2580					95% BCA Bootstrap UCL	1.9591E-6				95% Bootstrap t UCL		2.1774E-6
2581					95% H-UCL (Log ROS)	2.0354E-6						
2582												
2583					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2584					KM Mean (logged)	-13.35				KM Geo Mean		1.5929E-6
2585					KM SD (logged)	0.252				95% Critical H Value (KM-Log)		2
2586					KM Standard Error of Mean (logged)	0.0961				95% H-UCL (KM -Log)		1.9888E-6
2587					KM SD (logged)	0.252				95% Critical H Value (KM-Log)		2
2588					KM Standard Error of Mean (logged)	0.0961						
2589												
2590					**DL/2 Statistics**							
2591					**DL/2 Normal**					**DL/2 Log-Transformed**		
2592					Mean in Original Scale	1.5768E-6				Mean in Log Scale		-13.43
2593					SD in Original Scale	5.8091E-7				SD in Log Scale		0.43
2594					95% t UCL (Assumes normality)	1.9659E-6				95% H-Stat UCL		2.3194E-6
2595					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2596												
2597					**Nonparametric Distribution Free UCL Statistics**							
2598					**Detected Data appear Normal Distributed at 5% Significance Level**							
2599												
2600					**Suggested UCL to Use**							

2601					95% KM (t) UCL	1.96E-06						
2602												
2603	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2604	Recommendations are based upon data size, data distribution, and skewness.											
2605	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2606	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2607												
2608	**TEQ-ND=1/2DL (smw7)**											
2609												
2610	**General Statistics**											
2611					Total Number of Observations	4			Number of Distinct Observations	4		
2612					Number of Detects	1			Number of Non-Detects	3		
2613					Number of Distinct Detects	1			Number of Distinct Non-Detects	3		
2614												
2615	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
2616	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
2617												
2618	**The data set for variable TEQ-ND=1/2DL (smw7) was not processed!**											
2619												
2620												
2621	**TEQ-ND=1/2DL (smw8)**											
2622												
2623	**General Statistics**											
2624					Total Number of Observations	5			Number of Distinct Observations	5		
2625					Number of Detects	3			Number of Non-Detects	2		
2626					Number of Distinct Detects	3			Number of Distinct Non-Detects	2		
2627					Minimum Detect	1.0176E-6			Minimum Non-Detect	1.1763E-6		
2628					Maximum Detect	2.0705E-6			Maximum Non-Detect	1.3498E-6		
2629					Variance Detects	2.783E-13			Percent Non-Detects	40%		
2630					Mean Detects	1.5245E-6			SD Detects	5.2751E-7		
2631					Median Detects	1.4853E-6			CV Detects	N/A		
2632					Skewness Detects	0.332			Kurtosis Detects	N/A		
2633					Mean of Logged Detects	-13.44			SD of Logged Detects	0.355		
2634												
2635	**Warning: Data set has only 3 Detected Values.**											
2636	**This is not enough to compute meaningful or reliable statistics and estimates.**											
2637												
2638												
2639	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2640	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2641	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2642	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2643												
2644	**Normal GOF Test on Detects Only**											
2645					Shapiro Wilk Test Statistic	0.996			**Shapiro Wilk GOF Test**			
2646					5% Shapiro Wilk Critical Value	0.767			Detected Data appear Normal at 5% Significance Level			
2647					Lilliefors Test Statistic	0.196			**Lilliefors GOF Test**			
2648					5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level			
2649	**Detected Data appear Normal at 5% Significance Level**											
2650												
2651	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2652					KM Mean	1.3217E-6			KM Standard Error of Mean	2.2779E-7		

2653					KM SD	4.1588E-7				95% KM (BCA) UCL		N/A
2654					95% KM (t) UCL	1.8073E-6				95% KM (Percentile Bootstrap) UCL		N/A
2655					95% KM (z) UCL	1.6964E-6				95% KM Bootstrap t UCL		N/A
2656					90% KM Chebyshev UCL	2.0051E-6				95% KM Chebyshev UCL		2.3146E-6
2657					97.5% KM Chebyshev UCL	2.7443E-6				99% KM Chebyshev UCL		3.5882E-6
2658												
2659					**Gamma GOF Tests on Detected Observations Only**							
2660					**Not Enough Data to Perform GOF Test**							
2661												
2662					**Gamma Statistics on Detected Data Only**							
2663					k hat (MLE)	12.26				k star (bias corrected MLE)		N/A
2664					Theta hat (MLE)	1.2439E-7				Theta star (bias corrected MLE)		N/A
2665					nu hat (MLE)	73.53				nu star (bias corrected)		N/A
2666					Mean (detects)	1.5245E-6						
2667												
2668					**Gamma ROS Statistics using Imputed Non-Detects**							
2669					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2670					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2671					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2672					This is especially true when the sample size is small.							
2673					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2674					Minimum	1.0176E-6				Mean		0.004
2675					Maximum	0.01				Median		2.0705E-6
2676					SD	0.00548				CV		1.369
2677					k hat (MLE)	0.172				k star (bias corrected MLE)		0.202
2678					Theta hat (MLE)	0.0233				Theta star (bias corrected MLE)		0.0198
2679					nu hat (MLE)	1.719				nu star (bias corrected)		2.021
2680					Adjusted Level of Significance (β)	0.0086						
2681					Approximate Chi Square Value (2.02, α)	0.154				Adjusted Chi Square Value (2.02, β)		0.0706
2682					95% Gamma Approximate UCL (use when n>=50)	0.0527				95% Gamma Adjusted UCL (use when n<50)		N/A
2683												
2684					**Estimates of Gamma Parameters using KM Estimates**							
2685					Mean (KM)	1.3217E-6				SD (KM)		4.1588E-7
2686					Variance (KM)	1.730E-13				SE of Mean (KM)		2.2779E-7
2687					k hat (KM)	10.1				k star (KM)		4.174
2688					nu hat (KM)	101				nu star (KM)		41.74
2689					theta hat (KM)	1.3085E-7				theta star (KM)		3.1668E-7
2690					80% gamma percentile (KM)	1.8134E-6				90% gamma percentile (KM)		2.1888E-6
2691					95% gamma percentile (KM)	2.5336E-6				99% gamma percentile (KM)		3.2684E-6
2692												
2693					**Gamma Kaplan-Meier (KM) Statistics**							
2694					Approximate Chi Square Value (41.74, α)	27.93				Adjusted Chi Square Value (41.74, β)		23.11
2695					95% Gamma Approximate KM-UCL (use when n>=50)	1.9752E-6				95% Gamma Adjusted KM-UCL (use when n<50)		2.3871E-6
2696												
2697					**Lognormal GOF Test on Detected Observations Only**							
2698					Shapiro Wilk Test Statistic	0.999				**Shapiro Wilk GOF Test**		
2699					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
2700					Lilliefors Test Statistic	0.184				**Lilliefors GOF Test**		
2701					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
2702					**Detected Data appear Lognormal at 5% Significance Level**							
2703												
2704					**Lognormal ROS Statistics Using Imputed Non-Detects**							

2705				Mean in Original Scale	1.3126E-6					Mean in Log Scale	-13.59	
2706				SD in Original Scale	4.7254E-7					SD in Log Scale	0.328	
2707				95% t UCL (assumes normality of ROS data)	1.7631E-6					95% Percentile Bootstrap UCL	N/A	
2708				95% BCA Bootstrap UCL	N/A					95% Bootstrap t UCL	N/A	
2709				95% H-UCL (Log ROS)	1.9837E-6							
2710												
2711	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2712				KM Mean (logged)	-13.58					KM Geo Mean	1.2651E-6	
2713				KM SD (logged)	0.287					95% Critical H Value (KM-Log)	2.372	
2714				KM Standard Error of Mean (logged)	0.157					95% H-UCL (KM -Log)	1.8517E-6	
2715				KM SD (logged)	0.287					95% Critical H Value (KM-Log)	2.372	
2716				KM Standard Error of Mean (logged)	0.157							
2717												
2718	**DL/2 Statistics**											
2719	**DL/2 Normal**									**DL/2 Log-Transformed**		
2720				Mean in Original Scale	1.1673E-6					Mean in Log Scale	-13.77	
2721				SD in Original Scale	6.1586E-7					SD in Log Scale	0.528	
2722				95% t UCL (Assumes normality)	1.7544E-6					95% H-Stat UCL	2.6739E-6	
2723	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2724												
2725	**Nonparametric Distribution Free UCL Statistics**											
2726	**Detected Data appear Normal Distributed at 5% Significance Level**											
2727												
2728	**Suggested UCL to Use**											
2729				95% KM (t) UCL	1.81E-06							
2730												
2731	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2732	Recommendations are based upon data size, data distribution, and skewness.											
2733	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2734	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2735												
2736	**TEQ-ND=1/2DL (smw9)**											
2737												
2738	**General Statistics**											
2739				Total Number of Observations	9					Number of Distinct Observations	9	
2740				Number of Detects	8					Number of Non-Detects	1	
2741				Number of Distinct Detects	8					Number of Distinct Non-Detects	1	
2742				Minimum Detect	1.0489E-6					Minimum Non-Detect	1.1186E-6	
2743				Maximum Detect	2.6706E-6					Maximum Non-Detect	1.1186E-6	
2744				Variance Detects	3.027E-13					Percent Non-Detects	11.11%	
2745				Mean Detects	1.5901E-6					SD Detects	5.5017E-7	
2746				Median Detects	1.4229E-6					CV Detects	N/A	
2747				Skewness Detects	1.208					Kurtosis Detects	0.953	
2748				Mean of Logged Detects	-13.4					SD of Logged Detects	0.319	
2749												
2750	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2751	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2752	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2753	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2754												
2755	**Normal GOF Test on Detects Only**											
2756				Shapiro Wilk Test Statistic	0.884					**Shapiro Wilk GOF Test**		

	A	B	C	D	E	F	G	H	I	J	K	L
2757	5% Shapiro Wilk Critical Value					0.818	Detected Data appear Normal at 5% Significance Level					
2758	Lilliefors Test Statistic					0.216	**Lilliefors GOF Test**					
2759	5% Lilliefors Critical Value					0.283	Detected Data appear Normal at 5% Significance Level					
2760	**Detected Data appear Normal at 5% Significance Level**											
2761												
2762	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2763	KM Mean					1.5300E-6	KM Standard Error of Mean					1.8322E-7
2764	KM SD					5.1416E-7	95% KM (BCA) UCL					1.8601E-6
2765	95% KM (t) UCL					1.8707E-6	95% KM (Percentile Bootstrap) UCL					1.8460E-6
2766	95% KM (z) UCL					1.8314E-6	95% KM Bootstrap t UCL					2.0941E-6
2767	90% KM Chebyshev UCL					2.0797E-6	95% KM Chebyshev UCL					2.3286E-6
2768	97.5% KM Chebyshev UCL					2.6742E-6	99% KM Chebyshev UCL					3.3530E-6
2769												
2770	**Gamma GOF Tests on Detected Observations Only**											
2771	A-D Test Statistic					0.345	**Anderson-Darling GOF Test**					
2772	5% A-D Critical Value					0.715	Detected data appear Gamma Distributed at 5% Significance Level					
2773	K-S Test Statistic					0.224	**Kolmogorov-Smirnov GOF**					
2774	5% K-S Critical Value					0.294	Detected data appear Gamma Distributed at 5% Significance Level					
2775	**Detected data appear Gamma Distributed at 5% Significance Level**											
2776												
2777	**Gamma Statistics on Detected Data Only**											
2778	k hat (MLE)					10.82	k star (bias corrected MLE)					6.844
2779	Theta hat (MLE)					1.4699E-7	Theta star (bias corrected MLE)					2.3233E-7
2780	nu hat (MLE)					173.1	nu star (bias corrected)					109.5
2781	Mean (detects)					1.5901E-6						
2782												
2783	**Gamma ROS Statistics using Imputed Non-Detects**											
2784	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2785	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2786	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2787	This is especially true when the sample size is small.											
2788	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2789	Minimum					1.0489E-6	Mean					0.00111
2790	Maximum					0.01	Median					1.5697E-6
2791	SD					0.00333	CV					2.996
2792	k hat (MLE)					0.138	k star (bias corrected MLE)					0.166
2793	Theta hat (MLE)					0.00804	Theta star (bias corrected MLE)					0.00669
2794	nu hat (MLE)					2.49	nu star (bias corrected)					2.993
2795	Adjusted Level of Significance (β)					0.0231						
2796	Approximate Chi Square Value (2.99, α)					0.37	Adjusted Chi Square Value (2.99, β)					0.234
2797	95% Gamma Approximate UCL (use when n>=50)					0.00899	95% Gamma Adjusted UCL (use when n<50)					0.0142
2798												
2799	**Estimates of Gamma Parameters using KM Estimates**											
2800	Mean (KM)					1.5300E-6	SD (KM)					5.1416E-7
2801	Variance (KM)					2.644E-13	SE of Mean (KM)					1.8322E-7
2802	k hat (KM)					8.855	k star (KM)					5.977
2803	nu hat (KM)					159.4	nu star (KM)					107.6
2804	theta hat (KM)					1.7278E-7	theta star (KM)					2.5596E-7
2805	80% gamma percentile (KM)					2.0168E-6	90% gamma percentile (KM)					2.3666E-6
2806	95% gamma percentile (KM)					2.6832E-6	99% gamma percentile (KM)					3.3467E-6
2807												
2808	**Gamma Kaplan-Meier (KM) Statistics**											

2809	Approximate Chi Square Value (107.59, α)					84.65	Adjusted Chi Square Value (107.59, β)					80.37
2810	95% Gamma Approximate KM-UCL (use when n>=50)					1.9446E-6	95% Gamma Adjusted KM-UCL (use when n<50)					2.0482E-6
2811												
2812	**Lognormal GOF Test on Detected Observations Only**											
2813	Shapiro Wilk Test Statistic					0.936	**Shapiro Wilk GOF Test**					
2814	5% Shapiro Wilk Critical Value					0.818	Detected Data appear Lognormal at 5% Significance Level					
2815	Lilliefors Test Statistic					0.206	**Lilliefors GOF Test**					
2816	5% Lilliefors Critical Value					0.283	Detected Data appear Lognormal at 5% Significance Level					
2817	**Detected Data appear Lognormal at 5% Significance Level**											
2818												
2819	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2820	Mean in Original Scale					1.5135E-6	Mean in Log Scale					-13.46
2821	SD in Original Scale					5.6368E-7	SD in Log Scale					0.346
2822	95% t UCL (assumes normality of ROS data)					1.8629E-6	95% Percentile Bootstrap UCL					1.8147E-6
2823	95% BCA Bootstrap UCL					1.8886E-6	95% Bootstrap t UCL					2.1139E-6
2824	95% H-UCL (Log ROS)					1.9561E-6						
2825												
2826	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2827	KM Mean (logged)					-13.44	KM Geo Mean					1.4563E-6
2828	KM SD (logged)					0.305	95% Critical H Value (KM-Log)					2.016
2829	KM Standard Error of Mean (logged)					0.109	95% H-UCL (KM -Log)					1.8953E-6
2830	KM SD (logged)					0.305	95% Critical H Value (KM-Log)					2.016
2831	KM Standard Error of Mean (logged)					0.109						
2832												
2833	**DL/2 Statistics**											
2834	**DL/2 Normal**						**DL/2 Log-Transformed**					
2835	Mean in Original Scale					1.4756E-6	Mean in Log Scale					-13.51
2836	SD in Original Scale					6.1880E-7	SD in Log Scale					0.447
2837	95% t UCL (Assumes normality)					1.8592E-6	95% H-Stat UCL					2.1186E-6
2838	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2839												
2840	**Nonparametric Distribution Free UCL Statistics**											
2841	**Detected Data appear Normal Distributed at 5% Significance Level**											
2842												
2843	**Suggested UCL to Use**											
2844	95% KM (t) UCL					1.87E-06						
2845												
2846	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2847	Recommendations are based upon data size, data distribution, and skewness.											
2848	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2849	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2850												
2851												
2852	**TEQ-ND=1/2DL (tw2r)**											
2853												
2854	**General Statistics**											
2855	Total Number of Observations					9	Number of Distinct Observations					9
2856							Number of Missing Observations					0
2857	Minimum					8.0110E-7	Mean					1.4381E-6
2858	Maximum					3.0441E-6	Median					1.1643E-6
2859	SD					6.9331E-7	Std. Error of Mean					2.3110E-7
2860	Coefficient of Variation					N/A	Skewness					1.844

	A	B	C	D	E	F	G	H	I	J	K	L
2861												
2862	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2863	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2864	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2865	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2866												
2867	**Normal GOF Test**											
2868	Shapiro Wilk Test Statistic					0.798	**Shapiro Wilk GOF Test**					
2869	5% Shapiro Wilk Critical Value					0.829	Data Not Normal at 5% Significance Level					
2870	Lilliefors Test Statistic					0.251	**Lilliefors GOF Test**					
2871	5% Lilliefors Critical Value					0.274	Data appear Normal at 5% Significance Level					
2872	**Data appear Approximate Normal at 5% Significance Level**											
2873												
2874	**Assuming Normal Distribution**											
2875	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2876	95% Student's-t UCL					1.8679E-6	95% Adjusted-CLT UCL (Chen-1995)					1.9701E-6
2877							95% Modified-t UCL (Johnson-1978)					1.8916E-6
2878												
2879	**Gamma GOF Test**											
2880	A-D Test Statistic					0.531	**Anderson-Darling Gamma GOF Test**					
2881	5% A-D Critical Value					0.722	Detected data appear Gamma Distributed at 5% Significance Level					
2882	K-S Test Statistic					0.22	**Kolmogorov-Smirnov Gamma GOF Test**					
2883	5% K-S Critical Value					0.28	Detected data appear Gamma Distributed at 5% Significance Level					
2884	**Detected data appear Gamma Distributed at 5% Significance Level**											
2885												
2886	**Gamma Statistics**											
2887	k hat (MLE)					6.298	k star (bias corrected MLE)					4.272
2888	Theta hat (MLE)					2.2836E-7	Theta star (bias corrected MLE)					3.3660E-7
2889	nu hat (MLE)					113.4	nu star (bias corrected)					76.9
2890	MLE Mean (bias corrected)					1.4381E-6	MLE Sd (bias corrected)					6.9576E-7
2891							Approximate Chi Square Value (0.05)					57.7
2892	Adjusted Level of Significance					0.0231	Adjusted Chi Square Value					54.21
2893												
2894	**Assuming Gamma Distribution**											
2895	95% Approximate Gamma UCL (use when n>=50))					1.9167E-6	95% Adjusted Gamma UCL (use when n<50)					2.0402E-6
2896												
2897	**Lognormal GOF Test**											
2898	Shapiro Wilk Test Statistic					0.915	**Shapiro Wilk Lognormal GOF Test**					
2899	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
2900	Lilliefors Test Statistic					0.193	**Lilliefors Lognormal GOF Test**					
2901	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
2902	**Data appear Lognormal at 5% Significance Level**											
2903												
2904	**Lognormal Statistics**											
2905	Minimum of Logged Data					-14.04	Mean of logged Data					-13.53
2906	Maximum of Logged Data					-12.7	SD of logged Data					0.406
2907												
2908	**Assuming Lognormal Distribution**											
2909	95% H-UCL					1.9566E-6	90% Chebyshev (MVUE) UCL					2.0096E-6
2910	95% Chebyshev (MVUE) UCL					2.2742E-6	97.5% Chebyshev (MVUE) UCL					2.6414E-6
2911	99% Chebyshev (MVUE) UCL					3.3628E-6						
2912												

	A	B	C	D	E	F	G	H	I	J	K	L
2913	**Nonparametric Distribution Free UCL Statistics**											
2914	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2915												
2916	**Nonparametric Distribution Free UCLs**											
2917					95% CLT UCL	1.8183E-6			95% Jackknife UCL	1.8679E-6		
2918					95% Standard Bootstrap UCL	1.7948E-6			95% Bootstrap-t UCL	2.4645E-6		
2919					95% Hall's Bootstrap UCL	3.6099E-6			95% Percentile Bootstrap UCL	1.8016E-6		
2920					95% BCA Bootstrap UCL	2.0334E-6						
2921					90% Chebyshev(Mean, Sd) UCL	2.1314E-6			95% Chebyshev(Mean, Sd) UCL	2.4455E-6		
2922					97.5% Chebyshev(Mean, Sd) UCL	2.8814E-6			99% Chebyshev(Mean, Sd) UCL	3.7376E-6		
2923												
2924	**Suggested UCL to Use**											
2925					95% Student's-t UCL	1.87E-06						
2926												
2927	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2928	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2929												
2930	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2931	Recommendations are based upon data size, data distribution, and skewness.											
2932	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2933	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2934												
2935	**TEQ-ND=1/2DL (tw5r)**											
2936												
2937	**General Statistics**											
2938					Total Number of Observations	5			Number of Distinct Observations	5		
2939					Number of Detects	4			Number of Non-Detects	1		
2940					Number of Distinct Detects	4			Number of Distinct Non-Detects	1		
2941					Minimum Detect	1.2521E-6			Minimum Non-Detect	1.0875E-6		
2942					Maximum Detect	1.6237E-6			Maximum Non-Detect	1.0875E-6		
2943					Variance Detects	2.768E-14			Percent Non-Detects	20%		
2944					Mean Detects	1.3797E-6			SD Detects	1.6636E-7		
2945					Median Detects	1.3215E-6			CV Detects	N/A		
2946					Skewness Detects	1.734			Kurtosis Detects	3.218		
2947					Mean of Logged Detects	-13.5			SD of Logged Detects	0.115		
2948												
2949	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2950	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2951	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2952	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2953												
2954	**Normal GOF Test on Detects Only**											
2955					Shapiro Wilk Test Statistic	0.816			**Shapiro Wilk GOF Test**			
2956					5% Shapiro Wilk Critical Value	0.748			Detected Data appear Normal at 5% Significance Level			
2957					Lilliefors Test Statistic	0.353			**Lilliefors GOF Test**			
2958					5% Lilliefors Critical Value	0.375			Detected Data appear Normal at 5% Significance Level			
2959	**Detected Data appear Normal at 5% Significance Level**											
2960												
2961	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2962					KM Mean	1.3213E-6			KM Standard Error of Mean	8.9848E-8		
2963					KM SD	1.7399E-7			95% KM (BCA) UCL	N/A		
2964					95% KM (t) UCL	1.5128E-6			95% KM (Percentile Bootstrap) UCL	N/A		

2965					95% KM (z) UCL	1.4691E-6				95% KM Bootstrap t UCL		N/A
2966					90% KM Chebyshev UCL	1.5908E-6				95% KM Chebyshev UCL		1.7129E-6
2967					97.5% KM Chebyshev UCL	1.8824E-6				99% KM Chebyshev UCL		2.2152E-6
2968												
2969					**Gamma GOF Tests on Detected Observations Only**							
2970					A-D Test Statistic	0.522	**Anderson-Darling GOF Test**					
2971					5% A-D Critical Value	0.656	Detected data appear Gamma Distributed at 5% Significance Level					
2972					K-S Test Statistic	0.361	**Kolmogorov-Smirnov GOF**					
2973					5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level					
2974					**Detected data appear Gamma Distributed at 5% Significance Level**							
2975												
2976					**Gamma Statistics on Detected Data Only**							
2977					k hat (MLE)	97.61	k star (bias corrected MLE)					24.57
2978					Theta hat (MLE)	1.4135E-8	Theta star (bias corrected MLE)					5.6157E-8
2979					nu hat (MLE)	780.9	nu star (bias corrected)					196.5
2980					Mean (detects)	1.3797E-6						
2981												
2982					**Gamma ROS Statistics using Imputed Non-Detects**							
2983					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2984					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2985					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2986					This is especially true when the sample size is small.							
2987					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2988					Minimum	1.2521E-6	Mean					0.002
2989					Maximum	0.01	Median					1.3362E-6
2990					SD	0.00447	CV					2.235
2991					k hat (MLE)	0.141	k star (bias corrected MLE)					0.19
2992					Theta hat (MLE)	0.0142	Theta star (bias corrected MLE)					0.0106
2993					nu hat (MLE)	1.409	nu star (bias corrected)					1.897
2994					Adjusted Level of Significance (β)	0.0086						
2995					Approximate Chi Square Value (1.90, α)	0.138	Adjusted Chi Square Value (1.90, β)					0.0665
2996					95% Gamma Approximate UCL (use when n>=50)	0.0274	95% Gamma Adjusted UCL (use when n<50)					N/A
2997												
2998					**Estimates of Gamma Parameters using KM Estimates**							
2999					Mean (KM)	1.3213E-6	SD (KM)					1.7399E-7
3000					Variance (KM)	3.027E-14	SE of Mean (KM)					8.9848E-8
3001					k hat (KM)	57.67	k star (KM)					23.2
3002					nu hat (KM)	576.7	nu star (KM)					232
3003					theta hat (KM)	2.2911E-8	theta star (KM)					5.6950E-8
3004					80% gamma percentile (KM)	1.5449E-6	90% gamma percentile (KM)					1.6827E-6
3005					95% gamma percentile (KM)	1.8025E-6	99% gamma percentile (KM)					2.0416E-6
3006												
3007					**Gamma Kaplan-Meier (KM) Statistics**							
3008					Approximate Chi Square Value (232.01, α)	197.7	Adjusted Chi Square Value (232.01, β)					183.8
3009					95% Gamma Approximate KM-UCL (use when n>=50)	1.5502E-6	95% Gamma Adjusted KM-UCL (use when n<50)					1.6676E-6
3010												
3011					**Lognormal GOF Test on Detected Observations Only**							
3012					Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk GOF Test**					
3013					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level					
3014					Lilliefors Test Statistic	0.342	**Lilliefors GOF Test**					
3015					5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level					
3016					**Detected Data appear Lognormal at 5% Significance Level**							

	A	B	C	D	E	F	G	H	I	J	K	L
3017												
3018	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3019					Mean in Original Scale	1.3095E-6				Mean in Log Scale		-13.56
3020					SD in Original Scale	2.1315E-7				SD in Log Scale		0.163
3021				95% t UCL (assumes normality of ROS data)		1.5127E-6				95% Percentile Bootstrap UCL		1.4453E-6
3022					95% BCA Bootstrap UCL	1.4472E-6				95% Bootstrap t UCL		1.5250E-6
3023					95% H-UCL (Log ROS)	1.5626E-6						
3024												
3025	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3026					KM Mean (logged)	-13.55				KM Geo Mean		1.3102E-6
3027					KM SD (logged)	0.129				95% Critical H Value (KM-Log)		2.078
3028				KM Standard Error of Mean (logged)		0.0666				95% H-UCL (KM -Log)		1.5106E-6
3029					KM SD (logged)	0.129				95% Critical H Value (KM-Log)		2.078
3030				KM Standard Error of Mean (logged)		0.0666						
3031												
3032	**DL/2 Statistics**											
3033	**DL/2 Normal**						**DL/2 Log-Transformed**					
3034					Mean in Original Scale	1.2125E-6				Mean in Log Scale		-13.68
3035					SD in Original Scale	4.0066E-7				SD in Log Scale		0.426
3036					95% t UCL (Assumes normality)	1.5945E-6				95% H-Stat UCL		2.2307E-6
3037	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3038												
3039	**Nonparametric Distribution Free UCL Statistics**											
3040	**Detected Data appear Normal Distributed at 5% Significance Level**											
3041												
3042	**Suggested UCL to Use**											
3043					95% KM (t) UCL	1.51E-06						
3044												
3045	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3046	Recommendations are based upon data size, data distribution, and skewness.											
3047	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3048	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3049												
3050												
3051	**TEQ-ND=1/2DL (waste water clarifier well)**											
3052												
3053	**General Statistics**											
3054					Total Number of Observations	1				Number of Distinct Observations		1
3055										Number of Missing Observations		0
3056					Minimum	1.4269E-6				Mean		1.4269E-6
3057					Maximum	1.4269E-6				Median		1.4269E-6
3058												
3059	**Warning: This data set only has 1 observations!**											
3060	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
3061	**The data set for variable TEQ-ND=1/2DL (waste water clarifier well) was not processed!**											
3062												
3063	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
3064	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											

1			**General Statistics on Uncensored Data**									
2	Date/Time of Computation		ProUCL 5.15/7/2021 12:37:59 PM									
3	**User Selected Options**											
4	From File		OU3 ProUCL Input 05.07.2021.xls									
5	Full Precision		OFF									
6												
7	**From File: OU3 ProUCL Input 05.07.2021.xls**											
8												
9	**General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method**											
10												
11	**Variable**	**NumObs**	**# Missing**	**Num Ds**	**NumNDs**	**% NDs**	**Min ND**	**Max ND**	**KM Mean**	**KM Var**	**KM SD**	**KM CV**
12	Aluminum (atmw6)	9	0	9	0	0.00%	N/A	N/A	208	24529	156.6	0.753
13	Aluminum (nfmw10)	8	0	8	0	0.00%	N/A	N/A	119.4	3153	56.15	0.47
14	Aluminum (nfmw11)	8	0	4	4	50.00%	8.1	113	18.19	119.4	10.93	0.601
15	Aluminum (nfmw12)	8	0	8	0	0.00%	N/A	N/A	57.43	8105	90.03	1.568
16	Aluminum (nfmw19)	8	0	8	0	0.00%	N/A	N/A	3395	20291504	4505	1.327
17	Aluminum (nfmw1d)	9	0	9	0	0.00%	N/A	N/A	110.2	618.4	24.87	0.226
18	Aluminum (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	2302	8954854	2992	1.3
19	Aluminum (nfmw2)	9	0	7	2	22.22%	27.7	113	64.24	11873	109	1.696
20	Aluminum (nfmw20)	8	0	7	1	12.50%	113	113	41.21	133.1	11.54	0.28
21	Aluminum (nfmw22)	4	0	4	0	0.00%	N/A	N/A	149.3	320.9	17.91	0.12
22	Aluminum (nfmw23)	4	0	4	0	0.00%	N/A	N/A	143.3	587.6	24.24	0.169
23	Aluminum (nfmw3)	9	0	8	1	11.11%	400	400	53.55	183.2	13.53	0.253
24	Aluminum (nfmw4)	9	0	8	1	11.11%	113	113	22.26	104	10.2	0.458
25	Aluminum (nfmw7)	9	0	8	1	11.11%	28.2	28.2	100.6	11383	106.7	1.061
26	Aluminum (nfmw8)	8	0	5	3	37.50%	35.5	113	38.83	896.7	29.95	0.771
27	Aluminum (nfmw9)	8	0	8	0	0.00%	N/A	N/A	134.5	5140	71.69	0.533
28	Aluminum (smw10)	8	0	7	1	12.50%	113	113	65.36	284	16.85	0.258
29	Aluminum (smw11)	9	0	8	1	11.11%	400	400	123.9	2452	49.51	0.4
30	Aluminum (smw12)	8	0	8	0	0.00%	N/A	N/A	237.6	17608	132.7	0.559
31	Aluminum (smw13)	8	0	7	1	12.50%	113	113	81.26	2588	50.87	0.626
32	Aluminum (smw14)	8	0	5	3	37.50%	23.2	113	59.41	12703	112.7	1.897
33	Aluminum (smw15)	9	0	9	0	0.00%	N/A	N/A	788.7	253744	503.7	0.639
34	Aluminum (smw16)	9	0	9	0	0.00%	N/A	N/A	210.5	7518	86.71	0.412
35	Aluminum (smw16d)	8	0	4	4	50.00%	8.1	113	20.24	1046	32.34	1.598
36	Aluminum (smw17)	8	0	8	0	0.00%	N/A	N/A	394.2	24653	157	0.398
37	Aluminum (smw17d)	8	0	5	3	37.50%	8.1	113	13.1	37.89	6.156	0.47
38	Aluminum (smw18)	8	0	8	0	0.00%	N/A	N/A	231.1	10531	102.6	0.444
39	Aluminum (smw18d)	8	0	6	2	25.00%	25.5	113	54.96	949.8	30.82	0.561
40	Aluminum (smw19)	8	0	6	2	25.00%	35.5	113	49.62	444.3	21.08	0.425
41	Aluminum (smw7)	8	0	2	6	75.00%	5.6	113	4.15	0.903	0.95	0.229
42	Aluminum (smw8)	8	0	4	4	50.00%	8.1	20	43.09	7667	87.56	2.032
43	Aluminum (smw9)	9	0	5	4	44.44%	8.1	113	21.93	116.6	10.8	0.492
44	Aluminum (tw2r)	9	0	3	6	66.67%	8.2	40.3	34.76	3482	59.01	1.698
45	Aluminum (tw5r)	8	0	6	2	25.00%	5.6	8.1	212.7	110341	332.2	1.561
46	Aluminum (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
47	Antimony (atmw6)	9	0	2	7	77.78%	0.11	0.38	0.168	0.0131	0.115	0.682
48	Antimony (nfmw10)	8	0	5	3	37.50%	0.24	1.5	0.372	0.0287	0.169	0.456
49	Antimony (nfmw11)	8	0	0	8	100.00%	0.077	1.5	N/A	N/A	N/A	N/A
50	Antimony (nfmw12)	8	0	2	6	75.00%	0.077	0.38	0.0859	3.3055E-4	0.0182	0.212
51	Antimony (nfmw19)	8	0	0	8	100.00%	0.077	1.5	N/A	N/A	N/A	N/A
52	Antimony (nfmw1d)	9	0	5	4	44.44%	0.25	1.5	0.346	0.00794	0.0891	0.257
53	Antimony (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	4.399	6.33	2.516	0.572
54	Antimony (nfmw2)	9	0	2	7	77.78%	0.077	1.5	0.0967	0.00135	0.0367	0.38
55	Antimony (nfmw20)	8	0	3	5	62.50%	0.14	1.5	0.183	0.00147	0.0383	0.21
56	Antimony (nfmw22)	4	0	4	0	0.00%	N/A	N/A	0.61	0.00333	0.0577	0.0946
57	Antimony (nfmw23)	4	0	4	0	0.00%	N/A	N/A	0.988	0.00569	0.0754	0.0764
58	Antimony (nfmw3)	9	0	4	5	55.56%	0.25	1.5	0.143	8.1875E-4	0.0286	0.201

	A	B	C	D	E	F	G	H	I	J	K	L	M
59		Antimony (nfmw4)	9	0	6	3	33.33%	0.25	1.5	0.175	0.00183	0.0427	0.244
60		Antimony (nfmw7)	9	0	9	0	0.00%	N/A	N/A	1.19	0.29	0.539	0.453
61		Antimony (nfmw8)	8	0	2	6	75.00%	0.077	1.5	0.077	4.8000E-5	0.00693	0.09
62		Antimony (nfmw9)	8	0	5	3	37.50%	0.33	1.5	0.601	0.0543	0.233	0.388
63		Antimony (smw10)	8	0	3	5	62.50%	0.35	1.5	0.441	0.0112	0.106	0.239
64		Antimony (smw11)	9	0	7	2	22.22%	0.42	1.5	0.689	0.0181	0.134	0.195
65		Antimony (smw12)	8	0	3	5	62.50%	0.18	1.5	0.325	0.0228	0.151	0.464
66		Antimony (smw13)	8	0	3	5	62.50%	0.31	1.5	0.358	0.00238	0.0488	0.136
67		Antimony (smw14)	8	0	6	2	25.00%	0.49	1.5	0.603	0.0165	0.129	0.213
68		Antimony (smw15)	9	0	5	4	44.44%	0.15	0.38	0.322	0.0408	0.202	0.627
69		Antimony (smw16)	9	0	7	2	22.22%	0.25	1.5	0.926	0.113	0.336	0.363
70		Antimony (smw16d)	8	0	5	3	37.50%	0.2	1.5	0.223	0.00151	0.0389	0.174
71		Antimony (smw17)	8	0	5	3	37.50%	0.38	1.5	1.033	0.133	0.365	0.353
72		Antimony (smw17d)	8	0	2	6	75.00%	0.077	1.5	0.0774	4.6240E-5	0.0068	0.0879
73		Antimony (smw18)	8	0	2	6	75.00%	0.32	1.5	0.438	0.0281	0.168	0.382
74		Antimony (smw18d)	8	0	5	3	37.50%	0.2	1.5	0.218	2.3447E-4	0.0153	0.0702
75		Antimony (smw19)	8	0	4	4	50.00%	0.077	1.5	0.214	0.045	0.212	0.991
76		Antimony (smw7)	8	0	2	6	75.00%	0.25	1.5	0.17	0	0	N/A
77		Antimony (smw8)	8	0	1	7	87.50%	0.077	1.5	0.0802	4.0960E-5	0.0064	0.0798
78		Antimony (smw9)	9	0	3	6	66.67%	0.3	1.5	0.408	0.02	0.141	0.347
79		Antimony (tw2r)	9	0	2	7	77.78%	0.14	0.5	0.137	8.8889E-5	0.00943	0.069
80		Antimony (tw5r)	8	0	2	6	75.00%	0.18	1.5	0.223	0.00485	0.0696	0.312
81		Antimony (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
82		Arsenic (atmw6)	9	0	9	0	0.00%	N/A	N/A	6.544	6.943	2.635	0.403
83		Arsenic (nfmw10)	8	0	8	0	0.00%	N/A	N/A	14.58	16.94	4.116	0.282
84		Arsenic (nfmw11)	8	0	8	0	0.00%	N/A	N/A	3.3	0.369	0.607	0.184
85		Arsenic (nfmw12)	8	0	8	0	0.00%	N/A	N/A	1.145	0.815	0.903	0.789
86		Arsenic (nfmw19)	8	0	8	0	0.00%	N/A	N/A	3.575	2.296	1.515	0.424
87		Arsenic (nfmw1d)	9	0	9	0	0.00%	N/A	N/A	18.71	9.101	3.017	0.161
88		Arsenic (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	11.14	50.74	7.123	0.639
89		Arsenic (nfmw2)	9	0	9	0	0.00%	N/A	N/A	8.644	24.69	4.969	0.575
90		Arsenic (nfmw20)	8	0	8	0	0.00%	N/A	N/A	3.963	1.191	1.091	0.275
91		Arsenic (nfmw22)	4	0	4	0	0.00%	N/A	N/A	12.63	2.076	1.441	0.114
92		Arsenic (nfmw23)	4	0	4	0	0.00%	N/A	N/A	60.78	95.95	9.795	0.161
93		Arsenic (nfmw3)	9	0	9	0	0.00%	N/A	N/A	4.6	4.59	2.142	0.466
94		Arsenic (nfmw4)	9	0	8	1	11.11%	2.3	2.3	2.781	2.003	1.415	0.509
95		Arsenic (nfmw7)	9	0	9	0	0.00%	N/A	N/A	3.578	10.08	3.175	0.887
96		Arsenic (nfmw8)	8	0	8	0	0.00%	N/A	N/A	4.05	0.5	0.707	0.175
97		Arsenic (nfmw9)	8	0	8	0	0.00%	N/A	N/A	18.54	144.5	12.02	0.648
98		Arsenic (smw10)	8	0	8	0	0.00%	N/A	N/A	32.21	6.376	2.525	0.0784
99		Arsenic (smw11)	9	0	9	0	0.00%	N/A	N/A	34.74	74.17	8.612	0.248
100		Arsenic (smw12)	8	0	8	0	0.00%	N/A	N/A	12.11	25.05	5.005	0.413
101		Arsenic (smw13)	8	0	8	0	0.00%	N/A	N/A	6.025	19.13	4.373	0.726
102		Arsenic (smw14)	8	0	8	0	0.00%	N/A	N/A	18.41	27.64	5.257	0.286
103		Arsenic (smw15)	9	0	9	0	0.00%	N/A	N/A	2.921	13.29	3.646	1.248
104		Arsenic (smw16)	9	0	9	0	0.00%	N/A	N/A	25.93	55.92	7.478	0.288
105		Arsenic (smw16d)	8	0	7	1	12.50%	2.3	2.3	1.814	0.0098	0.099	0.0546
106		Arsenic (smw17)	8	0	8	0	0.00%	N/A	N/A	41.6	172.1	13.12	0.315
107		Arsenic (smw17d)	8	0	8	0	0.00%	N/A	N/A	2.975	0.159	0.399	0.134
108		Arsenic (smw18)	8	0	8	0	0.00%	N/A	N/A	7.575	9.776	3.127	0.413
109		Arsenic (smw18d)	8	0	8	0	0.00%	N/A	N/A	4.1	0.263	0.513	0.125
110		Arsenic (smw19)	8	0	7	1	12.50%	2.3	2.3	2.529	0.825	0.908	0.359
111		Arsenic (smw7)	8	0	7	1	12.50%	2.3	2.3	3.05	0.175	0.418	0.137
112		Arsenic (smw8)	8	0	8	0	0.00%	N/A	N/A	5.625	1.082	1.04	0.185
113		Arsenic (smw9)	9	0	9	0	0.00%	N/A	N/A	9.044	1.513	1.23	0.136
114		Arsenic (tw2r)	9	0	8	1	11.11%	0.7	0.7	2.038	6.216	2.493	1.224
115		Arsenic (tw5r)	8	0	7	1	12.50%	2.3	2.3	2.968	4.833	2.198	0.741
116		Arsenic (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A

	A	B	C	D	E	F	G	H	I	J	K	L	M
117		Barium (atmw6)	9	0	9	0	0.00%	N/A	N/A	81.13	271	16.46	0.203
118		Barium (nfmw10)	8	0	8	0	0.00%	N/A	N/A	252.3	3953	62.87	0.249
119		Barium (nfmw11)	8	0	8	0	0.00%	N/A	N/A	130.3	4200	64.81	0.498
120		Barium (nfmw12)	8	0	8	0	0.00%	N/A	N/A	68.35	899.5	29.99	0.439
121		Barium (nfmw19)	8	0	8	0	0.00%	N/A	N/A	33.11	26.8	5.177	0.156
122		Barium (nfmw1d)	9	0	9	0	0.00%	N/A	N/A	483.4	7164	84.64	0.175
123		Barium (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	107.6	14265	119.4	1.11
124		Barium (nfmw2)	9	0	9	0	0.00%	N/A	N/A	176.1	2102	45.84	0.26
125		Barium (nfmw20)	8	0	8	0	0.00%	N/A	N/A	50.46	116.8	10.81	0.214
126		Barium (nfmw22)	4	0	4	0	0.00%	N/A	N/A	40.35	22.9	4.785	0.119
127		Barium (nfmw23)	4	0	4	0	0.00%	N/A	N/A	102.1	338.7	18.4	0.18
128		Barium (nfmw3)	9	0	9	0	0.00%	N/A	N/A	935	37971	194.9	0.208
129		Barium (nfmw4)	9	0	9	0	0.00%	N/A	N/A	113.9	1409	37.54	0.329
130		Barium (nfmw7)	9	0	9	0	0.00%	N/A	N/A	108	353	18.79	0.174
131		Barium (nfmw8)	8	0	8	0	0.00%	N/A	N/A	1096	13297	115.3	0.105
132		Barium (nfmw9)	8	0	8	0	0.00%	N/A	N/A	369.8	69356	263.4	0.712
133		Barium (smw10)	8	0	8	0	0.00%	N/A	N/A	90.36	386.4	19.66	0.218
134		Barium (smw11)	9	0	9	0	0.00%	N/A	N/A	130	1136	33.7	0.259
135		Barium (smw12)	8	0	8	0	0.00%	N/A	N/A	105.5	60.53	7.78	0.0738
136		Barium (smw13)	8	0	8	0	0.00%	N/A	N/A	108	2372	48.71	0.451
137		Barium (smw14)	8	0	8	0	0.00%	N/A	N/A	106.5	810.4	28.47	0.267
138		Barium (smw15)	9	0	9	0	0.00%	N/A	N/A	30.34	181.4	13.47	0.444
139		Barium (smw16)	9	0	9	0	0.00%	N/A	N/A	144.3	539.5	23.23	0.161
140		Barium (smw16d)	8	0	8	0	0.00%	N/A	N/A	44.09	58.48	7.647	0.173
141		Barium (smw17)	8	0	8	0	0.00%	N/A	N/A	113.8	1561	39.5	0.347
142		Barium (smw17d)	8	0	8	0	0.00%	N/A	N/A	61.03	8.068	2.84	0.0465
143		Barium (smw18)	8	0	8	0	0.00%	N/A	N/A	62.16	690	26.27	0.423
144		Barium (smw18d)	8	0	8	0	0.00%	N/A	N/A	47.23	32.92	5.737	0.121
145		Barium (smw19)	8	0	8	0	0.00%	N/A	N/A	147.4	1391	37.3	0.253
146		Barium (smw7)	8	0	8	0	0.00%	N/A	N/A	104.2	199.6	14.13	0.136
147		Barium (smw8)	8	0	8	0	0.00%	N/A	N/A	93.51	189.3	13.76	0.147
148		Barium (smw9)	9	0	9	0	0.00%	N/A	N/A	47.02	107	10.34	0.22
149		Barium (tw2r)	9	0	9	0	0.00%	N/A	N/A	47.39	1024	32.01	0.675
150		Barium (tw5r)	8	0	8	0	0.00%	N/A	N/A	68.5	2854	53.42	0.78
151		Barium (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
152		Cadmium (atmw6)	9	0	3	6	66.67%	0.03	0.14	0.0393	2.1294E-4	0.0146	0.372
153		Cadmium (nfmw10)	8	0	0	8	100.00%	0.028	0.54	N/A	N/A	N/A	N/A
154		Cadmium (nfmw11)	8	0	0	8	100.00%	0.028	0.54	N/A	N/A	N/A	N/A
155		Cadmium (nfmw12)	8	0	1	7	87.50%	0.028	0.14	0.0583	0.00641	0.08	1.374
156		Cadmium (nfmw19)	8	0	6	2	25.00%	0.14	0.54	0.556	0.305	0.553	0.994
157		Cadmium (nfmw1d)	9	0	0	9	100.00%	0.028	1.6	N/A	N/A	N/A	N/A
158		Cadmium (nfmw1s)	7	0	4	3	42.86%	0.15	0.54	0.072	0.00196	0.0443	0.615
159		Cadmium (nfmw2)	9	0	1	8	88.89%	0.028	1.6	0.0314	7.0531E-5	0.0084	0.267
160		Cadmium (nfmw20)	8	0	0	8	100.00%	0.028	0.54	N/A	N/A	N/A	N/A
161		Cadmium (nfmw22)	4	0	2	2	50.00%	0.15	0.15	0.047	1.6000E-5	0.004	0.0851
162		Cadmium (nfmw23)	4	0	3	1	25.00%	0.15	0.15	0.088	0.00174	0.0417	0.474
163		Cadmium (nfmw3)	9	0	0	9	100.00%	0.028	0.54	N/A	N/A	N/A	N/A
164		Cadmium (nfmw4)	9	0	3	6	66.67%	0.013	0.54	0.0215	1.2400E-4	0.0111	0.518
165		Cadmium (nfmw7)	9	0	6	3	33.33%	0.03	0.14	0.0624	0.00121	0.0348	0.557
166		Cadmium (nfmw8)	8	0	0	8	100.00%	0.013	1.6	N/A	N/A	N/A	N/A
167		Cadmium (nfmw9)	8	0	3	5	62.50%	0.028	0.54	0.0946	0.00752	0.0867	0.917
168		Cadmium (smw10)	8	0	1	7	87.50%	0.028	0.54	0.018	0	0	N/A
169		Cadmium (smw11)	9	0	1	8	88.89%	0.028	0.54	0.02	0	0	N/A
170		Cadmium (smw12)	8	0	1	7	87.50%	0.03	0.54	0.044	7.8400E-4	0.028	0.636
171		Cadmium (smw13)	8	0	3	5	62.50%	0.03	0.54	0.0623	8.6319E-4	0.0294	0.472
172		Cadmium (smw14)	8	0	5	3	37.50%	0.14	0.54	0.0898	6.8256E-4	0.0261	0.291
173		Cadmium (smw15)	9	0	8	1	11.11%	0.14	0.14	2.352	4.214	2.053	0.873
174		Cadmium (smw16)	9	0	0	9	100.00%	0.013	0.54	N/A	N/A	N/A	N/A

	A	B	C	D	E	F	G	H	I	J	K	L	M
175		Cadmium (smw16d)	8	0	6	2	25.00%	0.03	0.54	0.0437	1.7078E-4	0.0131	0.299
176		Cadmium (smw17)	8	0	1	7	87.50%	0.03	0.54	0.022	0	0	N/A
177		Cadmium (smw17d)	8	0	5	3	37.50%	0.03	0.54	0.0437	3.1335E-4	0.0177	0.405
178		Cadmium (smw18)	8	0	1	7	87.50%	0.03	0.54	0.0345	6.0750E-5	0.00779	0.226
179		Cadmium (smw18d)	8	0	7	1	12.50%	0.54	0.54	0.0911	4.9212E-4	0.0222	0.243
180		Cadmium (smw19)	8	0	1	7	87.50%	0.028	0.54	0.0398	4.1419E-4	0.0204	0.512
181		Cadmium (smw7)	8	0	6	2	25.00%	0.03	0.54	0.0501	4.7698E-4	0.0218	0.436
182		Cadmium (smw8)	8	0	0	8	100.00%	0.013	0.54	N/A	N/A	N/A	N/A
183		Cadmium (smw9)	9	0	4	5	55.56%	0.03	0.54	0.0387	1.1163E-4	0.0106	0.273
184		Cadmium (tw2r)	9	0	0	9	100.00%	0.013	0.15	N/A	N/A	N/A	N/A
185		Cadmium (tw5r)	8	0	2	6	75.00%	0.028	0.54	0.0265	1.1250E-5	0.00335	0.127
186		Cadmium (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
187		Chromium (atmw6)	9	0	8	1	11.11%	4.6	4.6	1.896	0.513	0.716	0.378
188		Chromium (nfmw10)	8	0	8	0	0.00%	N/A	N/A	4.738	4.186	2.046	0.432
189		Chromium (nfmw11)	8	0	5	3	37.50%	0.8	4.6	0.616	0.12	0.346	0.562
190		Chromium (nfmw12)	8	0	3	5	62.50%	0.26	4.6	0.275	0.00146	0.0383	0.139
191		Chromium (nfmw19)	8	0	4	4	50.00%	0.64	3.2	0.929	0.42	0.648	0.698
192		Chromium (nfmw1d)	9	0	9	0	0.00%	N/A	N/A	6.767	1.775	1.332	0.197
193		Chromium (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	31.94	3158	56.19	1.759
194		Chromium (nfmw2)	9	0	3	6	66.67%	0.21	3.2	0.357	0.0497	0.223	0.624
195		Chromium (nfmw20)	8	0	5	3	37.50%	2.5	4.6	1.64	0.342	0.585	0.357
196		Chromium (nfmw22)	4	0	4	0	0.00%	N/A	N/A	3.975	0.109	0.33	0.0831
197		Chromium (nfmw23)	4	0	4	0	0.00%	N/A	N/A	3.775	0.0358	0.189	0.0501
198		Chromium (nfmw3)	9	0	8	1	11.11%	4.6	4.6	4.336	0.932	0.965	0.223
199		Chromium (nfmw4)	9	0	7	2	22.22%	3.2	4.6	0.751	0.101	0.318	0.424
200		Chromium (nfmw7)	9	0	7	2	22.22%	0.8	4.6	1.327	1.535	1.239	0.934
201		Chromium (nfmw8)	8	0	5	3	37.50%	3.2	4.6	2.707	0.394	0.627	0.232
202		Chromium (nfmw9)	8	0	8	0	0.00%	N/A	N/A	9.413	4.236	2.058	0.219
203		Chromium (smw10)	8	0	6	2	25.00%	3.2	4.6	1.717	0.118	0.344	0.2
204		Chromium (smw11)	9	0	8	1	11.11%	4.6	4.6	3.434	1.546	1.244	0.362
205		Chromium (smw12)	8	0	8	0	0.00%	N/A	N/A	4.2	3.077	1.754	0.418
206		Chromium (smw13)	8	0	5	3	37.50%	0.8	4.6	1.016	0.682	0.826	0.813
207		Chromium (smw14)	8	0	4	4	50.00%	0.8	4.6	0.75	0.183	0.427	0.57
208		Chromium (smw15)	9	0	7	2	22.22%	0.8	4.6	1.556	3.569	1.889	1.214
209		Chromium (smw16)	9	0	9	0	0.00%	N/A	N/A	12.01	34.73	5.894	0.491
210		Chromium (smw16d)	8	0	2	6	75.00%	0.13	3.2	0.222	0.0133	0.115	0.52
211		Chromium (smw17)	8	0	8	0	0.00%	N/A	N/A	11.61	16.5	4.061	0.35
212		Chromium (smw17d)	8	0	1	7	87.50%	0.21	3.2	0.237	0.00142	0.0377	0.159
213		Chromium (smw18)	8	0	7	1	12.50%	3.2	3.2	4.163	1.53	1.237	0.297
214		Chromium (smw18d)	8	0	4	4	50.00%	0.39	4.6	0.48	0.0242	0.155	0.324
215		Chromium (smw19)	8	0	6	2	25.00%	3.2	4.6	1.047	0.0709	0.266	0.254
216		Chromium (smw7)	8	0	3	5	62.50%	0.13	3.2	0.225	0.018	0.134	0.597
217		Chromium (smw8)	8	0	2	6	75.00%	0.13	3.2	0.176	0.00366	0.0605	0.344
218		Chromium (smw9)	9	0	6	3	33.33%	0.8	4.6	0.552	0.0119	0.109	0.198
219		Chromium (tw2r)	9	0	4	5	55.56%	0.5	4.6	0.647	0.506	0.711	1.1
220		Chromium (tw5r)	8	0	3	5	62.50%	0.21	4.6	0.393	0.073	0.27	0.688
221		Chromium (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
222		Cobalt (atmw6)	9	0	3	6	66.67%	0.085	0.5	0.124	0.00202	0.045	0.362
223		Cobalt (nfmw10)	8	0	6	2	25.00%	0.76	1.7	0.536	0.0256	0.16	0.298
224		Cobalt (nfmw11)	8	0	6	2	25.00%	0.43	1.7	0.268	0.00328	0.0573	0.213
225		Cobalt (nfmw12)	8	0	3	5	62.50%	0.085	0.5	0.754	2.581	1.607	2.132
226		Cobalt (nfmw19)	8	0	8	0	0.00%	N/A	N/A	20.62	1060	32.56	1.579
227		Cobalt (nfmw1d)	9	0	7	2	22.22%	1.7	1.7	0.473	0.00453	0.0673	0.142
228		Cobalt (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	1.429	2.23	1.493	1.045
229		Cobalt (nfmw2)	9	0	7	2	22.22%	1.7	1.7	0.22	0.00343	0.0586	0.266
230		Cobalt (nfmw20)	8	0	5	3	37.50%	0.43	1.7	0.5	0.0853	0.292	0.584
231		Cobalt (nfmw22)	4	0	3	1	25.00%	0.43	0.43	0.435	7.5000E-5	0.00866	0.0199
232		Cobalt (nfmw23)	4	0	4	0	0.00%	N/A	N/A	0.593	0.0139	0.118	0.199

	A	B	C	D	E	F	G	H	I	J	K	L	M
233		Cobalt (nfmw3)	9	0	8	1	11.11%	1.7	1.7	0.968	0.0393	0.198	0.205
234		Cobalt (nfmw4)	9	0	6	3	33.33%	0.15	1.7	0.203	0.00728	0.0853	0.421
235		Cobalt (nfmw7)	9	0	9	0	0.00%	N/A	N/A	1.223	0.199	0.446	0.365
236		Cobalt (nfmw8)	8	0	6	2	25.00%	1.7	1.7	0.682	0.0158	0.126	0.185
237		Cobalt (nfmw9)	8	0	7	1	12.50%	1.7	1.7	5.9	44.7	6.686	1.133
238		Cobalt (smw10)	8	0	7	1	12.50%	1.7	1.7	0.324	0.00325	0.057	0.176
239		Cobalt (smw11)	9	0	8	1	11.11%	0.76	0.76	2.374	24.01	4.9	2.064
240		Cobalt (smw12)	8	0	6	2	25.00%	0.76	1.7	0.398	0.00715	0.0845	0.212
241		Cobalt (smw13)	8	0	4	4	50.00%	0.43	1.7	1.579	5.816	2.412	1.527
242		Cobalt (smw14)	8	0	6	2	25.00%	0.43	1.7	0.571	0.051	0.226	0.395
243		Cobalt (smw15)	9	0	9	0	0.00%	N/A	N/A	80.89	6740	82.1	1.015
244		Cobalt (smw16)	9	0	8	1	11.11%	1.7	1.7	1.053	0.163	0.404	0.383
245		Cobalt (smw16d)	8	0	7	1	12.50%	1.7	1.7	0.371	0.0023	0.0479	0.129
246		Cobalt (smw17)	8	0	6	2	25.00%	1.7	1.7	1.249	0.0828	0.288	0.23
247		Cobalt (smw17d)	8	0	7	1	12.50%	1.7	1.7	0.374	0.00228	0.0478	0.128
248		Cobalt (smw18)	8	0	6	2	25.00%	1.7	1.7	0.755	0.201	0.449	0.594
249		Cobalt (smw18d)	8	0	7	1	12.50%	1.7	1.7	1.036	0.0309	0.176	0.17
250		Cobalt (smw19)	8	0	5	3	37.50%	0.43	1.7	1.292	6.435	2.537	1.963
251		Cobalt (smw7)	8	0	7	1	12.50%	1.7	1.7	1.695	1.906	1.381	0.815
252		Cobalt (smw8)	8	0	3	5	62.50%	0.085	1.7	0.0812	1.0576E-4	0.0103	0.127
253		Cobalt (smw9)	9	0	6	3	33.33%	0.25	1.7	0.221	0.0018	0.0425	0.192
254		Cobalt (tw2r)	9	0	7	2	22.22%	0.25	0.43	0.284	0.028	0.167	0.59
255		Cobalt (tw5r)	8	0	7	1	12.50%	1.7	1.7	0.424	0.0519	0.228	0.537
256		Cobalt (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
257		Copper (atmw6)	9	0	9	0	0.00%	N/A	N/A	4.911	7.044	2.654	0.54
258		Copper (nfmw10)	8	0	7	1	12.50%	4.3	4.3	2.081	2.871	1.694	0.814
259		Copper (nfmw11)	8	0	1	7	87.50%	0.43	4.3	0.23	0	0	N/A
260		Copper (nfmw12)	8	0	2	6	75.00%	0.2	1.1	0.398	0.175	0.418	1.053
261		Copper (nfmw19)	8	0	5	3	37.50%	1	4.3	11.63	194.8	13.96	1.201
262		Copper (nfmw1d)	9	0	5	4	44.44%	0.43	4.3	4.675	133.2	11.54	2.468
263		Copper (nfmw1s)	7	0	5	2	28.57%	0.22	2.1	9.24	287	16.94	1.833
264		Copper (nfmw2)	9	0	5	4	44.44%	0.43	4.3	1.204	1.355	1.164	0.967
265		Copper (nfmw20)	8	0	4	4	50.00%	0.43	4.3	1.062	0.287	0.536	0.505
266		Copper (nfmw22)	4	0	4	0	0.00%	N/A	N/A	4.375	0.256	0.506	0.116
267		Copper (nfmw23)	4	0	4	0	0.00%	N/A	N/A	11.83	14.24	3.774	0.319
268		Copper (nfmw3)	9	0	2	7	77.78%	0.22	4.3	0.351	0.0322	0.18	0.512
269		Copper (nfmw4)	9	0	7	2	22.22%	0.43	4.3	1.114	0.846	0.92	0.826
270		Copper (nfmw7)	9	0	9	0	0.00%	N/A	N/A	7.833	2.603	1.613	0.206
271		Copper (nfmw8)	8	0	3	5	62.50%	0.4	4.3	1.216	2.813	1.677	1.379
272		Copper (nfmw9)	8	0	6	2	25.00%	1	4.3	17	420.5	20.51	1.206
273		Copper (smw10)	8	0	8	0	0.00%	N/A	N/A	2.6	1.126	1.061	0.408
274		Copper (smw11)	9	0	7	2	22.22%	1	2.1	2.747	12.72	3.567	1.298
275		Copper (smw12)	8	0	7	1	12.50%	0.58	0.58	2.633	3.469	1.862	0.707
276		Copper (smw13)	8	0	6	2	25.00%	2.1	4.3	2.838	1.319	1.149	0.405
277		Copper (smw14)	8	0	7	1	12.50%	4.3	4.3	5.65	3.043	1.744	0.309
278		Copper (smw15)	9	0	9	0	0.00%	N/A	N/A	34.96	817.6	28.59	0.818
279		Copper (smw16)	9	0	5	4	44.44%	1	4.3	0.767	0.141	0.375	0.489
280		Copper (smw16d)	8	0	7	1	12.50%	4.3	4.3	1.757	0.411	0.641	0.365
281		Copper (smw17)	8	0	3	5	62.50%	1	4.3	0.8	0.124	0.352	0.44
282		Copper (smw17d)	8	0	7	1	12.50%	0.98	0.98	1.568	1.319	1.148	0.733
283		Copper (smw18)	8	0	6	2	25.00%	4.3	4.3	3.617	3.381	1.839	0.508
284		Copper (smw18d)	8	0	8	0	0.00%	N/A	N/A	16.65	12.29	3.506	0.211
285		Copper (smw19)	8	0	3	5	62.50%	0.98	4.3	1.246	2.152	1.467	1.177
286		Copper (smw7)	8	0	7	1	12.50%	4.3	4.3	4.508	1.066	1.032	0.229
287		Copper (smw8)	8	0	6	2	25.00%	0.67	1	2.783	34.41	5.866	2.108
288		Copper (smw9)	9	0	9	0	0.00%	N/A	N/A	7.078	11.86	3.443	0.487
289		Copper (tw2r)	9	0	3	6	66.67%	0.22	2.1	0.95	1.81	1.345	1.415
290		Copper (tw5r)	8	0	7	1	12.50%	4.3	4.3	2.032	2.431	1.559	0.767

	A	B	C	D	E	F	G	H	I	J	K	L	M
291		Copper (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
292		Iron (atmw6)	9	0	9	0	0.00%	N/A	N/A	3169	756086	869.5	0.274
293		Iron (nfmw10)	8	0	8	0	0.00%	N/A	N/A	1023	991199	995.6	0.973
294		Iron (nfmw11)	8	0	8	0	0.00%	N/A	N/A	466.3	5587	74.75	0.16
295		Iron (nfmw12)	8	0	8	0	0.00%	N/A	N/A	8648	67809221	8235	0.952
296		Iron (nfmw19)	8	0	8	0	0.00%	N/A	N/A	32946	2.888E+8	16994	0.516
297		Iron (nfmw1d)	9	0	9	0	0.00%	N/A	N/A	1586	32553	180.4	0.114
298		Iron (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	708.6	378530	615.2	0.868
299		Iron (nfmw2)	9	0	9	0	0.00%	N/A	N/A	5124	8235257	2870	0.56
300		Iron (nfmw20)	8	0	8	0	0.00%	N/A	N/A	5288	4437707	2107	0.398
301		Iron (nfmw22)	4	0	4	0	0.00%	N/A	N/A	1303	1092	33.04	0.0254
302		Iron (nfmw23)	4	0	4	0	0.00%	N/A	N/A	9945	308967	555.8	0.0559
303		Iron (nfmw3)	9	0	9	0	0.00%	N/A	N/A	3078	10804278	3287	1.068
304		Iron (nfmw4)	9	0	9	0	0.00%	N/A	N/A	11380	16547425	4068	0.357
305		Iron (nfmw7)	9	0	9	0	0.00%	N/A	N/A	565	166871	408.5	0.723
306		Iron (nfmw8)	8	0	8	0	0.00%	N/A	N/A	2725	3178003	1783	0.654
307		Iron (nfmw9)	8	0	8	0	0.00%	N/A	N/A	23226	3.014E+8	17360	0.747
308		Iron (smw10)	8	0	8	0	0.00%	N/A	N/A	2129	209184	457.4	0.215
309		Iron (smw11)	9	0	9	0	0.00%	N/A	N/A	2587	2133150	1461	0.565
310		Iron (smw12)	8	0	7	1	12.50%	109	109	64.47	480	21.91	0.34
311		Iron (smw13)	8	0	8	0	0.00%	N/A	N/A	1220	4271300	2067	1.694
312		Iron (smw14)	8	0	8	0	0.00%	N/A	N/A	901.4	317017	563	0.625
313		Iron (smw15)	9	0	9	0	0.00%	N/A	N/A	7460	36270045	6022	0.807
314		Iron (smw16)	9	0	9	0	0.00%	N/A	N/A	5682	2810294	1676	0.295
315		Iron (smw16d)	8	0	2	6	75.00%	6.8	109	91.34	36804	191.8	2.1
316		Iron (smw17)	8	0	8	0	0.00%	N/A	N/A	2396	27919838	5284	2.205
317		Iron (smw17d)	8	0	5	3	37.50%	14.1	109	15.53	21.12	4.595	0.296
318		Iron (smw18)	8	0	8	0	0.00%	N/A	N/A	1191	752987	867.7	0.729
319		Iron (smw18d)	8	0	7	1	12.50%	109	109	68.96	1228	35.04	0.508
320		Iron (smw19)	8	0	8	0	0.00%	N/A	N/A	5417	74310228	8620	1.591
321		Iron (smw7)	8	0	1	7	87.50%	11.5	109	17.4	174.1	13.19	0.758
322		Iron (smw8)	8	0	8	0	0.00%	N/A	N/A	1333	46107	214.7	0.161
323		Iron (smw9)	9	0	6	3	33.33%	11.5	109	33.12	359.6	18.96	0.573
324		Iron (tw2r)	9	0	9	0	0.00%	N/A	N/A	7348	95874694	9792	1.333
325		Iron (tw5r)	8	0	8	0	0.00%	N/A	N/A	3255	300171	547.9	0.168
326		Iron (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
327		Manganese (atmw6)	9	0	9	0	0.00%	N/A	N/A	2673	635025	796.9	0.298
328		Manganese (nfmw10)	8	0	8	0	0.00%	N/A	N/A	6263	3767536	1941	0.31
329		Manganese (nfmw11)	8	0	8	0	0.00%	N/A	N/A	3753	533421	730.4	0.195
330		Manganese (nfmw12)	8	0	8	0	0.00%	N/A	N/A	4796	4997227	2235	0.466
331		Manganese (nfmw19)	8	0	8	0	0.00%	N/A	N/A	40238	91856964	9584	0.238
332		Manganese (nfmw1d)	9	0	9	0	0.00%	N/A	N/A	3637	590775	768.6	0.211
333		Manganese (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	93.53	3088	55.57	0.594
334		Manganese (nfmw2)	9	0	9	0	0.00%	N/A	N/A	4452	771294	878.2	0.197
335		Manganese (nfmw20)	8	0	8	0	0.00%	N/A	N/A	12963	4176964	2044	0.158
336		Manganese (nfmw22)	4	0	4	0	0.00%	N/A	N/A	2735	40700	201.7	0.0738
337		Manganese (nfmw23)	4	0	4	0	0.00%	N/A	N/A	4340	177333	421.1	0.097
338		Manganese (nfmw3)	9	0	9	0	0.00%	N/A	N/A	6016	1824378	1351	0.225
339		Manganese (nfmw4)	9	0	9	0	0.00%	N/A	N/A	5661	7832886	2799	0.494
340		Manganese (nfmw7)	9	0	9	0	0.00%	N/A	N/A	271	11848	108.8	0.402
341		Manganese (nfmw8)	8	0	8	0	0.00%	N/A	N/A	8936	1463998	1210	0.135
342		Manganese (nfmw9)	8	0	8	0	0.00%	N/A	N/A	6220	14831886	3851	0.619
343		Manganese (smw10)	8	0	8	0	0.00%	N/A	N/A	2240	228657	478.2	0.213
344		Manganese (smw11)	9	0	9	0	0.00%	N/A	N/A	7506	16667428	4083	0.544
345		Manganese (smw12)	8	0	8	0	0.00%	N/A	N/A	3429	620041	787.4	0.23
346		Manganese (smw13)	8	0	8	0	0.00%	N/A	N/A	3533	4060164	2015	0.57
347		Manganese (smw14)	8	0	8	0	0.00%	N/A	N/A	2311	1700688	1304	0.564
348		Manganese (smw15)	9	0	9	0	0.00%	N/A	N/A	8309	16467686	4058	0.488

	A	B	C	D	E	F	G	H	I	J	K	L	M
349		Manganese (smw16)	9	0	9	0	0.00%	N/A	N/A	4479	240761	490.7	0.11
350		Manganese (smw16d)	8	0	8	0	0.00%	N/A	N/A	367.9	1152	33.95	0.0923
351		Manganese (smw17)	8	0	8	0	0.00%	N/A	N/A	5750	18969314	4355	0.757
352		Manganese (smw17d)	8	0	8	0	0.00%	N/A	N/A	638.3	6261	79.12	0.124
353		Manganese (smw18)	8	0	8	0	0.00%	N/A	N/A	3355	3570771	1890	0.563
354		Manganese (smw18d)	8	0	8	0	0.00%	N/A	N/A	841.5	58432	241.7	0.287
355		Manganese (smw19)	8	0	8	0	0.00%	N/A	N/A	5760	5433514	2331	0.405
356		Manganese (smw7)	8	0	8	0	0.00%	N/A	N/A	667.5	186213	431.5	0.646
357		Manganese (smw8)	8	0	8	0	0.00%	N/A	N/A	968.8	25468	159.6	0.165
358		Manganese (smw9)	9	0	8	1	11.11%	0.32	0.32	108	23291	152.6	1.414
359		Manganese (tw2r)	9	0	9	0	0.00%	N/A	N/A	1209	402027	634.1	0.524
360		Manganese (tw5r)	8	0	8	0	0.00%	N/A	N/A	471.6	105960	325.5	0.69
361		Manganese (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
362		Nickel (atmw6)	9	0	9	0	0.00%	N/A	N/A	1.018	0.101	0.318	0.312
363		Nickel (nfmw10)	8	0	8	0	0.00%	N/A	N/A	4.875	1.268	1.126	0.231
364		Nickel (nfmw11)	8	0	8	0	0.00%	N/A	N/A	1.838	0.668	0.818	0.445
365		Nickel (nfmw12)	8	0	4	4	50.00%	0.15	0.54	1.238	6.737	2.596	2.096
366		Nickel (nfmw19)	8	0	8	0	0.00%	N/A	N/A	23.48	856.6	29.27	1.247
367		Nickel (nfmw1d)	9	0	9	0	0.00%	N/A	N/A	9.644	5.255	2.292	0.238
368		Nickel (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	31.81	267.5	16.36	0.514
369		Nickel (nfmw2)	9	0	8	1	11.11%	2.1	2.1	1.541	0.611	0.782	0.507
370		Nickel (nfmw20)	8	0	8	0	0.00%	N/A	N/A	3.225	0.356	0.597	0.185
371		Nickel (nfmw22)	4	0	4	0	0.00%	N/A	N/A	6.55	0.0967	0.311	0.0475
372		Nickel (nfmw23)	4	0	4	0	0.00%	N/A	N/A	6.375	0.223	0.472	0.074
373		Nickel (nfmw3)	9	0	9	0	0.00%	N/A	N/A	4.489	1.659	1.288	0.287
374		Nickel (nfmw4)	9	0	7	2	22.22%	0.23	2.1	0.469	0.0339	0.184	0.393
375		Nickel (nfmw7)	9	0	9	0	0.00%	N/A	N/A	2.767	0.463	0.68	0.246
376		Nickel (nfmw8)	8	0	8	0	0.00%	N/A	N/A	4.038	1.766	1.329	0.329
377		Nickel (nfmw9)	8	0	8	0	0.00%	N/A	N/A	12.74	30.17	5.493	0.431
378		Nickel (smw10)	8	0	7	1	12.50%	5.3	5.3	4.628	0.498	0.705	0.152
379		Nickel (smw11)	9	0	9	0	0.00%	N/A	N/A	5.589	4.969	2.229	0.399
380		Nickel (smw12)	8	0	7	1	12.50%	5.3	5.3	4.675	13.91	3.73	0.798
381		Nickel (smw13)	8	0	8	0	0.00%	N/A	N/A	4.325	4.299	2.073	0.479
382		Nickel (smw14)	8	0	8	0	0.00%	N/A	N/A	3.488	0.661	0.813	0.233
383		Nickel (smw15)	9	0	9	0	0.00%	N/A	N/A	89.74	8006	89.48	0.997
384		Nickel (smw16)	9	0	9	0	0.00%	N/A	N/A	10.8	13.5	3.674	0.34
385		Nickel (smw16d)	8	0	6	2	25.00%	2.1	5.3	1.45	0.0525	0.229	0.158
386		Nickel (smw17)	8	0	8	0	0.00%	N/A	N/A	10.25	4.08	2.02	0.197
387		Nickel (smw17d)	8	0	7	1	12.50%	5.3	5.3	1.664	1.497	1.224	0.735
388		Nickel (smw18)	8	0	7	1	12.50%	5.3	5.3	7.108	109.8	10.48	1.474
389		Nickel (smw18d)	8	0	7	1	12.50%	5.3	5.3	2.857	0.528	0.727	0.254
390		Nickel (smw19)	8	0	7	1	12.50%	0.89	0.89	2.224	5.443	2.333	1.049
391		Nickel (smw7)	8	0	6	2	25.00%	2.1	5.3	1.258	0.0787	0.281	0.223
392		Nickel (smw8)	8	0	6	2	25.00%	0.15	2.1	0.276	0.00985	0.0993	0.36
393		Nickel (smw9)	9	0	8	1	11.11%	5.3	5.3	3.638	0.492	0.702	0.193
394		Nickel (tw2r)	9	0	8	1	11.11%	0.15	0.15	1.158	0.363	0.602	0.52
395		Nickel (tw5r)	8	0	7	1	12.50%	5.3	5.3	1.566	0.255	0.505	0.323
396		Nickel (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
397		Thallium (atmw6)	9	0	0	9	100.00%	0.0072	0.13	N/A	N/A	N/A	N/A
398		Thallium (nfmw10)	8	0	0	8	100.00%	0.028	0.53	N/A	N/A	N/A	N/A
399		Thallium (nfmw11)	8	0	0	8	100.00%	0.028	0.53	N/A	N/A	N/A	N/A
400		Thallium (nfmw12)	8	0	0	8	100.00%	0.028	0.13	N/A	N/A	N/A	N/A
401		Thallium (nfmw19)	8	0	0	8	100.00%	0.028	0.53	N/A	N/A	N/A	N/A
402		Thallium (nfmw1d)	9	0	0	9	100.00%	0.025	0.53	N/A	N/A	N/A	N/A
403		Thallium (nfmw1s)	7	0	1	6	85.71%	0.047	0.53	0.0816	0.00479	0.0692	0.848
404		Thallium (nfmw2)	9	0	0	9	100.00%	0.025	0.53	N/A	N/A	N/A	N/A
405		Thallium (nfmw20)	8	0	0	8	100.00%	0.028	0.53	N/A	N/A	N/A	N/A
406		Thallium (nfmw22)	4	0	0	4	100.00%	0.047	0.24	N/A	N/A	N/A	N/A

	A	B	C	D	E	F	G	H	I	J	K	L	M
407		Thallium (nfmw23)	4	0	0	4	100.00%	0.047	0.24	N/A	N/A	N/A	N/A
408		Thallium (nfmw3)	9	0	0	9	100.00%	0.025	0.53	N/A	N/A	N/A	N/A
409		Thallium (nfmw4)	9	0	0	9	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
410		Thallium (nfmw7)	9	0	1	8	88.89%	0.028	0.13	0.046	0.00259	0.0509	1.107
411		Thallium (nfmw8)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
412		Thallium (nfmw9)	8	0	0	8	100.00%	0.028	0.53	N/A	N/A	N/A	N/A
413		Thallium (smw10)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
414		Thallium (smw11)	9	0	1	8	88.89%	0.028	0.53	0.036	6.4000E-5	0.008	0.222
415		Thallium (smw12)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
416		Thallium (smw13)	8	0	1	7	87.50%	0.047	0.53	0.012	0	0	N/A
417		Thallium (smw14)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
418		Thallium (smw15)	9	0	6	3	33.33%	0.047	0.13	0.0838	0.00112	0.0335	0.4
419		Thallium (smw16)	9	0	1	8	88.89%	0.025	0.53	0.014	0	0	N/A
420		Thallium (smw16d)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
421		Thallium (smw17)	8	0	1	7	87.50%	0.047	0.53	0.01	0	0	N/A
422		Thallium (smw17d)	8	0	1	7	87.50%	0.028	0.53	0.012	0	0	N/A
423		Thallium (smw18)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
424		Thallium (smw18d)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
425		Thallium (smw19)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
426		Thallium (smw7)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
427		Thallium (smw8)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
428		Thallium (smw9)	9	0	0	9	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
429		Thallium (tw2r)	9	0	0	9	100.00%	0.0072	0.24	N/A	N/A	N/A	N/A
430		Thallium (tw5r)	8	0	0	8	100.00%	0.0072	0.53	N/A	N/A	N/A	N/A
431		Thallium (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
432		Vanadium (atmw6)	9	0	9	0	0.00%	N/A	N/A	9.344	18.04	4.247	0.454
433		Vanadium (nfmw10)	8	0	8	0	0.00%	N/A	N/A	25.7	151.4	12.3	0.479
434		Vanadium (nfmw11)	8	0	6	2	25.00%	1.3	5.3	1.949	1.71	1.308	0.671
435		Vanadium (nfmw12)	8	0	5	3	37.50%	0.27	1.3	0.507	0.0368	0.192	0.379
436		Vanadium (nfmw19)	8	0	5	3	37.50%	1.3	5.3	1.671	1.005	1.002	0.6
437		Vanadium (nfmw1d)	9	0	9	0	0.00%	N/A	N/A	29.27	39.23	6.263	0.214
438		Vanadium (nfmw1s)	7	0	7	0	0.00%	N/A	N/A	89.56	2190	46.8	0.523
439		Vanadium (nfmw2)	9	0	6	3	33.33%	0.89	5.3	1.612	3.969	1.992	1.236
440		Vanadium (nfmw20)	8	0	8	0	0.00%	N/A	N/A	4.675	2.494	1.579	0.338
441		Vanadium (nfmw22)	4	0	4	0	0.00%	N/A	N/A	34.43	0.529	0.727	0.0211
442		Vanadium (nfmw23)	4	0	4	0	0.00%	N/A	N/A	48.83	28.89	5.375	0.11
443		Vanadium (nfmw3)	9	0	9	0	0.00%	N/A	N/A	10.4	11.44	3.382	0.325
444		Vanadium (nfmw4)	9	0	8	1	11.11%	5.3	5.3	1.263	0.0673	0.26	0.206
445		Vanadium (nfmw7)	9	0	9	0	0.00%	N/A	N/A	10.13	92.91	9.639	0.951
446		Vanadium (nfmw8)	8	0	7	1	12.50%	5.3	5.3	6.738	1.202	1.097	0.163
447		Vanadium (nfmw9)	8	0	8	0	0.00%	N/A	N/A	21.86	53.42	7.309	0.334
448		Vanadium (smw10)	8	0	8	0	0.00%	N/A	N/A	13.39	8.298	2.881	0.215
449		Vanadium (smw11)	9	0	9	0	0.00%	N/A	N/A	17.97	58.85	7.671	0.427
450		Vanadium (smw12)	8	0	8	0	0.00%	N/A	N/A	14.6	41.05	6.407	0.439
451		Vanadium (smw13)	8	0	8	0	0.00%	N/A	N/A	7.863	40.06	6.33	0.805
452		Vanadium (smw14)	8	0	8	0	0.00%	N/A	N/A	11.59	3.836	1.958	0.169
453		Vanadium (smw15)	9	0	8	1	11.11%	1.3	1.3	6.844	97.32	9.865	1.441
454		Vanadium (smw16)	9	0	9	0	0.00%	N/A	N/A	45.77	387.8	19.69	0.43
455		Vanadium (smw16d)	8	0	7	1	12.50%	5.3	5.3	1.229	0.0163	0.128	0.104
456		Vanadium (smw17)	8	0	8	0	0.00%	N/A	N/A	53.29	372.9	19.31	0.362
457		Vanadium (smw17d)	8	0	7	1	12.50%	5.3	5.3	2.4	0.691	0.832	0.346
458		Vanadium (smw18)	8	0	8	0	0.00%	N/A	N/A	18.09	51.81	7.198	0.398
459		Vanadium (smw18d)	8	0	8	0	0.00%	N/A	N/A	6.038	2.677	1.636	0.271
460		Vanadium (smw19)	8	0	7	1	12.50%	5.3	5.3	3.215	2.232	1.494	0.465
461		Vanadium (smw7)	8	0	7	1	12.50%	5.3	5.3	1.843	0.262	0.512	0.278
462		Vanadium (smw8)	8	0	6	2	25.00%	0.27	5.3	0.459	0.0145	0.12	0.263
463		Vanadium (smw9)	9	0	9	0	0.00%	N/A	N/A	6.467	3.455	1.859	0.287
464		Vanadium (tw2r)	9	0	6	3	33.33%	0.27	1.3	2.37	18.17	4.263	1.799

	A	B	C	D	E	F	G	H	I	J	K	L	M
465		Vanadium (tw5r)	8	0	6	2	25.00%	0.27	5.3	0.991	0.725	0.852	0.859
466		Vanadium (waste water clarifier well)	1	0	1	0	0.00%	N/A	N/A	N/A	N/A	N/A	N/A
467													
468		General Statistics for Raw Data Sets using Detected Data Only											
469													
470		**Variable**	**NumObs**	**# Missing**	**Minimum**	**Maximum**	**Mean**	**Median**	**Var**	**SD**	**MAD/0.675**	**Skewness**	**CV**
471		Aluminum (atmw6)	9	0	57	480	208	161	24529	156.6	87.47	1.175	0.753
472		Aluminum (nfmw10)	8	0	56.4	224	119.4	112	3153	56.15	59.3	0.78	0.47
473		Aluminum (nfmw11)	4	0	8.8	35.5	23.93	25.7	158.5	12.59	12.68	-0.444	0.526
474		Aluminum (nfmw12)	8	0	8.7	278	57.43	25.15	8105	90.03	11.79	2.719	1.568
475		Aluminum (nfmw19)	8	0	76.3	12800	3395	986	20291504	4505	1161	1.55	1.327
476		Aluminum (nfmw1d)	9	0	80	156	110.2	105	618.4	24.87	25.2	0.809	0.226
477		Aluminum (nfmw1s)	7	0	504	8860	2302	1160	8954854	2992	948.9	2.312	1.3
478		Aluminum (nfmw2)	7	0	9.7	348	79.24	11.7	16627	128.9	2.965	1.98	1.627
479		Aluminum (nfmw20)	7	0	24.9	62.6	41.21	39.5	155.2	12.46	12.31	0.564	0.302
480		Aluminum (nfmw22)	4	0	132	174	149.3	145.5	320.9	17.91	12.6	1.119	0.12
481		Aluminum (nfmw23)	4	0	118	176	143.3	139.5	587.6	24.24	18.53	0.873	0.169
482		Aluminum (nfmw3)	8	0	35.6	78.2	53.55	51.5	209.4	14.47	13.94	0.594	0.27
483		Aluminum (nfmw4)	8	0	9	45.1	22.26	19.45	118.9	10.9	6.746	1.359	0.49
484		Aluminum (nfmw7)	8	0	13.2	345	110.9	64.55	13531	116.3	71.39	1.313	1.049
485		Aluminum (nfmw8)	5	0	25.7	118	45.62	28.4	1639	40.48	2.076	2.23	0.887
486		Aluminum (nfmw9)	8	0	60.9	243	134.5	110.8	5140	71.69	59.9	0.805	0.533
487		Aluminum (smw10)	7	0	46.5	93.8	65.36	63.1	331.4	18.2	21.65	0.456	0.279
488		Aluminum (smw11)	8	0	33.7	175	123.9	145.5	2802	52.93	13.34	-1.268	0.427
489		Aluminum (smw12)	8	0	92.6	506	237.6	197	17608	132.7	73.39	1.34	0.559
490		Aluminum (smw13)	7	0	10.9	161	84.6	89.7	3141	56.05	77.54	0.0695	0.662
491		Aluminum (smw14)	5	0	9.3	357	85.56	20.3	23090	152	13.94	2.22	1.776
492		Aluminum (smw15)	9	0	246	1720	788.7	570	253744	503.7	240.2	1.054	0.639
493		Aluminum (smw16)	9	0	74.9	384	210.5	199	7518	86.71	50.41	0.643	0.412
494		Aluminum (smw16d)	4	0	5.3	99.2	31.45	10.65	2050	45.28	5.708	1.971	1.44
495		Aluminum (smw17)	8	0	58.2	537	394.2	438	24653	157	106	-1.611	0.398
496		Aluminum (smw17d)	5	0	7.1	23.2	15.5	15	41.11	6.412	7.709	-0.119	0.414
497		Aluminum (smw18)	8	0	124	388	231.1	200	10531	102.6	84.51	0.829	0.444
498		Aluminum (smw18d)	6	0	20.1	110	60.77	55.35	1046	32.35	32.47	0.469	0.532
499		Aluminum (smw19)	6	0	22.1	78	53.43	58.55	495.6	22.26	24.39	-0.539	0.417
500		Aluminum (smw7)	2	0	3.2	5.1	4.15	4.15	1.805	1.344	1.408	N/A	0.324
501		Aluminum (smw8)	4	0	3.8	273	81.88	25.35	16427	128.2	24.54	1.931	1.565
502		Aluminum (smw9)	5	0	20.1	35.3	29.42	29.7	35.27	5.939	5.93	-1.053	0.202
503		Aluminum (tw2r)	3	0	16	200	83.3	33.9	10294	101.5	26.54	1.672	1.218
504		Aluminum (tw5r)	6	0	4.6	1050	282.1	121	153442	391.7	125.5	2.061	1.388
505		Aluminum (waste water clarifier well)	1	0	65.3	65.3	65.3	65.3	N/A	N/A	0	N/A	N/A
506		Antimony (atmw6)	2	0	0.26	0.46	0.36	0.36	0.02	0.141	0.148	N/A	0.393
507		Antimony (nfmw10)	5	0	0.19	0.61	0.416	0.47	0.0335	0.183	0.208	-0.372	0.44
508		Antimony (nfmw11)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
509		Antimony (nfmw12)	2	0	0.083	0.13	0.107	0.107	0.0011	0.0332	0.0348	N/A	0.312
510		Antimony (nfmw19)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
511		Antimony (nfmw1d)	5	0	0.28	0.5	0.38	0.41	0.00875	0.0935	0.133	0.0458	0.246
512		Antimony (nfmw1s)	7	0	0.49	7.7	4.399	4.1	6.33	2.516	2.372	-0.207	0.572
513		Antimony (nfmw2)	2	0	0.081	0.17	0.126	0.126	0.00396	0.0629	0.066	N/A	0.501
514		Antimony (nfmw20)	3	0	0.15	0.23	0.197	0.21	0.00173	0.0416	0.0297	-1.293	0.212
515		Antimony (nfmw22)	4	0	0.54	0.68	0.61	0.61	0.00333	0.0577	0.0593	5.559E-15	0.0946
516		Antimony (nfmw23)	4	0	0.94	1.1	0.988	0.955	0.00569	0.0754	0.0148	1.93	0.0764
517		Antimony (nfmw3)	4	0	0.11	0.18	0.143	0.14	0.00109	0.033	0.0371	0.229	0.232
518		Antimony (nfmw4)	6	0	0.13	0.23	0.175	0.17	0.00219	0.0468	0.0593	0.141	0.267
519		Antimony (nfmw7)	9	0	0.84	2.5	1.19	0.98	0.29	0.539	0.193	2.164	0.453
520		Antimony (nfmw8)	2	0	0.073	0.089	0.081	0.081	1.2800E-4	0.0113	0.0119	N/A	0.14
521		Antimony (nfmw9)	5	0	0.48	1.1	0.686	0.65	0.0599	0.245	0.178	1.658	0.357
522		Antimony (smw10)	3	0	0.56	0.57	0.563	0.56	3.3333E-5	0.00577	0	1.732	0.0102

	A	B	C	D	E	F	G	H	I	J	K	L	M
523		Antimony (smw11)	7	0	0.55	0.87	0.727	0.74	0.0103	0.102	0.089	-0.488	0.14
524		Antimony (smw12)	3	0	0.39	0.53	0.47	0.49	0.0052	0.0721	0.0593	-1.152	0.153
525		Antimony (smw13)	3	0	0.4	0.42	0.407	0.4	1.3333E-4	0.0115	0	1.732	0.0284
526		Antimony (smw14)	6	0	0.46	0.82	0.627	0.625	0.0184	0.136	0.17	0.201	0.216
527		Antimony (smw15)	5	0	0.18	0.67	0.446	0.47	0.0475	0.218	0.297	-0.23	0.489
528		Antimony (smw16)	7	0	0.75	1.4	1.023	0.93	0.0637	0.252	0.252	0.553	0.247
529		Antimony (smw16d)	5	0	0.19	0.29	0.232	0.21	0.00202	0.0449	0.0297	0.608	0.194
530		Antimony (smw17)	5	0	0.85	1.5	1.19	1.3	0.068	0.261	0.297	-0.322	0.219
531		Antimony (smw17d)	2	0	0.074	0.091	0.0825	0.0825	1.4450E-4	0.012	0.0126	N/A	0.146
532		Antimony (smw18)	2	0	0.66	0.69	0.675	0.675	4.5000E-4	0.0212	0.0222	N/A	0.0314
533		Antimony (smw18d)	5	0	0.2	0.24	0.224	0.23	2.3000E-4	0.0152	0.0148	-1.118	0.0677
534		Antimony (smw19)	4	0	0.092	0.72	0.291	0.175	0.0843	0.29	0.0875	1.837	1
535		Antimony (smw7)	2	0	0.17	0.17	0.17	0.17	0	0	0	N/A	N/A
536		Antimony (smw8)	1	0	0.093	0.093	0.093	0.093	N/A	N/A	0	N/A	N/A
537		Antimony (smw9)	3	0	0.53	0.64	0.587	0.59	0.00303	0.0551	0.0741	-0.271	0.0939
538		Antimony (tw2r)	2	0	0.13	0.15	0.14	0.14	2.0000E-4	0.0141	0.0148	N/A	0.101
539		Antimony (tw5r)	2	0	0.21	0.39	0.3	0.3	0.0162	0.127	0.133	N/A	0.424
540		Antimony (waste water clarifier well)	1	0	0.82	0.82	0.82	0.82	N/A	N/A	0	N/A	N/A
541		Arsenic (atmw6)	9	0	3.8	11.1	6.544	6.3	6.943	2.635	2.965	0.866	0.403
542		Arsenic (nfmw10)	8	0	9.5	21.5	14.58	14.7	16.94	4.116	4.893	0.441	0.282
543		Arsenic (nfmw11)	8	0	2.6	4.2	3.3	3.15	0.369	0.607	0.815	0.352	0.184
544		Arsenic (nfmw12)	8	0	0.37	3.1	1.145	0.885	0.815	0.903	0.66	1.668	0.789
545		Arsenic (nfmw19)	8	0	2.3	6.7	3.575	3.1	2.296	1.515	1.186	1.393	0.424
546		Arsenic (nfmw1d)	9	0	12.7	22.6	18.71	18.4	9.101	3.017	3.262	-0.769	0.161
547		Arsenic (nfmw1s)	7	0	5.3	26.3	11.14	9.7	50.74	7.123	3.706	2.009	0.639
548		Arsenic (nfmw2)	9	0	2.2	16.5	8.644	7	24.69	4.969	4.893	0.409	0.575
549		Arsenic (nfmw20)	8	0	3	6.1	3.963	3.55	1.191	1.091	0.815	1.192	0.275
550		Arsenic (nfmw22)	4	0	11.1	14	12.63	12.7	2.076	1.441	1.705	-0.111	0.114
551		Arsenic (nfmw23)	4	0	50.8	73.8	60.78	59.25	95.95	9.795	8.228	0.813	0.161
552		Arsenic (nfmw3)	9	0	2.4	9.4	4.6	4.3	4.59	2.142	1.927	1.525	0.466
553		Arsenic (nfmw4)	8	0	1.1	5.1	2.95	2.75	2.271	1.507	2.15	0.21	0.511
554		Arsenic (nfmw7)	9	0	1.3	10.8	3.578	2.2	10.08	3.175	1.038	1.888	0.887
555		Arsenic (nfmw8)	8	0	3	5.2	4.05	4	0.5	0.707	0.593	0.239	0.175
556		Arsenic (nfmw9)	8	0	2.9	32.4	18.54	17.35	144.5	12.02	15.64	-2.604E-4	0.648
557		Arsenic (smw10)	8	0	29.7	37	32.21	31.8	6.376	2.525	2.52	0.915	0.0784
558		Arsenic (smw11)	9	0	20	44.9	34.74	37.5	74.17	8.612	4.893	-0.981	0.248
559		Arsenic (smw12)	8	0	6.7	21.9	12.11	11.35	25.05	5.005	4.67	1.085	0.413
560		Arsenic (smw13)	8	0	2.3	12.6	6.025	3.8	19.13	4.373	2.076	0.858	0.726
561		Arsenic (smw14)	8	0	10.9	24.5	18.41	18.15	27.64	5.257	7.784	-0.199	0.286
562		Arsenic (smw15)	9	0	0.53	9.9	2.921	0.97	13.29	3.646	0.652	1.558	1.248
563		Arsenic (smw16)	9	0	11.1	36.8	25.93	26.2	55.92	7.478	7.116	-0.673	0.288
564		Arsenic (smw16d)	7	0	1.7	2	1.814	1.8	0.0114	0.107	0.148	0.772	0.0589
565		Arsenic (smw17)	8	0	14.7	54.3	41.6	46.75	172.1	13.12	7.858	-1.466	0.315
566		Arsenic (smw17d)	8	0	2.6	3.8	2.975	2.85	0.159	0.399	0.222	1.485	0.134
567		Arsenic (smw18)	8	0	3.2	14.1	7.575	7.6	9.776	3.127	1.557	1.144	0.413
568		Arsenic (smw18d)	8	0	3.5	5	4.1	4	0.263	0.513	0.519	0.687	0.125
569		Arsenic (smw19)	7	0	1.3	4.2	2.643	2.8	0.963	0.981	1.186	0.25	0.371
570		Arsenic (smw7)	7	0	2.6	3.6	3.157	3.2	0.126	0.355	0.445	-0.474	0.113
571		Arsenic (smw8)	8	0	3.9	7.5	5.625	5.7	1.082	1.04	0.667	0.197	0.185
572		Arsenic (smw9)	9	0	7.2	11.6	9.044	8.8	1.513	1.23	0.593	0.956	0.136
573		Arsenic (tw2r)	8	0	0.21	8.3	2.229	0.885	7.611	2.759	0.764	1.876	1.238
574		Arsenic (tw5r)	7	0	0.91	8.1	3.187	2.7	5.964	2.442	1.927	1.618	0.766
575		Arsenic (waste water clarifier well)	1	0	27.5	27.5	27.5	27.5	N/A	N/A	0	N/A	N/A
576		Barium (atmw6)	9	0	57.2	113	81.13	79.1	271	16.46	13.94	0.66	0.203
577		Barium (nfmw10)	8	0	136	320	252.3	269.5	3953	62.87	49.67	-0.927	0.249
578		Barium (nfmw11)	8	0	89.9	287	130.3	105	4200	64.81	15.49	2.588	0.498
579		Barium (nfmw12)	8	0	34.2	130	68.35	60.8	899.5	29.99	18.61	1.328	0.439
580		Barium (nfmw19)	8	0	25.3	40.6	33.11	32.3	26.8	5.177	2.965	0.388	0.156

	A	B	C	D	E	F	G	H	I	J	K	L	M
581		Barium (nfmw1d)	9	0	400	667	483.4	455	7164	84.64	80.06	1.379	0.175
582		Barium (nfmw1s)	7	0	37	368	107.6	52.3	14265	119.4	12.01	2.283	1.11
583		Barium (nfmw2)	9	0	123	268	176.1	166	2102	45.84	45.96	1.03	0.26
584		Barium (nfmw20)	8	0	38.7	65.1	50.46	47.45	116.8	10.81	11.42	0.365	0.214
585		Barium (nfmw22)	4	0	35.1	46.4	40.35	39.95	22.9	4.785	4.67	0.435	0.119
586		Barium (nfmw23)	4	0	84.5	127	102.1	98.5	338.7	18.4	14.46	0.98	0.18
587		Barium (nfmw3)	9	0	499	1200	935	983	37971	194.9	84.51	-1.383	0.208
588		Barium (nfmw4)	9	0	76.9	183	113.9	109	1409	37.54	39.44	1.029	0.329
589		Barium (nfmw7)	9	0	78.4	148	108	111	353	18.79	4.448	0.826	0.174
590		Barium (nfmw8)	8	0	841	1200	1096	1125	13297	115.3	66.72	-1.861	0.105
591		Barium (nfmw9)	8	0	55.6	804	369.8	473.5	69356	263.4	250.6	0.137	0.712
592		Barium (smw10)	8	0	70.5	129	90.36	85.85	386.4	19.66	20.98	1.071	0.218
593		Barium (smw11)	9	0	98.2	200	130	126	1136	33.7	31.13	1.198	0.259
594		Barium (smw12)	8	0	91.5	115	105.5	108.5	60.53	7.78	6.672	-0.784	0.0738
595		Barium (smw13)	8	0	46.8	203	108	97.1	2372	48.71	35.88	0.993	0.451
596		Barium (smw14)	8	0	76.6	169	106.5	97.1	810.4	28.47	16.6	1.734	0.267
597		Barium (smw15)	9	0	17.7	59.1	30.34	24	181.4	13.47	9.34	1.277	0.444
598		Barium (smw16)	9	0	102	191	144.3	143	539.5	23.23	8.895	0.358	0.161
599		Barium (smw16d)	8	0	38.9	62.3	44.09	41.7	58.48	7.647	2.52	2.438	0.173
600		Barium (smw17)	8	0	54.1	168	113.8	120.5	1561	39.5	44.33	-0.245	0.347
601		Barium (smw17d)	8	0	58.1	65.5	61.03	60.15	8.068	2.84	2.669	0.695	0.0465
602		Barium (smw18)	8	0	33.4	119	62.16	62.45	690	26.27	18.24	1.538	0.423
603		Barium (smw18d)	8	0	39.7	58.5	47.23	47	32.92	5.737	4.151	0.902	0.121
604		Barium (smw19)	8	0	99.9	194	147.4	130.5	1391	37.3	31.21	0.382	0.253
605		Barium (smw7)	8	0	88.3	133	104.2	102	199.6	14.13	11.86	1.213	0.136
606		Barium (smw8)	8	0	67	108	93.51	95.85	189.3	13.76	10.9	-1.065	0.147
607		Barium (smw9)	9	0	37.4	71.2	47.02	44.6	107	10.34	6.968	1.816	0.22
608		Barium (tw2r)	9	0	15.6	98.6	47.39	35.5	1024	32.01	29.5	0.461	0.675
609		Barium (tw5r)	8	0	19.4	153	68.5	50.35	2854	53.42	44.63	0.596	0.78
610		Barium (waste water clarifier well)	1	0	291	291	291	291	N/A	N/A	0	N/A	N/A
611		Cadmium (atmw6)	3	0	0.044	0.074	0.0547	0.046	2.8133E-4	0.0168	0.00297	1.704	0.307
612		Cadmium (nfmw10)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
613		Cadmium (nfmw11)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
614		Cadmium (nfmw12)	1	0	0.27	0.27	0.27	0.27	N/A	N/A	0	N/A	N/A
615		Cadmium (nfmw19)	6	0	0.093	1.8	0.706	0.625	0.381	0.617	0.541	1.205	0.875
616		Cadmium (nfmw1d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
617		Cadmium (nfmw1s)	4	0	0.044	0.16	0.0775	0.053	0.00306	0.0553	0.0104	1.933	0.714
618		Cadmium (nfmw2)	1	0	0.052	0.052	0.052	0.052	N/A	N/A	0	N/A	N/A
619		Cadmium (nfmw20)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
620		Cadmium (nfmw22)	2	0	0.043	0.051	0.047	0.047	3.2000E-5	0.00566	0.00593	N/A	0.12
621		Cadmium (nfmw23)	3	0	0.06	0.16	0.096	0.068	0.00309	0.0556	0.0119	1.692	0.579
622		Cadmium (nfmw3)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
623		Cadmium (nfmw4)	3	0	0.033	0.04	0.0357	0.034	1.4333E-5	0.00379	0.00148	1.597	0.106
624		Cadmium (nfmw7)	6	0	0.041	0.14	0.0748	0.06	0.00145	0.0381	0.023	1.22	0.509
625		Cadmium (nfmw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
626		Cadmium (nfmw9)	3	0	0.047	0.24	0.159	0.19	0.01	0.1	0.0741	-1.259	0.63
627		Cadmium (smw10)	1	0	0.018	0.018	0.018	0.018	N/A	N/A	0	N/A	N/A
628		Cadmium (smw11)	1	0	0.02	0.02	0.02	0.02	N/A	N/A	0	N/A	N/A
629		Cadmium (smw12)	1	0	0.1	0.1	0.1	0.1	N/A	N/A	0	N/A	N/A
630		Cadmium (smw13)	3	0	0.036	0.094	0.073	0.089	0.00103	0.0321	0.00741	-1.685	0.44
631		Cadmium (smw14)	5	0	0.062	0.13	0.0898	0.08	8.5320E-4	0.0292	0.0267	0.651	0.325
632		Cadmium (smw15)	8	0	0.036	6.1	2.642	1.85	4.556	2.134	0.741	0.947	0.808
633		Cadmium (smw16)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
634		Cadmium (smw16d)	6	0	0.029	0.063	0.0462	0.0455	1.8857E-4	0.0137	0.0193	0.0588	0.297
635		Cadmium (smw17)	1	0	0.022	0.022	0.022	0.022	N/A	N/A	0	N/A	N/A
636		Cadmium (smw17d)	5	0	0.03	0.075	0.0492	0.04	4.1670E-4	0.0204	0.0148	0.561	0.415
637		Cadmium (smw18)	1	0	0.048	0.048	0.048	0.048	N/A	N/A	0	N/A	N/A
638		Cadmium (smw18d)	7	0	0.055	0.12	0.0911	0.1	5.7414E-4	0.024	0.0148	-0.634	0.263

	A	B	C	D	E	F	G	H	I	J	K	L	M
639		Cadmium (smw19)	1	0	0.075	0.075	0.075	0.075	N/A	N/A	0	N/A	N/A
640		Cadmium (smw7)	6	0	0.033	0.094	0.0535	0.0435	5.7310E-4	0.0239	0.0126	1.181	0.447
641		Cadmium (smw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
642		Cadmium (smw9)	4	0	0.035	0.06	0.0453	0.043	1.2758E-4	0.0113	0.00964	0.82	0.25
643		Cadmium (tw2r)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
644		Cadmium (tw5r)	2	0	0.025	0.034	0.0295	0.0295	4.0500E-5	0.00636	0.00667	N/A	0.216
645		Cadmium (waste water clarifier well)	1	0	0.58	0.58	0.58	0.58	N/A	N/A	0	N/A	N/A
646		Chromium (atmw6)	8	0	0.87	3.2	1.896	1.7	0.586	0.765	0.519	0.689	0.404
647		Chromium (nfmw10)	8	0	2.4	8.2	4.738	4.55	4.186	2.046	2.446	0.46	0.432
648		Chromium (nfmw11)	5	0	0.33	1.3	0.66	0.45	0.164	0.405	0.178	1.277	0.613
649		Chromium (nfmw12)	3	0	0.25	0.35	0.29	0.27	0.0028	0.0529	0.0297	1.458	0.182
650		Chromium (nfmw19)	4	0	0.47	2	1.235	1.235	0.685	0.828	1.06	6.528E-16	0.67
651		Chromium (nfmw1d)	9	0	4.7	8.5	6.767	7.1	1.775	1.332	1.631	-0.143	0.197
652		Chromium (nfmw1s)	7	0	3.2	157	31.94	5.7	3158	56.19	3.706	2.456	1.759
653		Chromium (nfmw2)	3	0	0.28	0.88	0.513	0.38	0.103	0.321	0.148	1.545	0.626
654		Chromium (nfmw20)	5	0	1.1	2.4	1.64	1.3	0.428	0.654	0.297	0.554	0.399
655		Chromium (nfmw22)	4	0	3.5	4.2	3.975	4.1	0.109	0.33	0.148	-1.56	0.0831
656		Chromium (nfmw23)	4	0	3.5	3.9	3.775	3.85	0.0358	0.189	0.0741	-1.659	0.0501
657		Chromium (nfmw3)	8	0	3.2	5.8	4.438	4.4	1.077	1.038	1.408	0.0113	0.234
658		Chromium (nfmw4)	7	0	0.36	1.4	0.751	0.7	0.118	0.344	0.252	1.054	0.458
659		Chromium (nfmw7)	7	0	0.44	3.5	1.439	0.75	1.927	1.388	0.445	1.15	0.965
660		Chromium (nfmw8)	5	0	2.1	4.1	2.8	2.7	0.61	0.781	0.593	1.511	0.279
661		Chromium (nfmw9)	8	0	7.1	13.5	9.413	9	4.236	2.058	1.927	1.101	0.219
662		Chromium (smw10)	6	0	1.3	2.3	1.717	1.65	0.142	0.376	0.445	0.65	0.219
663		Chromium (smw11)	8	0	0.87	4.3	3.434	4.1	1.767	1.329	0.297	-1.523	0.387
664		Chromium (smw12)	8	0	2	7.3	4.2	3.65	3.077	1.754	1.334	0.8	0.418
665		Chromium (smw13)	5	0	0.27	2.7	1.136	0.85	0.909	0.953	0.667	1.426	0.839
666		Chromium (smw14)	4	0	0.27	1.4	0.888	0.94	0.262	0.511	0.534	-0.395	0.576
667		Chromium (smw15)	7	0	0.3	5.3	1.86	0.48	4.853	2.203	0.267	1.18	1.184
668		Chromium (smw16)	9	0	3.7	24.1	12.01	10.6	34.73	5.894	3.706	0.954	0.491
669		Chromium (smw16d)	2	0	0.32	0.4	0.36	0.36	0.0032	0.0566	0.0593	N/A	0.157
670		Chromium (smw17)	8	0	2.5	15.6	11.61	12.45	16.5	4.061	1.927	-1.863	0.35
671		Chromium (smw17d)	1	0	0.29	0.29	0.29	0.29	N/A	N/A	0	N/A	N/A
672		Chromium (smw18)	7	0	2.9	6.8	4.343	4.3	1.736	1.318	0.593	0.906	0.303
673		Chromium (smw18d)	4	0	0.36	0.78	0.51	0.45	0.0343	0.185	0.0741	1.665	0.363
674		Chromium (smw19)	6	0	0.69	1.4	1.047	0.95	0.085	0.292	0.237	0.433	0.279
675		Chromium (smw7)	3	0	0.24	0.53	0.337	0.24	0.028	0.167	0	1.732	0.497
676		Chromium (smw8)	2	0	0.21	0.28	0.245	0.245	0.00245	0.0495	0.0519	N/A	0.202
677		Chromium (smw9)	6	0	0.38	0.72	0.552	0.555	0.0143	0.12	0.104	-0.052	0.217
678		Chromium (tw2r)	4	0	0.22	2.5	0.928	0.495	1.116	1.056	0.215	1.907	1.139
679		Chromium (tw5r)	3	0	0.3	0.99	0.533	0.31	0.156	0.396	0.0148	1.731	0.742
680		Chromium (waste water clarifier well)	1	0	2.3	2.3	2.3	2.3	N/A	N/A	0	N/A	N/A
681		Cobalt (atmw6)	3	0	0.12	0.21	0.16	0.15	0.0021	0.0458	0.0445	0.935	0.286
682		Cobalt (nfmw10)	6	0	0.35	0.85	0.545	0.535	0.0331	0.182	0.178	0.84	0.334
683		Cobalt (nfmw11)	6	0	0.2	0.36	0.268	0.255	0.00394	0.0627	0.0667	0.512	0.234
684		Cobalt (nfmw12)	3	0	0.12	5	1.8	0.28	7.686	2.772	0.237	1.726	1.54
685		Cobalt (nfmw19)	8	0	0.44	98.4	20.62	7.5	1060	32.56	9.311	2.467	1.579
686		Cobalt (nfmw1d)	7	0	0.4	0.6	0.473	0.46	0.00529	0.0727	0.089	0.804	0.154
687		Cobalt (nfmw1s)	7	0	0.42	4.7	1.429	1	2.23	1.493	0.726	2.29	1.045
688		Cobalt (nfmw2)	7	0	0.15	0.32	0.22	0.21	0.004	0.0632	0.0593	0.747	0.287
689		Cobalt (nfmw20)	5	0	0.25	1.1	0.588	0.62	0.115	0.339	0.46	0.797	0.577
690		Cobalt (nfmw22)	3	0	0.43	0.45	0.437	0.43	1.3333E-4	0.0115	0	1.732	0.0264
691		Cobalt (nfmw23)	4	0	0.45	0.73	0.593	0.595	0.0139	0.118	0.126	-0.112	0.199
692		Cobalt (nfmw3)	8	0	0.7	1.4	0.968	0.92	0.0449	0.212	0.148	1.179	0.219
693		Cobalt (nfmw4)	6	0	0.13	0.39	0.222	0.2	0.0095	0.0975	0.0815	1.121	0.44
694		Cobalt (nfmw7)	9	0	0.62	1.8	1.223	1.2	0.199	0.446	0.741	-0.072	0.365
695		Cobalt (nfmw8)	6	0	0.52	0.83	0.682	0.69	0.019	0.138	0.208	-0.13	0.202
696		Cobalt (nfmw9)	7	0	1.6	21.7	6.514	2.5	56.08	7.489	1.334	1.81	1.15

	A	B	C	D	E	F	G	H	I	J	K	L	M
697		Cobalt (smw10)	7	0	0.25	0.39	0.324	0.33	0.0038	0.0616	0.0741	-0.23	0.19
698		Cobalt (smw11)	8	0	0.42	16.2	2.608	0.55	30.31	5.506	0.126	2.801	2.112
699		Cobalt (smw12)	6	0	0.25	0.52	0.398	0.4	0.00858	0.0926	0.0741	-0.484	0.232
700		Cobalt (smw13)	4	0	0.51	7.9	2.66	1.115	12.34	3.513	0.66	1.935	1.321
701		Cobalt (smw14)	6	0	0.42	1.1	0.597	0.5	0.066	0.257	0.104	2.048	0.431
702		Cobalt (smw15)	9	0	1.4	264	80.89	63.8	6740	82.1	34.4	1.588	1.015
703		Cobalt (smw16)	8	0	0.33	1.8	1.065	0.985	0.193	0.44	0.371	0.0623	0.413
704		Cobalt (smw16d)	7	0	0.32	0.45	0.371	0.35	0.00268	0.0518	0.0445	0.521	0.139
705		Cobalt (smw17)	6	0	0.84	1.7	1.27	1.3	0.106	0.325	0.385	-0.0905	0.256
706		Cobalt (smw17d)	7	0	0.32	0.46	0.374	0.36	0.00266	0.0516	0.0297	0.95	0.138
707		Cobalt (smw18)	6	0	0.3	1.5	0.755	0.575	0.242	0.491	0.348	0.81	0.651
708		Cobalt (smw18d)	7	0	0.75	1.2	1.036	1.1	0.0361	0.19	0.148	-0.68	0.183
709		Cobalt (smw19)	5	0	0.23	8	1.878	0.4	11.72	3.424	0.163	2.232	1.823
710		Cobalt (smw7)	7	0	0.38	4.2	1.804	1.1	2.401	1.55	0.815	1.01	0.859
711		Cobalt (smw8)	3	0	0.073	0.097	0.0867	0.09	1.5233E-4	0.0123	0.0104	-1.127	0.142
712		Cobalt (smw9)	6	0	0.15	0.3	0.223	0.225	0.00231	0.048	0.0148	0.147	0.215
713		Cobalt (tw2r)	7	0	0.12	0.55	0.317	0.21	0.0359	0.189	0.133	0.33	0.597
714		Cobalt (tw5r)	7	0	0.1	0.85	0.424	0.37	0.0605	0.246	0.222	0.628	0.58
715		Cobalt (waste water clarifier well)	1	0	12.5	12.5	12.5	12.5	N/A	N/A	0	N/A	N/A
716		Copper (atmw6)	9	0	1.7	10.8	4.911	4.5	7.044	2.654	1.927	1.374	0.54
717		Copper (nfmw10)	7	0	0.5	5.9	2.159	2.3	3.622	1.903	2.342	1.396	0.882
718		Copper (nfmw11)	1	0	0.23	0.23	0.23	0.23	N/A	N/A	0	N/A	N/A
719		Copper (nfmw12)	2	0	0.28	1.5	0.89	0.89	0.744	0.863	0.904	N/A	0.969
720		Copper (nfmw19)	5	0	3.4	42.4	17.84	14.6	260.5	16.14	14.97	0.958	0.905
721		Copper (nfmw1d)	5	0	0.38	37.3	8.068	0.66	267.2	16.35	0.415	2.233	2.026
722		Copper (nfmw1s)	5	0	1.3	50.5	12.74	3.9	448.5	21.18	2.817	2.2	1.662
723		Copper (nfmw2)	5	0	0.69	4	1.514	0.89	1.952	1.397	0.297	2.176	0.923
724		Copper (nfmw20)	4	0	0.48	1.7	1.22	1.35	0.312	0.559	0.445	-0.923	0.458
725		Copper (nfmw22)	4	0	3.8	5	4.375	4.35	0.256	0.506	0.519	0.261	0.116
726		Copper (nfmw23)	4	0	8.2	16	11.83	11.55	14.24	3.774	4.299	0.188	0.319
727		Copper (nfmw3)	2	0	0.48	0.68	0.58	0.58	0.02	0.141	0.148	N/A	0.244
728		Copper (nfmw4)	7	0	0.34	3	1.219	0.66	1.026	1.013	0.474	1.004	0.831
729		Copper (nfmw7)	9	0	5.6	10.4	7.833	7.4	2.603	1.613	1.038	0.778	0.206
730		Copper (nfmw8)	3	0	0.84	5.6	2.513	1.1	7.163	2.676	0.385	1.714	1.065
731		Copper (nfmw9)	6	0	4.5	60.6	22.33	10.9	536.3	23.16	8.302	1.177	1.037
732		Copper (smw10)	8	0	1.7	4.8	2.6	2.15	1.126	1.061	0.593	1.552	0.408
733		Copper (smw11)	7	0	0.58	12.4	3.299	1.5	17.46	4.178	1.364	2.246	1.267
734		Copper (smw12)	7	0	0.88	6	2.926	2.5	3.823	1.955	1.779	0.693	0.668
735		Copper (smw13)	6	0	1.4	4.5	3.117	3.2	1.382	1.175	1.483	-0.352	0.377
736		Copper (smw14)	7	0	4	9.6	5.886	5.3	3.538	1.881	1.483	1.427	0.32
737		Copper (smw15)	9	0	3.5	97.2	34.96	26.6	817.6	28.59	27.28	1.347	0.818
738		Copper (smw16)	5	0	0.37	1.5	0.852	0.73	0.203	0.451	0.534	0.675	0.529
739		Copper (smw16d)	7	0	1.3	3.2	1.757	1.4	0.48	0.692	0.148	1.881	0.394
740		Copper (smw17)	3	0	0.45	1.2	0.917	1.1	0.166	0.407	0.148	-1.615	0.444
741		Copper (smw17d)	7	0	0.72	4.5	1.689	1.3	1.622	1.273	0.297	2.355	0.754
742		Copper (smw18)	6	0	1.5	6.4	4.067	4.2	4.267	2.066	2.743	-0.122	0.508
743		Copper (smw18d)	8	0	10.7	21	16.65	17.35	12.29	3.506	2.743	-0.704	0.211
744		Copper (smw19)	3	0	0.48	5	2.293	1.4	5.706	2.389	1.364	1.448	1.042
745		Copper (smw7)	7	0	3.4	6.7	4.629	4.6	1.279	1.131	1.038	0.993	0.244
746		Copper (smw8)	6	0	0.43	18.3	3.532	0.565	52.37	7.237	0.17	2.447	2.049
747		Copper (smw9)	9	0	4.5	15.8	7.078	5.9	11.86	3.443	1.483	2.462	0.487
748		Copper (tw2r)	3	0	0.59	4.6	2.197	1.4	4.496	2.12	1.201	1.452	0.965
749		Copper (tw5r)	7	0	0.79	6	2.113	1.5	3.146	1.774	0.445	2.297	0.839
750		Copper (waste water clarifier well)	1	0	16.3	16.3	16.3	16.3	N/A	N/A	0	N/A	N/A
751		Iron (atmw6)	9	0	2530	4920	3169	2840	756086	869.5	266.9	1.615	0.274
752		Iron (nfmw10)	8	0	377	2700	1023	503	991199	995.6	185.3	1.397	0.973
753		Iron (nfmw11)	8	0	388	568	466.3	442	5587	74.75	75.61	0.423	0.16
754		Iron (nfmw12)	8	0	1320	27200	8648	5830	67809221	8235	4040	1.968	0.952

	A	B	C	D	E	F	G	H	I	J	K	L	M
755		Iron (nfmw19)	8	0	8770	57300	32946	30100	2.888E+8	16994	21349	0.111	0.516
756		Iron (nfmw1d)	9	0	1370	1820	1586	1590	32553	180.4	311.3	-0.0358	0.114
757		Iron (nfmw1s)	7	0	212	2010	708.6	516	378530	615.2	438.8	1.955	0.868
758		Iron (nfmw2)	9	0	609	8410	5124	5940	8235257	2870	3010	-0.425	0.56
759		Iron (nfmw20)	8	0	2420	9210	5288	4885	4437707	2107	1097	0.88	0.398
760		Iron (nfmw22)	4	0	1280	1350	1303	1290	1092	33.04	14.83	1.56	0.0254
761		Iron (nfmw23)	4	0	9270	10600	9945	9955	308967	555.8	585.6	-0.0981	0.0559
762		Iron (nfmw3)	9	0	298	9980	3078	1730	10804278	3287	1417	1.51	1.068
763		Iron (nfmw4)	9	0	7460	21000	11380	10300	16547425	4068	3262	1.843	0.357
764		Iron (nfmw7)	9	0	127	1300	565	522	166871	408.5	475.9	0.617	0.723
765		Iron (nfmw8)	8	0	887	5450	2725	2020	3178003	1783	1537	0.556	0.654
766		Iron (nfmw9)	8	0	2200	45700	23226	22100	3.014E+8	17360	24574	0.0932	0.747
767		Iron (smw10)	8	0	1630	3050	2129	2085	209184	457.4	422.5	1.157	0.215
768		Iron (smw11)	9	0	1530	6190	2587	1980	2133150	1461	341	2.314	0.565
769		Iron (smw12)	7	0	36.5	112	65.44	58.6	601.2	24.52	9.044	1.204	0.375
770		Iron (smw13)	8	0	51	6210	1220	475.5	4271300	2067	501.1	2.572	1.694
771		Iron (smw14)	8	0	291	1760	901.4	755.5	317017	563	415.9	0.778	0.625
772		Iron (smw15)	9	0	252	20800	7460	6620	36270045	6022	4463	1.377	0.807
773		Iron (smw16)	9	0	3200	7750	5682	5020	2810294	1676	2431	0.0535	0.295
774		Iron (smw16d)	2	0	83.2	594	338.6	338.6	130458	361.2	378.7	N/A	1.067
775		Iron (smw17)	8	0	135	15400	2396	406	27919838	5284	360.3	2.768	2.205
776		Iron (smw17d)	5	0	11.5	24.6	16.24	14.7	27.87	5.279	4.744	1.208	0.325
777		Iron (smw18)	8	0	479	3140	1191	955	752987	867.7	485.5	1.937	0.729
778		Iron (smw18d)	7	0	24.7	132	70.24	60	1496	38.68	40.33	0.502	0.551
779		Iron (smw19)	8	0	192	24500	5417	549.5	74310228	8620	527.1	1.911	1.591
780		Iron (smw7)	1	0	46.9	46.9	46.9	46.9	N/A	N/A	0	N/A	N/A
781		Iron (smw8)	8	0	1070	1640	1333	1340	46107	214.7	289.1	0.107	0.161
782		Iron (smw9)	6	0	15	68.6	40.03	40.2	345	18.57	15.57	0.298	0.464
783		Iron (tw2r)	9	0	940	32800	7348	4820	95874694	9792	2698	2.717	1.333
784		Iron (tw5r)	8	0	2600	4050	3255	3245	300171	547.9	748.7	0.197	0.168
785		Iron (waste water clarifier well)	1	0	11200	11200	11200	11200	N/A	N/A	0	N/A	N/A
786		Manganese (atmw6)	9	0	1670	4100	2673	2470	635025	796.9	1038	0.573	0.298
787		Manganese (nfmw10)	8	0	2520	8510	6263	6785	3767536	1941	2098	-0.972	0.31
788		Manganese (nfmw11)	8	0	2500	4570	3753	3715	533421	730.4	941.4	-0.518	0.195
789		Manganese (nfmw12)	8	0	1880	8100	4796	4515	4997227	2235	2580	0.209	0.466
790		Manganese (nfmw19)	8	0	22500	51500	40238	41100	91856964	9584	9637	-0.742	0.238
791		Manganese (nfmw1d)	9	0	2700	5250	3637	3310	590775	768.6	622.7	1.167	0.211
792		Manganese (nfmw1s)	7	0	42.3	200	93.53	83.6	3088	55.57	48.33	1.286	0.594
793		Manganese (nfmw2)	9	0	3420	6330	4452	4240	771294	878.2	578.2	1.316	0.197
794		Manganese (nfmw20)	8	0	10300	15200	12963	13300	4176964	2044	2743	-0.312	0.158
795		Manganese (nfmw22)	4	0	2490	2960	2735	2745	40700	201.7	215	-0.242	0.0738
796		Manganese (nfmw23)	4	0	3760	4680	4340	4460	177333	421.1	281.7	-1.196	0.097
797		Manganese (nfmw3)	9	0	4380	7660	6016	5620	1824378	1351	1838	-0.0258	0.225
798		Manganese (nfmw4)	9	0	2520	10900	5661	4370	7832886	2799	2417	0.838	0.494
799		Manganese (nfmw7)	9	0	131	539	271	250	11848	108.8	22.24	2.045	0.402
800		Manganese (nfmw8)	8	0	7070	11400	8936	8730	1463998	1210	556	0.898	0.135
801		Manganese (nfmw9)	8	0	2670	14300	6220	4970	14831886	3851	2454	1.542	0.619
802		Manganese (smw10)	8	0	1710	3220	2240	2040	228657	478.2	311.3	1.335	0.213
803		Manganese (smw11)	9	0	5090	18100	7506	6090	16667428	4083	963.7	2.717	0.544
804		Manganese (smw12)	8	0	2570	4870	3429	3265	620041	787.4	919.2	0.803	0.23
805		Manganese (smw13)	8	0	1120	6690	3533	3385	4060164	2015	2357	0.455	0.57
806		Manganese (smw14)	8	0	509	4240	2311	2315	1700688	1304	1490	-0.0117	0.564
807		Manganese (smw15)	9	0	3280	15500	8309	7920	16467686	4058	4952	0.586	0.488
808		Manganese (smw16)	9	0	3830	5410	4479	4520	240761	490.7	474.4	0.482	0.11
809		Manganese (smw16d)	8	0	315	417	367.9	364.5	1152	33.95	22.98	0.18	0.0923
810		Manganese (smw17)	8	0	3800	16500	5750	4285	18969314	4355	452.2	2.798	0.757
811		Manganese (smw17d)	8	0	525	788	638.3	626	6261	79.12	57.08	0.709	0.124
812		Manganese (smw18)	8	0	1910	7060	3355	2395	3570771	1890	719.1	1.384	0.563

	A	B	C	D	E	F	G	H	I	J	K	L	M
813		Manganese (smw18d)	8	0	650	1420	841.5	786	58432	241.7	72.65	2.458	0.287
814		Manganese (smw19)	8	0	2860	8770	5760	5130	5433514	2331	2713	0.234	0.405
815		Manganese (smw7)	8	0	137	1300	667.5	517.5	186213	431.5	376.6	0.659	0.646
816		Manganese (smw8)	8	0	737	1230	968.8	947	25468	159.6	94.89	0.471	0.165
817		Manganese (smw9)	8	0	2.5	504	121.4	59.6	28084	167.6	83.84	2.072	1.38
818		Manganese (tw2r)	9	0	306	2110	1209	1290	402027	634.1	815.4	-0.123	0.524
819		Manganese (tw5r)	8	0	204	1220	471.6	375.5	105960	325.5	149	2.123	0.69
820		Manganese (waste water clarifier well)	1	0	1980	1980	1980	1980	N/A	N/A	0	N/A	N/A
821		Nickel (atmw6)	9	0	0.5	1.5	1.018	1.1	0.101	0.318	0.297	-0.293	0.312
822		Nickel (nfmw10)	8	0	3.3	6.5	4.875	4.95	1.268	1.126	1.112	-0.146	0.231
823		Nickel (nfmw11)	8	0	1	3.5	1.838	1.6	0.668	0.818	0.815	1.265	0.445
824		Nickel (nfmw12)	4	0	0.24	8.1	2.273	0.375	15.1	3.886	0.156	1.997	1.71
825		Nickel (nfmw19)	8	0	3.1	90.6	23.48	12.8	856.6	29.27	13.27	2.109	1.247
826		Nickel (nfmw1d)	9	0	6.4	13.6	9.644	9.6	5.255	2.292	2.224	0.321	0.238
827		Nickel (nfmw1s)	7	0	19.4	66.8	31.81	26.2	267.5	16.36	9.34	2.072	0.514
828		Nickel (nfmw2)	8	0	0.73	2.8	1.601	1.45	0.722	0.85	0.964	0.342	0.531
829		Nickel (nfmw20)	8	0	2.4	4.4	3.225	3.2	0.356	0.597	0.519	0.898	0.185
830		Nickel (nfmw22)	4	0	6.2	6.9	6.55	6.55	0.0967	0.311	0.371	-8.56E-15	0.0475
831		Nickel (nfmw23)	4	0	5.7	6.8	6.375	6.5	0.223	0.472	0.222	-1.441	0.074
832		Nickel (nfmw3)	9	0	2.9	6.5	4.489	4.1	1.659	1.288	1.186	0.476	0.287
833		Nickel (nfmw4)	7	0	0.29	0.84	0.503	0.44	0.0344	0.185	0.148	1.011	0.369
834		Nickel (nfmw7)	9	0	1.8	4	2.767	2.8	0.463	0.68	0.445	0.0957	0.246
835		Nickel (nfmw8)	8	0	2.3	5.9	4.038	4.05	1.766	1.329	1.705	0.191	0.329
836		Nickel (nfmw9)	8	0	6	21.6	12.74	11.45	30.17	5.493	3.039	0.846	0.431
837		Nickel (smw10)	7	0	3.7	5.6	4.7	4.5	0.597	0.772	1.186	-0.0456	0.164
838		Nickel (smw11)	9	0	2.2	10	5.589	5.8	4.969	2.229	0.89	0.415	0.399
839		Nickel (smw12)	7	0	2	14.3	4.871	3.4	18.06	4.25	1.334	2.411	0.872
840		Nickel (smw13)	8	0	1.7	8.5	4.325	3.9	4.299	2.073	1.483	1.109	0.479
841		Nickel (smw14)	8	0	2.2	4.8	3.488	3.5	0.661	0.813	0.815	0.0484	0.233
842		Nickel (smw15)	9	0	5	260	89.74	66	8006	89.48	38.7	1.289	0.997
843		Nickel (smw16)	9	0	5.4	18.4	10.8	10.1	13.5	3.674	3.113	0.867	0.34
844		Nickel (smw16d)	6	0	1.1	1.7	1.45	1.5	0.063	0.251	0.297	-0.512	0.173
845		Nickel (smw17)	8	0	5.8	11.8	10.25	10.9	4.08	2.02	1.112	-1.855	0.197
846		Nickel (smw17d)	7	0	0.75	4.2	1.664	0.98	1.747	1.322	0.178	1.581	0.794
847		Nickel (smw18)	7	0	1.8	34.7	7.671	3.4	143.2	11.97	1.779	2.602	1.56
848		Nickel (smw18d)	7	0	1.9	4.3	2.857	2.8	0.616	0.785	0.593	0.923	0.275
849		Nickel (smw19)	7	0	1	8.3	2.414	1.5	6.918	2.63	0.741	2.504	1.089
850		Nickel (smw7)	6	0	0.85	1.7	1.258	1.2	0.0944	0.307	0.297	0.251	0.244
851		Nickel (smw8)	6	0	0.2	0.46	0.297	0.265	0.0101	0.101	0.0815	0.949	0.339
852		Nickel (smw9)	8	0	2.7	5	3.638	3.4	0.563	0.75	0.371	0.971	0.206
853		Nickel (tw2r)	8	0	0.62	2.4	1.284	1.25	0.303	0.551	0.445	1.118	0.429
854		Nickel (tw5r)	7	0	0.66	2.2	1.566	1.5	0.298	0.545	0.593	-0.506	0.348
855		Nickel (waste water clarifier well)	1	0	8.8	8.8	8.8	8.8	N/A	N/A	0	N/A	N/A
856		Thallium (atmw6)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
857		Thallium (nfmw10)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
858		Thallium (nfmw11)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
859		Thallium (nfmw12)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
860		Thallium (nfmw19)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
861		Thallium (nfmw1d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
862		Thallium (nfmw1s)	1	0	0.22	0.22	0.22	0.22	N/A	N/A	0	N/A	N/A
863		Thallium (nfmw2)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
864		Thallium (nfmw20)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
865		Thallium (nfmw22)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
866		Thallium (nfmw23)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
867		Thallium (nfmw3)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
868		Thallium (nfmw4)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
869		Thallium (nfmw7)	1	0	0.19	0.19	0.19	0.19	N/A	N/A	0	N/A	N/A
870		Thallium (nfmw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	A	B	C	D	E	F	G	H	I	J	K	L	M
871		Thallium (nfmw9)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
872		Thallium (smw10)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
873		Thallium (smw11)	1	0	0.044	0.044	0.044	0.044	N/A	N/A	0	N/A	N/A
874		Thallium (smw12)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
875		Thallium (smw13)	1	0	0.012	0.012	0.012	0.012	N/A	N/A	0	N/A	N/A
876		Thallium (smw14)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
877		Thallium (smw15)	6	0	0.05	0.15	0.0927	0.0835	0.00137	0.037	0.0356	0.646	0.399
878		Thallium (smw16)	1	0	0.014	0.014	0.014	0.014	N/A	N/A	0	N/A	N/A
879		Thallium (smw16d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
880		Thallium (smw17)	1	0	0.01	0.01	0.01	0.01	N/A	N/A	0	N/A	N/A
881		Thallium (smw17d)	1	0	0.012	0.012	0.012	0.012	N/A	N/A	0	N/A	N/A
882		Thallium (smw18)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
883		Thallium (smw18d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
884		Thallium (smw19)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
885		Thallium (smw7)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
886		Thallium (smw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
887		Thallium (smw9)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
888		Thallium (tw2r)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
889		Thallium (tw5r)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
890		Thallium (waste water clarifier well)	1	0	0.17	0.17	0.17	0.17	N/A	N/A	0	N/A	N/A
891		Vanadium (atmw6)	9	0	4.2	17	9.344	8.8	18.04	4.247	4.744	0.612	0.454
892		Vanadium (nfmw10)	8	0	11.7	44.9	25.7	24.85	151.4	12.3	15.2	0.434	0.479
893		Vanadium (nfmw11)	6	0	0.88	4.7	2.097	1.45	2.206	1.485	0.682	1.356	0.708
894		Vanadium (nfmw12)	5	0	0.36	0.88	0.554	0.53	0.0384	0.196	0.104	1.468	0.354
895		Vanadium (nfmw19)	5	0	1	4	1.92	1.6	1.487	1.219	0.741	1.755	0.635
896		Vanadium (nfmw1d)	9	0	19.4	36.4	29.27	32.1	39.23	6.263	6.375	-0.37	0.214
897		Vanadium (nfmw1s)	7	0	44.2	178	89.56	83	2190	46.8	54.86	1.218	0.523
898		Vanadium (nfmw2)	6	0	0.56	7.2	2.02	1.045	6.498	2.549	0.245	2.399	1.262
899		Vanadium (nfmw20)	8	0	2.9	6.8	4.675	4.5	2.494	1.579	1.853	0.357	0.338
900		Vanadium (nfmw22)	4	0	33.9	35.5	34.43	34.15	0.529	0.727	0.222	1.822	0.0211
901		Vanadium (nfmw23)	4	0	41.9	54.7	48.83	49.35	28.89	5.375	4.967	-0.529	0.11
902		Vanadium (nfmw3)	9	0	6.3	16.8	10.4	8.6	11.44	3.382	3.41	0.784	0.325
903		Vanadium (nfmw4)	8	0	1	1.8	1.263	1.2	0.077	0.277	0.222	1.106	0.22
904		Vanadium (nfmw7)	9	0	3.7	31.8	10.13	5.7	92.91	9.639	2.965	1.849	0.951
905		Vanadium (nfmw8)	7	0	5.6	9	6.943	6.7	1.21	1.1	0.89	1.019	0.158
906		Vanadium (nfmw9)	8	0	11.6	33.1	21.86	20.95	53.42	7.309	6.523	0.351	0.334
907		Vanadium (smw10)	8	0	9.3	15.8	13.39	15.3	8.298	2.881	0.519	-0.676	0.215
908		Vanadium (smw11)	9	0	2.7	23.8	17.97	21	58.85	7.671	3.262	-1.532	0.427
909		Vanadium (smw12)	8	0	7.3	26.8	14.6	12.5	41.05	6.407	4.967	1.058	0.439
910		Vanadium (smw13)	8	0	2.6	17.7	7.863	3.9	40.06	6.33	1.557	0.752	0.805
911		Vanadium (smw14)	8	0	9.3	14.7	11.59	11.15	3.836	1.958	2.669	0.391	0.169
912		Vanadium (smw15)	8	0	0.73	25.6	7.6	2.1	119.3	10.92	2.016	1.399	1.437
913		Vanadium (smw16)	9	0	18.8	83.5	45.77	44.4	387.8	19.69	17.64	0.758	0.43
914		Vanadium (smw16d)	7	0	1	1.4	1.229	1.3	0.019	0.138	0.148	-0.706	0.112
915		Vanadium (smw17)	8	0	11.8	75.4	53.29	58.75	372.9	19.31	8.97	-1.569	0.362
916		Vanadium (smw17d)	7	0	1.6	3.7	2.4	1.8	0.807	0.898	0.297	0.73	0.374
917		Vanadium (smw18)	8	0	8.6	32.2	18.09	18	51.81	7.198	6.153	0.904	0.398
918		Vanadium (smw18d)	8	0	3.8	8.4	6.038	6.05	2.677	1.636	2.076	0.11	0.271
919		Vanadium (smw19)	7	0	1.9	6.7	3.286	2.6	2.835	1.684	1.038	1.658	0.512
920		Vanadium (smw7)	7	0	1.1	2.7	1.843	1.7	0.306	0.553	0.593	0.314	0.3
921		Vanadium (smw8)	6	0	0.38	0.62	0.49	0.475	0.012	0.11	0.133	0.185	0.224
922		Vanadium (smw9)	9	0	4.6	10.8	6.467	6.3	3.455	1.859	1.483	1.742	0.287
923		Vanadium (tw2r)	6	0	0.31	14.3	3.325	1.2	29.38	5.421	1.075	2.363	1.63
924		Vanadium (tw5r)	6	0	0.44	3	1.112	0.85	0.894	0.946	0.289	2.212	0.851
925		Vanadium (waste water clarifier well)	1	0	15.8	15.8	15.8	15.8	N/A	N/A	0	N/A	N/A
926													
927		**Percentiles using all Detects (Ds) and Non-Detects (NDs)**											
928													

	A	B	C	D	E	F	G	H	I	J	K	L	M
929	Variable		NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
930	Aluminum (atmw6)		9	0	71.16	95.88	110	161	220	314.8	461.6	470.8	478.2
931	Aluminum (nfmw10)		8	0	58.15	70.42	80.5	112	147.5	153.8	179.9	202	219.6
932	Aluminum (nfmw11)		8	0	8.59	12.64	16	24.1	33.63	34.5	58.75	85.88	107.6
933	Aluminum (nfmw12)		8	0	14.51	18.6	20	25.15	37.55	44.06	119.5	198.7	262.1
934	Aluminum (nfmw19)		8	0	253.9	342	352.5	986	5515	5928	8320	10560	12352
935	Aluminum (nfmw1d)		9	0	86.4	91.48	93.8	105	123	129.4	142.4	149.2	154.6
936	Aluminum (nfmw1s)		7	0	513.6	588.4	691	1160	2105	2498	5200	7030	8494
937	Aluminum (nfmw2)		9	0	10.1	11.04	11.6	15.5	113	127	188	268	332
938	Aluminum (nfmw20)		8	0	29.17	33	34.75	43.1	51.5	56.68	77.72	95.36	109.5
939	Aluminum (nfmw22)		4	0	135	138	139.5	145.5	155.3	159	166.5	170.3	173.3
940	Aluminum (nfmw23)		4	0	123.4	128.8	131.5	139.5	151.3	156.2	166.1	171.1	175
941	Aluminum (nfmw3)		9	0	38.8	42.72	44.8	51.7	68.8	72.56	142.6	271.3	374.3
942	Aluminum (nfmw4)		9	0	13.56	16.74	18.1	20.7	28.5	35.14	58.68	85.84	107.6
943	Aluminum (nfmw7)		9	0	18.32	20.14	20.5	61.9	179	179.8	213.8	279.4	331.9
944	Aluminum (nfmw8)		8	0	26.61	27.56	28.05	32.25	113	113	114.5	116.3	117.7
945	Aluminum (nfmw9)		8	0	71.61	77.96	79.5	110.8	177	205	238.8	240.9	242.6
946	Aluminum (smw10)		8	0	47.9	49.18	49.78	70.35	81.8	87.4	99.56	106.3	111.7
947	Aluminum (smw11)		9	0	44.02	102	139	147	157	164.2	220	310	382
948	Aluminum (smw12)		8	0	130.7	153.8	159.8	197	272.3	309	397.5	451.8	495.2
949	Aluminum (smw13)		8	0	24.27	39.84	48.45	96.85	120.3	130.4	147.7	154.4	159.7
950	Aluminum (smw14)		8	0	10.84	15.02	18.1	26.45	58.48	83.92	186.2	271.6	339.9
951	Aluminum (smw15)		9	0	378	450	476	570	988	1177	1512	1616	1699
952	Aluminum (smw16)		9	0	131	158.2	167	199	233	249	295.2	339.6	375.1
953	Aluminum (smw16d)		8	0	7.26	8.1	8.1	8.2	34.55	64.72	103.3	108.2	112
954	Aluminum (smw17)		8	0	226.1	329.6	357.3	438	495.3	506.8	525.1	531.1	535.8
955	Aluminum (smw17d)		8	0	7.8	8.1	8.1	13.5	20.95	22	50.14	81.57	106.7
956	Aluminum (smw18)		8	0	130.3	150.6	166	200	280.3	326.8	382.4	385.2	387.4
957	Aluminum (smw18d)		8	0	23.88	31.3	36.38	55.35	90.35	99.52	110.9	112	112.8
958	Aluminum (smw19)		8	0	28.61	33.04	34.48	58.55	73.5	75.6	88.5	100.8	110.6
959	Aluminum (smw7)		8	0	4.53	5.3	5.475	7.6	8.1	8.1	39.57	76.28	105.7
960	Aluminum (smw8)		8	0	6.81	8.1	8.1	10.95	24.23	30.14	107.7	190.4	256.5
961	Aluminum (smw9)		9	0	8.1	15.3	20.1	28.3	33.7	34.34	50.84	81.92	106.8
962	Aluminum (tw2r)		9	0	11.72	14.64	16	20	33.9	36.46	72.24	136.1	187.2
963	Aluminum (tw5r)		8	0	5.3	6.6	7.475	85.05	187	252.8	544.6	797.3	999.5
964	Aluminum (waste water clarifier well)		1	0	65.3	65.3	65.3	65.3	65.3	65.3	65.3	65.3	65.3
965	Antimony (atmw6)		9	0	0.118	0.144	0.16	0.24	0.26	0.308	0.396	0.428	0.454
966	Antimony (nfmw10)		8	0	0.225	0.248	0.255	0.51	0.588	0.598	0.877	1.189	1.438
967	Antimony (nfmw11)		8	0	0.077	0.077	0.077	0.0985	0.185	0.276	0.716	1.108	1.422
968	Antimony (nfmw12)		8	0	0.077	0.077	0.077	0.102	0.123	0.126	0.205	0.293	0.363
969	Antimony (nfmw19)		8	0	0.077	0.0942	0.109	0.38	0.43	0.5	0.856	1.178	1.436
970	Antimony (nfmw1d)		9	0	0.274	0.286	0.29	0.41	0.5	0.9	1.5	1.5	1.5
971	Antimony (nfmw1s)		7	0	1.696	2.72	3.05	4.1	6.2	6.62	7.22	7.46	7.652
972	Antimony (nfmw2)		9	0	0.077	0.0794	0.081	0.17	0.5	0.9	1.5	1.5	1.5
973	Antimony (nfmw20)		8	0	0.147	0.174	0.195	0.305	0.38	0.38	0.716	1.108	1.422
974	Antimony (nfmw22)		4	0	0.558	0.576	0.585	0.61	0.635	0.644	0.662	0.671	0.678
975	Antimony (nfmw23)		4	0	0.943	0.946	0.948	0.955	0.995	1.016	1.058	1.079	1.096
976	Antimony (nfmw3)		9	0	0.118	0.144	0.16	0.25	0.5	0.532	0.764	1.132	1.426
977	Antimony (nfmw4)		9	0	0.13	0.136	0.14	0.22	0.25	0.35	0.7	1.1	1.42
978	Antimony (nfmw7)		9	0	0.848	0.868	0.88	0.98	1.4	1.4	1.62	2.06	2.412
979	Antimony (nfmw8)		8	0	0.0758	0.0814	0.0853	0.105	0.75	1.1	1.5	1.5	1.5
980	Antimony (nfmw9)		8	0	0.435	0.5	0.518	0.615	0.778	0.928	1.22	1.36	1.472
981	Antimony (smw10)		8	0	0.371	0.384	0.388	0.5	0.563	0.566	0.849	1.175	1.435
982	Antimony (smw11)		9	0	0.524	0.628	0.68	0.74	0.81	0.834	0.996	1.248	1.45
983	Antimony (smw12)		8	0	0.236	0.28	0.298	0.44	0.543	0.56	0.856	1.178	1.436
984	Antimony (smw13)		8	0	0.338	0.35	0.35	0.4	0.46	0.516	0.856	1.178	1.436
985	Antimony (smw14)		8	0	0.481	0.494	0.498	0.625	0.753	0.784	1.024	1.262	1.452
986	Antimony (smw15)		9	0	0.174	0.192	0.2	0.27	0.47	0.538	0.646	0.658	0.668

	A	B	C	D	E	F	G	H	I	J	K	L	M
987		Antimony (smw16)	9	0	0.65	0.768	0.78	0.93	1.3	1.34	1.42	1.46	1.492
988		Antimony (smw16d)	8	0	0.197	0.2	0.2	0.24	0.29	0.29	0.653	1.077	1.415
989		Antimony (smw17)	8	0	0.709	0.91	0.963	1.3	1.5	1.5	1.5	1.5	1.5
990		Antimony (smw17d)	8	0	0.0761	0.077	0.077	0.0855	0.215	0.348	0.8	1.15	1.43
991		Antimony (smw18)	8	0	0.341	0.35	0.35	0.52	0.893	1.176	1.5	1.5	1.5
992		Antimony (smw18d)	8	0	0.2	0.208	0.215	0.23	0.233	0.236	0.618	1.059	1.412
993		Antimony (smw19)	8	0	0.0875	0.111	0.128	0.295	0.465	0.584	0.954	1.227	1.445
994		Antimony (smw7)	8	0	0.17	0.202	0.23	0.32	0.373	0.376	0.716	1.108	1.422
995		Antimony (smw8)	8	0	0.077	0.077	0.077	0.085	0.215	0.348	0.8	1.15	1.43
996		Antimony (smw9)	9	0	0.332	0.346	0.35	0.4	0.59	0.61	0.812	1.156	1.431
997		Antimony (tw2r)	9	0	0.138	0.146	0.15	0.25	0.38	0.428	0.5	0.5	0.5
998		Antimony (tw5r)	8	0	0.201	0.214	0.218	0.28	0.368	0.378	0.723	1.112	1.422
999		Antimony (waste water clarifier well)	1	0	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
1000		Arsenic (atmw6)	9	0	4.04	4.22	4.3	6.3	7	8.32	10.46	10.78	11.04
1001		Arsenic (nfmw10)	8	0	9.85	10.84	11.58	14.7	16.23	17.38	19.54	20.52	21.3
1002		Arsenic (nfmw11)	8	0	2.6	2.76	2.9	3.15	3.775	3.88	4.06	4.13	4.186
1003		Arsenic (nfmw12)	8	0	0.398	0.49	0.56	0.885	1.375	1.48	2.05	2.575	2.995
1004		Arsenic (nfmw19)	8	0	2.3	2.34	2.375	3.1	4.325	4.36	5.09	5.895	6.539
1005		Arsenic (nfmw1d)	9	0	16.14	17.18	17.3	18.4	20.7	21.02	21.72	22.16	22.51
1006		Arsenic (nfmw1s)	7	0	5.96	6.56	6.8	9.7	11.55	11.7	17.6	21.95	25.43
1007		Arsenic (nfmw2)	9	0	3.4	4.6	5.2	7	13.6	13.72	14.42	15.46	16.29
1008		Arsenic (nfmw20)	8	0	3	3.08	3.15	3.55	4.575	4.68	5.19	5.645	6.009
1009		Arsenic (nfmw22)	4	0	11.28	11.46	11.55	12.7	13.78	13.82	13.91	13.96	13.99
1010		Arsenic (nfmw23)	4	0	52.54	54.28	55.15	59.25	64.88	66.66	70.23	72.02	73.44
1011		Arsenic (nfmw3)	9	0	2.8	3.14	3.3	4.3	5.6	5.68	6.52	7.96	9.112
1012		Arsenic (nfmw4)	9	0	1.34	1.64	1.8	2.5	4.3	4.34	4.54	4.82	5.044
1013		Arsenic (nfmw7)	9	0	1.46	1.62	1.7	2.2	3.1	4.58	7.6	9.2	10.48
1014		Arsenic (nfmw8)	8	0	3.42	3.6	3.6	4	4.4	4.54	4.85	5.025	5.165
1015		Arsenic (nfmw9)	8	0	6.54	8.66	9.15	17.35	29.78	30.58	31.77	32.09	32.34
1016		Arsenic (smw10)	8	0	29.91	30.12	30.23	31.8	33.48	33.58	34.69	35.85	36.77
1017		Arsenic (smw11)	9	0	21.36	28	32.2	37.5	39.8	40.2	41.62	43.26	44.57
1018		Arsenic (smw12)	8	0	7.4	8.1	8.45	11.35	13.85	14.9	17.84	19.87	21.49
1019		Arsenic (smw13)	8	0	2.44	2.58	2.65	3.8	9.275	10.64	12.32	12.46	12.57
1020		Arsenic (smw14)	8	0	11.88	13.86	15.23	18.15	23.18	23.7	24.36	24.43	24.49
1021		Arsenic (smw15)	9	0	0.658	0.732	0.76	0.97	2.3	4.82	8.86	9.38	9.796
1022		Arsenic (smw16)	9	0	19.34	21.52	21.6	26.2	31	31.56	33.28	35.04	36.45
1023		Arsenic (smw16d)	8	0	1.7	1.74	1.775	1.8	1.925	1.96	2.09	2.195	2.279
1024		Arsenic (smw17)	8	0	25.69	34.28	37.68	46.75	49.5	50.06	51.78	53.04	54.05
1025		Arsenic (smw17d)	8	0	2.67	2.7	2.7	2.85	3.075	3.18	3.45	3.625	3.765
1026		Arsenic (smw18)	8	0	4.81	5.82	6.1	7.6	8.025	8.2	10.11	12.11	13.7
1027		Arsenic (smw18d)	8	0	3.57	3.68	3.75	4	4.375	4.48	4.72	4.86	4.972
1028		Arsenic (smw19)	8	0	1.72	1.94	1.975	2.55	3.075	3.18	3.57	3.885	4.137
1029		Arsenic (smw7)	8	0	2.51	2.68	2.75	3.2	3.275	3.38	3.53	3.565	3.593
1030		Arsenic (smw8)	8	0	4.6	5.02	5.125	5.7	6.025	6.06	6.52	7.01	7.402
1031		Arsenic (smw9)	9	0	8.16	8.46	8.5	8.8	9.3	9.62	10.4	11	11.48
1032		Arsenic (tw2r)	9	0	0.466	0.584	0.62	0.7	2.4	3.04	4.86	6.58	7.956
1033		Arsenic (tw5r)	8	0	1.253	1.64	1.85	2.5	3.2	3.76	5.51	6.805	7.841
1034		Arsenic (waste water clarifier well)	1	0	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5
1035		Barium (atmw6)	9	0	66.56	69.98	70.7	79.1	88.5	91.1	98.6	105.8	111.6
1036		Barium (nfmw10)	8	0	176.6	209.6	223.3	269.5	297	298.4	306	313	318.6
1037		Barium (nfmw11)	8	0	95.64	100.1	101.8	105	123	128.6	180.6	233.8	276.4
1038		Barium (nfmw12)	8	0	44.49	48.94	48.98	60.8	77.78	83.06	101.4	115.7	127.1
1039		Barium (nfmw19)	8	0	28.59	30.24	30.45	32.3	35.15	37.6	40.46	40.53	40.59
1040		Barium (nfmw1d)	9	0	400.8	425.6	442	455	519	531	572.6	619.8	657.6
1041		Barium (nfmw1s)	7	0	44.14	49.22	49.7	52.3	98.2	120.9	228.8	298.4	354.1
1042		Barium (nfmw2)	9	0	131	143.8	151	166	197	206.6	230.4	249.2	264.2
1043		Barium (nfmw20)	8	0	40.17	40.8	40.8	47.45	61.6	61.74	62.86	63.98	64.88
1044		Barium (nfmw22)	4	0	36.12	37.14	37.65	39.95	42.65	43.4	44.9	45.65	46.25

	A	B	C	D	E	F	G	H	I	J	K	L	M
1045		Barium (nfmw23)	4	0	87.05	89.6	90.88	98.5	109.8	113.2	120.1	123.6	126.3
1046		Barium (nfmw3)	9	0	752.6	859.2	888	983	1030	1034	1072	1136	1187
1047		Barium (nfmw4)	9	0	80.66	82.08	82.4	109	120	138	168.6	175.8	181.6
1048		Barium (nfmw7)	9	0	90.72	96.44	98.2	111	112	112	119.2	133.6	145.1
1049		Barium (nfmw8)	8	0	973.3	1062	1090	1125	1170	1170	1179	1190	1198
1050		Barium (nfmw9)	8	0	63.51	89.74	109.7	473.5	480.3	480.6	577.9	691	781.4
1051		Barium (smw10)	8	0	70.5	74.06	77.18	85.85	99.85	101.3	110.8	119.9	127.2
1052		Barium (smw11)	9	0	100.4	103.4	105	126	139	147.8	168.8	184.4	196.9
1053		Barium (smw12)	8	0	97.17	99.64	99.68	108.5	110.3	110.6	112.2	113.6	114.7
1054		Barium (smw13)	8	0	66.96	76.56	77.4	97.1	128.5	134.8	160.3	181.7	198.7
1055		Barium (smw14)	8	0	84.3	90.36	92.78	97.1	112.5	116	134.7	151.9	165.6
1056		Barium (smw15)	9	0	18.1	19.82	20.9	24	36.5	37.46	42.94	51.02	57.48
1057		Barium (smw16)	9	0	129.2	136.6	137	143	145	150.6	165.4	178.2	188.4
1058		Barium (smw16d)	8	0	39.53	39.96	40.1	41.7	43.33	44.34	50.54	56.42	61.12
1059		Barium (smw17)	8	0	65.79	78.96	86.1	120.5	138.3	144.2	156.1	162.1	166.8
1060		Barium (smw17d)	8	0	58.45	58.64	58.68	60.15	62.95	63.72	64.87	65.19	65.44
1061		Barium (smw18)	8	0	39.56	43	43.7	62.45	65.8	67.2	83.86	101.4	115.5
1062		Barium (smw18d)	8	0	41.59	43.2	43.9	47	49.1	49.52	52.55	55.53	57.91
1063		Barium (smw19)	8	0	113.3	122.2	125	130.5	186.5	190	194	194	194
1064		Barium (smw7)	8	0	91.59	93.96	94.8	102	109.5	110.2	117.6	125.3	131.5
1065		Barium (smw8)	8	0	76.52	86.12	90.95	95.85	100.8	104.2	108	108	108
1066		Barium (smw9)	9	0	38.28	39.34	39.9	44.6	47.6	49.96	57.04	64.12	69.78
1067		Barium (tw2r)	9	0	17.52	18.24	18.4	35.5	76.5	77.42	82.76	90.68	97.02
1068		Barium (tw5r)	8	0	20.59	23.06	24.78	50.35	106.4	116.9	136.2	144.6	151.3
1069		Barium (waste water clarifier well)	1	0	291	291	291	291	291	291	291	291	291
1070		Cadmium (atmw6)	9	0	0.03	0.03	0.03	0.033	0.046	0.0572	0.0872	0.114	0.135
1071		Cadmium (nfmw10)	8	0	0.0294	0.03	0.03	0.03	0.14	0.14	0.26	0.4	0.512
1072		Cadmium (nfmw11)	8	0	0.028	0.0288	0.0295	0.03	0.0575	0.096	0.26	0.4	0.512
1073		Cadmium (nfmw12)	8	0	0.0294	0.03	0.03	0.03	0.0575	0.096	0.179	0.225	0.261
1074		Cadmium (nfmw19)	8	0	0.126	0.156	0.17	0.58	0.7	0.798	1.177	1.489	1.738
1075		Cadmium (nfmw1d)	9	0	0.028	0.0292	0.03	0.03	0.033	0.236	0.752	1.176	1.515
1076		Cadmium (nfmw1s)	7	0	0.0464	0.05	0.053	0.15	0.28	0.352	0.456	0.498	0.532
1077		Cadmium (nfmw2)	9	0	0.028	0.0292	0.03	0.03	0.052	0.247	0.752	1.176	1.515
1078		Cadmium (nfmw20)	8	0	0.028	0.0288	0.0295	0.085	0.15	0.15	0.267	0.404	0.513
1079		Cadmium (nfmw22)	4	0	0.0454	0.0478	0.049	0.101	0.15	0.15	0.15	0.15	0.15
1080		Cadmium (nfmw23)	4	0	0.0624	0.0648	0.066	0.109	0.153	0.154	0.157	0.159	0.16
1081		Cadmium (nfmw3)	9	0	0.0296	0.03	0.03	0.03	0.14	0.14	0.22	0.38	0.508
1082		Cadmium (nfmw4)	9	0	0.025	0.0292	0.03	0.033	0.034	0.0364	0.14	0.34	0.5
1083		Cadmium (nfmw7)	9	0	0.03	0.0366	0.041	0.054	0.1	0.116	0.14	0.14	0.14
1084		Cadmium (nfmw8)	8	0	0.0235	0.0288	0.0295	0.03	0.158	0.336	0.858	1.229	1.526
1085		Cadmium (nfmw9)	8	0	0.0294	0.0368	0.0428	0.165	0.28	0.336	0.442	0.491	0.53
1086		Cadmium (smw10)	8	0	0.025	0.0288	0.0295	0.03	0.03	0.03	0.183	0.362	0.504
1087		Cadmium (smw11)	9	0	0.0264	0.0292	0.03	0.03	0.14	0.144	0.228	0.384	0.509
1088		Cadmium (smw12)	8	0	0.03	0.03	0.03	0.065	0.14	0.14	0.26	0.4	0.512
1089		Cadmium (smw13)	8	0	0.0342	0.0572	0.0758	0.117	0.143	0.146	0.267	0.404	0.513
1090		Cadmium (smw14)	8	0	0.0655	0.0722	0.0768	0.12	0.143	0.146	0.267	0.404	0.513
1091		Cadmium (smw15)	9	0	0.119	0.956	1.5	1.6	2.5	3.78	5.78	5.94	6.068
1092		Cadmium (smw16)	9	0	0.0266	0.03	0.03	0.033	0.14	0.144	0.228	0.384	0.509
1093		Cadmium (smw16d)	8	0	0.0297	0.0316	0.033	0.0455	0.0608	0.0618	0.206	0.373	0.507
1094		Cadmium (smw17)	8	0	0.0276	0.03	0.03	0.145	0.248	0.384	0.54	0.54	0.54
1095		Cadmium (smw17d)	8	0	0.03	0.03	0.03	0.037	0.069	0.0718	0.215	0.377	0.507
1096		Cadmium (smw18)	8	0	0.03	0.03	0.03	0.094	0.248	0.384	0.54	0.54	0.54
1097		Cadmium (smw18d)	8	0	0.0606	0.0738	0.0833	0.1	0.113	0.116	0.246	0.393	0.511
1098		Cadmium (smw19)	8	0	0.0294	0.03	0.03	0.108	0.15	0.15	0.267	0.404	0.513
1099		Cadmium (smw7)	8	0	0.0321	0.0346	0.036	0.0435	0.076	0.0844	0.228	0.384	0.509
1100		Cadmium (smw8)	8	0	0.0235	0.0288	0.0295	0.03	0.03	0.03	0.183	0.362	0.504
1101		Cadmium (smw9)	9	0	0.03	0.03	0.03	0.038	0.06	0.092	0.22	0.38	0.508
1102		Cadmium (tw2r)	9	0	0.025	0.0292	0.03	0.03	0.033	0.0758	0.142	0.146	0.149

	A	B	C	D	E	F	G	H	I	J	K	L	M
1103		Cadmium (tw5r)	8	0	0.0271	0.0288	0.0295	0.03	0.0455	0.0616	0.218	0.379	0.508
1104		Cadmium (waste water clarifier well)	1	0	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
1105		Chromium (atmw6)	9	0	1.214	1.48	1.6	1.7	2.8	2.96	3.48	4.04	4.488
1106		Chromium (nfmw10)	8	0	2.47	2.82	3.1	4.55	6.15	6.22	6.87	7.535	8.067
1107		Chromium (nfmw11)	8	0	0.379	0.42	0.438	0.81	1.775	2.44	3.62	4.11	4.502
1108		Chromium (nfmw12)	8	0	0.257	0.264	0.268	0.315	0.575	0.68	1.94	3.27	4.334
1109		Chromium (nfmw19)	8	0	0.54	0.598	0.623	0.9	1.925	1.96	2.36	2.78	3.116
1110		Chromium (nfmw1d)	9	0	5.34	5.68	5.8	7.1	8	8.08	8.26	8.38	8.476
1111		Chromium (nfmw1s)	7	0	3.44	3.88	4.3	5.7	24.55	29.8	82.78	119.9	149.6
1112		Chromium (nfmw2)	9	0	0.21	0.252	0.28	0.5	0.88	1.808	3.2	3.2	3.2
1113		Chromium (nfmw20)	8	0	1.1	1.18	1.25	2.35	2.675	2.92	3.62	4.11	4.502
1114		Chromium (nfmw22)	4	0	3.65	3.8	3.875	4.1	4.2	4.2	4.2	4.2	4.2
1115		Chromium (nfmw23)	4	0	3.59	3.68	3.725	3.85	3.9	3.9	3.9	3.9	3.9
1116		Chromium (nfmw3)	9	0	3.2	3.56	3.8	4.6	5.2	5.32	5.56	5.68	5.776
1117		Chromium (nfmw4)	9	0	0.424	0.56	0.64	0.85	1.4	2.12	3.48	4.04	4.488
1118		Chromium (nfmw7)	9	0	0.448	0.498	0.53	0.8	3.4	3.44	3.72	4.16	4.512
1119		Chromium (nfmw8)	8	0	2.24	2.46	2.6	3	3.425	3.74	4.25	4.425	4.565
1120		Chromium (nfmw9)	8	0	7.59	7.88	7.95	9	10.43	10.46	11.4	12.45	13.29
1121		Chromium (smw10)	8	0	1.37	1.48	1.55	1.85	2.525	2.84	3.62	4.11	4.502
1122		Chromium (smw11)	9	0	1.614	3	3.8	4.2	4.3	4.3	4.36	4.48	4.576
1123		Chromium (smw12)	8	0	2.63	3.06	3.2	3.65	5.05	5.54	6.46	6.88	7.216
1124		Chromium (smw13)	8	0	0.473	0.656	0.74	1.075	2.825	3	3.62	4.11	4.502
1125		Chromium (smw14)	8	0	0.557	0.728	0.77	1.15	1.85	2.48	3.62	4.11	4.502
1126		Chromium (smw15)	9	0	0.436	0.47	0.47	0.8	4.6	4.68	4.9	5.1	5.26
1127		Chromium (smw16)	9	0	7.22	8.34	8.5	10.6	14.5	15.46	18.34	21.22	23.52
1128		Chromium (smw16d)	8	0	0.179	0.204	0.208	0.36	0.595	0.784	1.66	2.43	3.046
1129		Chromium (smw17)	8	0	7.82	10.94	11.68	12.45	13.2	14.04	15.18	15.39	15.56
1130		Chromium (smw17d)	8	0	0.21	0.242	0.27	0.415	0.5	0.5	1.31	2.255	3.011
1131		Chromium (smw18)	8	0	2.9	3.02	3.125	4.25	4.625	4.66	5.33	6.065	6.653
1132		Chromium (smw18d)	8	0	0.381	0.41	0.428	0.62	1.55	2.32	3.62	4.11	4.502
1133		Chromium (smw19)	8	0	0.83	0.894	0.898	1.2	1.85	2.48	3.62	4.11	4.502
1134		Chromium (smw7)	8	0	0.137	0.168	0.193	0.24	0.508	0.518	1.331	2.266	3.013
1135		Chromium (smw8)	8	0	0.186	0.21	0.21	0.245	0.5	0.5	1.31	2.255	3.011
1136		Chromium (smw9)	9	0	0.46	0.498	0.51	0.62	0.8	1.76	3.48	4.04	4.488
1137		Chromium (tw2r)	9	0	0.428	0.492	0.5	0.51	1.1	1.66	2.92	3.76	4.432
1138		Chromium (tw5r)	8	0	0.273	0.304	0.308	0.415	1.543	2.316	3.62	4.11	4.502
1139		Chromium (waste water clarifier well)	1	0	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
1140		Cobalt (atmw6)	9	0	0.085	0.106	0.12	0.15	0.25	0.322	0.444	0.472	0.494
1141		Cobalt (nfmw10)	8	0	0.371	0.432	0.478	0.59	0.783	0.814	1.105	1.403	1.641
1142		Cobalt (nfmw11)	8	0	0.214	0.224	0.228	0.3	0.378	0.402	0.811	1.256	1.611
1143		Cobalt (nfmw12)	8	0	0.11	0.132	0.143	0.355	0.5	0.5	1.85	3.425	4.685
1144		Cobalt (nfmw19)	8	0	1.532	3	3.875	7.5	22.25	22.32	45.2	71.8	93.08
1145		Cobalt (nfmw1d)	9	0	0.4	0.418	0.43	0.5	0.6	1.04	1.7	1.7	1.7
1146		Cobalt (nfmw1s)	7	0	0.474	0.542	0.59	1	1.35	1.44	2.78	3.74	4.508
1147		Cobalt (nfmw2)	9	0	0.166	0.176	0.18	0.22	0.32	0.872	1.7	1.7	1.7
1148		Cobalt (nfmw20)	8	0	0.292	0.358	0.4	0.525	0.77	0.924	1.28	1.49	1.658
1149		Cobalt (nfmw22)	4	0	0.43	0.43	0.43	0.43	0.435	0.438	0.444	0.447	0.449
1150		Cobalt (nfmw23)	4	0	0.483	0.516	0.533	0.595	0.655	0.67	0.7	0.715	0.727
1151		Cobalt (nfmw3)	9	0	0.78	0.86	0.9	0.92	1.1	1.22	1.46	1.58	1.676
1152		Cobalt (nfmw4)	9	0	0.146	0.15	0.15	0.24	0.26	0.312	0.652	1.176	1.595
1153		Cobalt (nfmw7)	9	0	0.628	0.828	0.96	1.2	1.7	1.7	1.72	1.76	1.792
1154		Cobalt (nfmw8)	8	0	0.527	0.582	0.628	0.775	1.048	1.352	1.7	1.7	1.7
1155		Cobalt (nfmw9)	8	0	1.67	1.9	2.075	2.4	5.825	8.38	14.42	18.06	20.97
1156		Cobalt (smw10)	8	0	0.25	0.266	0.28	0.355	0.383	0.386	0.783	1.242	1.608
1157		Cobalt (smw11)	9	0	0.428	0.478	0.51	0.58	0.76	1.096	4.52	10.36	15.03
1158		Cobalt (smw12)	8	0	0.327	0.368	0.375	0.44	0.58	0.664	1.042	1.371	1.634
1159		Cobalt (smw13)	8	0	0.43	0.462	0.49	0.795	1.475	1.58	3.56	5.73	7.466
1160		Cobalt (smw14)	8	0	0.427	0.434	0.438	0.5	0.74	0.908	1.28	1.49	1.658

	A	B	C	D	E	F	G	H	I	J	K	L	M
1161		Cobalt (smw15)	9	0	2.44	25.44	40.6	63.8	73.7	105.8	176	220	255.2
1162		Cobalt (smw16)	9	0	0.706	0.872	0.92	1	1.4	1.52	1.72	1.76	1.792
1163		Cobalt (smw16d)	8	0	0.32	0.328	0.335	0.375	0.428	0.438	0.825	1.263	1.613
1164		Cobalt (smw17)	8	0	0.938	1.068	1.145	1.45	1.7	1.7	1.7	1.7	1.7
1165		Cobalt (smw17d)	8	0	0.334	0.34	0.34	0.365	0.438	0.448	0.832	1.266	1.613
1166		Cobalt (smw18)	8	0	0.356	0.4	0.418	0.96	1.55	1.62	1.7	1.7	1.7
1167		Cobalt (smw18d)	8	0	0.799	0.884	0.94	1.15	1.2	1.2	1.35	1.525	1.665
1168		Cobalt (smw19)	8	0	0.272	0.334	0.373	0.43	0.778	1.208	3.59	5.795	7.559
1169		Cobalt (smw7)	8	0	0.499	0.77	0.963	1.3	2.225	2.96	3.92	4.06	4.172
1170		Cobalt (smw8)	8	0	0.0814	0.085	0.085	0.0935	0.238	0.36	0.86	1.28	1.616
1171		Cobalt (smw9)	9	0	0.198	0.216	0.22	0.23	0.3	0.352	0.684	1.192	1.598
1172		Cobalt (tw2r)	9	0	0.152	0.172	0.18	0.25	0.49	0.498	0.518	0.534	0.547
1173		Cobalt (tw5r)	8	0	0.205	0.274	0.295	0.445	0.64	0.738	1.105	1.403	1.641
1174		Cobalt (waste water clarifier well)	1	0	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
1175		Copper (atmw6)	9	0	2.34	3.28	3.8	4.5	5.8	6.08	7.36	9.08	10.46
1176		Copper (nfmw10)	8	0	0.563	0.642	0.688	2.3	3.175	3.7	4.78	5.34	5.788
1177		Copper (nfmw11)	8	0	0.37	0.43	0.43	0.715	1.025	1.06	2.06	3.18	4.076
1178		Copper (nfmw12)	8	0	0.256	0.34	0.393	0.43	0.598	0.832	1.22	1.36	1.472
1179		Copper (nfmw19)	8	0	1.77	2.62	3.075	4.4	17.03	20.42	29.73	36.07	41.13
1180		Copper (nfmw1d)	9	0	0.42	0.43	0.43	0.6	1.4	2.56	10.9	24.1	34.66
1181		Copper (nfmw1s)	7	0	0.868	1.46	1.7	2.2	4.85	5.42	23.68	37.09	47.82
1182		Copper (nfmw2)	9	0	0.43	0.586	0.69	0.89	4	4.12	4.3	4.3	4.3
1183		Copper (nfmw20)	8	0	0.465	0.728	0.945	1.65	2.1	2.1	2.76	3.53	4.146
1184		Copper (nfmw22)	4	0	3.92	4.04	4.1	4.35	4.625	4.7	4.85	4.925	4.985
1185		Copper (nfmw23)	4	0	8.47	8.74	8.875	11.55	14.5	14.8	15.4	15.7	15.94
1186		Copper (nfmw3)	9	0	0.388	0.43	0.43	0.64	1	1.04	1.74	3.02	4.044
1187		Copper (nfmw4)	9	0	0.404	0.426	0.43	0.66	2	2.4	3.26	3.78	4.196
1188		Copper (nfmw7)	9	0	6.48	6.88	7	7.4	8.1	9.02	10.4	10.4	10.4
1189		Copper (nfmw8)	8	0	0.421	0.43	0.43	0.635	1.9	3.02	4.69	5.145	5.509
1190		Copper (nfmw9)	8	0	3.31	4.38	4.45	6.7	21.13	30.4	46.88	53.74	59.23
1191		Copper (smw10)	8	0	1.77	1.88	1.95	2.15	2.9	3.18	3.89	4.345	4.709
1192		Copper (smw11)	9	0	0.764	0.924	1	1.5	3	3.28	5.44	8.92	11.7
1193		Copper (smw12)	8	0	0.79	1.048	1.195	2	3.725	4.32	5.3	5.65	5.93
1194		Copper (smw13)	8	0	1.89	2.14	2.175	3.2	4.225	4.26	4.36	4.43	4.486
1195		Copper (smw14)	8	0	4.21	4.3	4.3	5.3	6.175	6.42	7.57	8.585	9.397
1196		Copper (smw15)	9	0	7.26	15.52	20.4	26.6	50.1	51.38	62.08	79.64	93.69
1197		Copper (smw16)	9	0	0.522	0.662	0.73	1.1	1.5	1.74	2.54	3.42	4.124
1198		Copper (smw16d)	8	0	1.3	1.3	1.3	1.65	2.225	2.68	3.53	3.915	4.223
1199		Copper (smw17)	8	0	0.835	1.04	1.075	1.65	2.65	3.42	4.3	4.3	4.3
1200		Copper (smw17d)	8	0	0.902	1.028	1.07	1.2	1.525	1.56	2.47	3.485	4.297
1201		Copper (smw18)	8	0	1.99	2.56	2.875	4.3	5.45	5.66	6.05	6.225	6.365
1202		Copper (smw18d)	8	0	12.03	13.88	15	17.35	19.05	19.26	19.95	20.48	20.9
1203		Copper (smw19)	8	0	0.83	1.028	1.07	1.75	2.65	3.42	4.51	4.755	4.951
1204		Copper (smw7)	8	0	3.61	3.78	3.85	4.45	4.925	5.1	5.72	6.21	6.602
1205		Copper (smw8)	8	0	0.458	0.506	0.538	0.62	0.895	0.944	6.19	12.25	17.09
1206		Copper (smw9)	9	0	4.82	5.08	5.2	5.9	7.3	7.46	9.32	12.56	15.15
1207		Copper (tw2r)	9	0	0.388	0.526	0.59	1	1.4	1.68	2.6	3.6	4.4
1208		Copper (tw5r)	8	0	1.077	1.28	1.35	1.55	2.8	3.5	4.81	5.405	5.881
1209		Copper (waste water clarifier well)	1	0	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
1210		Iron (atmw6)	9	0	2594	2640	2660	2840	2920	3520	4520	4720	4880
1211		Iron (nfmw10)	8	0	378.4	407.8	433	503	1179	1819	2595	2648	2690
1212		Iron (nfmw11)	8	0	392.2	399.2	403.8	442	540.3	546.2	557.5	562.8	567
1213		Iron (nfmw12)	8	0	2279	3842	4850	5830	9255	10816	16980	22090	26178
1214		Iron (nfmw19)	8	0	13901	19660	22775	30100	46500	48740	53100	55200	56880
1215		Iron (nfmw1d)	9	0	1378	1380	1380	1590	1730	1758	1804	1812	1818
1216		Iron (nfmw1s)	7	0	216.8	277.2	363	516	748	792.4	1297	1654	1939
1217		Iron (nfmw2)	9	0	1354	2728	3520	5940	7880	7912	8050	8230	8374
1218		Iron (nfmw20)	8	0	3596	4136	4168	4885	5753	6526	7950	8580	9084

	A	B	C	D	E	F	G	H	I	J	K	L	M
1219		Iron (nfmw22)	4	0	1280	1280	1280	1290	1313	1320	1335	1343	1349
1220		Iron (nfmw23)	4	0	9432	9594	9675	9955	10225	10300	10450	10525	10585
1221		Iron (nfmw3)	9	0	678.8	963.6	1090	1730	3680	4980	7540	8760	9736
1222		Iron (nfmw4)	9	0	7556	8894	9770	10300	12500	12700	14600	17800	20360
1223		Iron (nfmw7)	9	0	186.2	208.8	214	522	851	884.2	1007	1154	1271
1224		Iron (nfmw8)	8	0	1022	1244	1388	2020	4323	4466	4876	5163	5393
1225		Iron (nfmw9)	8	0	4895	6654	7183	22100	39625	40220	42340	44020	45364
1226		Iron (smw10)	8	0	1672	1758	1818	2085	2258	2338	2616	2833	3007
1227		Iron (smw11)	9	0	1706	1852	1920	1980	2280	2760	4022	5106	5973
1228		Iron (smw12)	8	0	47.7	52.82	53.1	61.45	87.93	97.76	109.9	111	111.8
1229		Iron (smw13)	8	0	102.1	160	191.5	475.5	952.5	1166	2850	4530	5874
1230		Iron (smw14)	8	0	403.7	470.4	486.5	755.5	1174	1420	1718	1739	1756
1231		Iron (smw15)	9	0	2514	3398	3610	6620	9090	9814	12880	16840	20008
1232		Iron (smw16)	9	0	4168	4446	4470	5020	7220	7424	7734	7742	7748
1233		Iron (smw16d)	8	0	10.09	11.5	11.5	15.25	89.65	98.68	254.5	424.3	560.1
1234		Iron (smw17)	8	0	149.7	170.8	183.8	406	939	1355	5901	10651	14450
1235		Iron (smw17d)	8	0	12.2	13.14	13.7	16.3	30.95	39.84	67.7	88.35	104.9
1236		Iron (smw18)	8	0	483.2	603.8	707.8	955	1253	1410	2055	2598	3032
1237		Iron (smw18d)	8	0	30.37	41.4	48.93	71.95	105.3	107	115.9	124	130.4
1238		Iron (smw19)	8	0	194.8	217.2	235.8	549.5	7575	8940	14700	19600	23520
1239		Iron (smw7)	8	0	11.5	11.7	11.88	32.2	47.68	48.76	67.7	88.35	104.9
1240		Iron (smw8)	8	0	1105	1128	1135	1340	1493	1510	1563	1602	1632
1241		Iron (smw9)	9	0	14.3	17.1	18.5	35	48.6	56.6	76.68	92.84	105.8
1242		Iron (tw2r)	9	0	1388	2562	3270	4820	6640	7056	12704	22752	30790
1243		Iron (tw5r)	8	0	2656	2728	2770	3245	3645	3736	3903	3977	4035
1244		Iron (waste water clarifier well)	1	0	11200	11200	11200	11200	11200	11200	11200	11200	11200
1245		Manganese (atmw6)	9	0	1734	2134	2390	2470	3170	3314	3644	3872	4054
1246		Manganese (nfmw10)	8	0	4270	5096	5163	6785	7433	7716	8181	8346	8477
1247		Manganese (nfmw11)	8	0	2885	3266	3455	3715	4380	4464	4563	4567	4569
1248		Manganese (nfmw12)	8	0	2069	2930	3613	4515	6093	6740	7666	7883	8057
1249		Manganese (nfmw19)	8	0	30620	34580	35000	41100	47625	48360	49890	50695	51339
1250		Manganese (nfmw1d)	9	0	2932	3170	3290	3310	3850	4030	4490	4870	5174
1251		Manganese (nfmw1s)	7	0	47.52	51.16	51.4	83.6	113	118.4	153.2	176.6	195.3
1252		Manganese (nfmw2)	9	0	3716	3844	3880	4240	4630	4882	5474	5902	6244
1253		Manganese (nfmw20)	8	0	10300	10780	11200	13300	14750	14960	15200	15200	15200
1254		Manganese (nfmw22)	4	0	2544	2598	2625	2745	2855	2876	2918	2939	2956
1255		Manganese (nfmw23)	4	0	3922	4084	4165	4460	4635	4644	4662	4671	4678
1256		Manganese (nfmw3)	9	0	4388	4618	4770	5620	7270	7330	7468	7564	7641
1257		Manganese (nfmw4)	9	0	3280	3524	3560	4370	7930	8038	8740	9820	10684
1258		Manganese (nfmw7)	9	0	214.2	239.2	242	250	267	269	325.4	432.2	517.6
1259		Manganese (nfmw8)	8	0	8001	8496	8580	8730	9205	9282	9979	10690	11258
1260		Manganese (nfmw9)	8	0	2803	3568	4188	4970	6925	7982	10723	12512	13942
1261		Manganese (smw10)	8	0	1878	1962	1973	2040	2475	2496	2730	2975	3171
1262		Manganese (smw11)	9	0	5370	5554	5630	6090	6830	7422	10268	14184	17317
1263		Manganese (smw12)	8	0	2661	2752	2798	3265	3953	3970	4254	4562	4808
1264		Manganese (smw13)	8	0	1400	1740	1933	3385	4618	5216	6137	6414	6635
1265		Manganese (smw14)	8	0	732.3	1153	1437	2315	3280	3336	3652	3946	4181
1266		Manganese (smw15)	9	0	4160	4500	4580	7920	9520	10952	13580	14540	15308
1267		Manganese (smw16)	9	0	3886	4038	4130	4520	4690	4750	4954	5182	5364
1268		Manganese (smw16d)	8	0	333.9	347.6	352.5	364.5	382	396	413.5	415.3	416.7
1269		Manganese (smw17)	8	0	3821	3950	4055	4285	4473	4630	8317	12409	15682
1270		Manganese (smw17d)	8	0	559.3	591.6	607	626	662.8	679.2	725	756.5	781.7
1271		Manganese (smw18)	8	0	1910	2026	2128	2395	4073	4650	5835	6448	6938
1272		Manganese (smw18d)	8	0	688.5	715	723.8	786	827.3	827.6	1006	1213	1379
1273		Manganese (smw19)	8	0	3476	3884	4010	5130	8123	8196	8427	8599	8736
1274		Manganese (smw7)	8	0	237.1	372	452.5	517.5	913.5	1089	1293	1297	1299
1275		Manganese (smw8)	8	0	807.7	874	905.5	947	1012	1081	1181	1206	1225
1276		Manganese (smw9)	9	0	2.064	3.16	3.6	42.5	150	159.2	239.2	371.6	477.5

	A	B	C	D	E	F	G	H	I	J	K	L	M
1277		Manganese (tw2r)	9	0	420.4	592.4	688	1290	1720	1768	1894	2002	2088
1278		Manganese (tw5r)	8	0	249.5	273.8	278	375.5	491.5	537	778.3	999.2	1176
1279		Manganese (waste water clarifier well)	1	0	1980	1980	1980	1980	1980	1980	1980	1980	1980
1280		Nickel (atmw6)	9	0	0.612	0.748	0.82	1.1	1.2	1.24	1.34	1.42	1.484
1281		Nickel (nfmw10)	8	0	3.44	3.86	4.175	4.95	5.65	5.72	6.01	6.255	6.451
1282		Nickel (nfmw11)	8	0	1.07	1.22	1.325	1.6	2.225	2.26	2.66	3.08	3.416
1283		Nickel (nfmw12)	8	0	0.185	0.216	0.23	0.375	0.51	0.524	2.808	5.454	7.571
1284		Nickel (nfmw19)	8	0	4.15	4.72	4.825	12.8	27.85	30.16	50.14	70.37	86.55
1285		Nickel (nfmw1d)	9	0	7.12	7.78	8.1	9.6	10.9	11.3	12.24	12.92	13.46
1286		Nickel (nfmw1s)	7	0	20.6	21.66	22.05	26.2	33.1	33.46	46.94	56.87	64.81
1287		Nickel (nfmw2)	9	0	0.786	0.848	0.88	1.9	2.1	2.3	2.64	2.72	2.784
1288		Nickel (nfmw20)	8	0	2.68	2.84	2.875	3.2	3.375	3.48	3.84	4.12	4.344
1289		Nickel (nfmw22)	4	0	6.26	6.32	6.35	6.55	6.75	6.78	6.84	6.87	6.894
1290		Nickel (nfmw23)	4	0	5.94	6.18	6.3	6.5	6.575	6.62	6.71	6.755	6.791
1291		Nickel (nfmw3)	9	0	3.22	3.36	3.4	4.1	5.2	5.6	6.26	6.38	6.476
1292		Nickel (nfmw4)	9	0	0.278	0.344	0.38	0.44	0.63	0.714	1.092	1.596	1.999
1293		Nickel (nfmw7)	9	0	1.8	2.34	2.7	2.8	3.1	3.14	3.36	3.68	3.936
1294		Nickel (nfmw8)	8	0	2.51	2.84	3.05	4.05	4.8	5.22	5.76	5.83	5.886
1295		Nickel (nfmw9)	8	0	7.61	9.18	9.95	11.45	14.25	17.12	20.76	21.18	21.52
1296		Nickel (smw10)	8	0	3.84	4.1	4.275	4.9	5.35	5.42	5.53	5.565	5.593
1297		Nickel (smw11)	9	0	2.76	4.28	5.2	5.8	6.1	6.3	7.28	8.64	9.728
1298		Nickel (smw12)	8	0	2.49	2.78	2.85	3.85	4.7	4.98	8	11.15	13.67
1299		Nickel (smw13)	8	0	2.61	3.04	3.075	3.9	5.125	5.3	6.4	7.45	8.29
1300		Nickel (smw14)	8	0	2.62	2.92	3.025	3.5	3.9	4.04	4.38	4.59	4.758
1301		Nickel (smw15)	9	0	6.04	26.46	39.9	66	75.2	132.7	227.2	243.6	256.7
1302		Nickel (smw16)	9	0	7.32	8.64	9.2	10.1	12.2	12.64	14.32	16.36	17.99
1303		Nickel (smw16d)	8	0	1.17	1.32	1.425	1.6	1.8	1.94	3.06	4.18	5.076
1304		Nickel (smw17)	8	0	8.04	9.52	9.975	10.9	11.63	11.66	11.73	11.77	11.79
1305		Nickel (smw17d)	8	0	0.862	0.91	0.91	1.04	3.15	3.64	4.53	4.915	5.223
1306		Nickel (smw18)	8	0	2.08	2.48	2.725	3.5	5.15	5.22	14.12	24.41	32.64
1307		Nickel (smw18d)	8	0	2.18	2.34	2.375	2.95	3.475	3.86	4.6	4.95	5.23
1308		Nickel (smw19)	8	0	0.967	1	1	1.35	1.825	2	4.03	6.165	7.873
1309		Nickel (smw7)	8	0	1.025	1.1	1.1	1.4	1.8	1.94	3.06	4.18	5.076
1310		Nickel (smw8)	8	0	0.185	0.208	0.215	0.265	0.393	0.424	0.952	1.526	1.985
1311		Nickel (smw9)	9	0	3.02	3.28	3.4	3.4	4.5	4.7	5.06	5.18	5.276
1312		Nickel (tw2r)	9	0	0.526	0.758	0.85	1.2	1.5	1.5	1.68	2.04	2.328
1313		Nickel (tw5r)	8	0	1.038	1.28	1.35	1.7	2.125	2.16	3.13	4.215	5.083
1314		Nickel (waste water clarifier well)	1	0	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
1315		Thallium (atmw6)	9	0	0.0214	0.0268	0.028	0.047	0.047	0.047	0.0636	0.0968	0.123
1316		Thallium (nfmw10)	8	0	0.0413	0.047	0.047	0.0735	0.133	0.136	0.257	0.394	0.503
1317		Thallium (nfmw11)	8	0	0.028	0.0356	0.0423	0.047	0.0678	0.0968	0.25	0.39	0.502
1318		Thallium (nfmw12)	8	0	0.028	0.0288	0.0295	0.047	0.0603	0.0788	0.109	0.12	0.128
1319		Thallium (nfmw19)	8	0	0.0413	0.047	0.047	0.135	0.24	0.24	0.327	0.429	0.51
1320		Thallium (nfmw1d)	9	0	0.0274	0.028	0.028	0.047	0.1	0.272	0.53	0.53	0.53
1321		Thallium (nfmw1s)	7	0	0.047	0.0576	0.0735	0.13	0.23	0.236	0.356	0.443	0.513
1322		Thallium (nfmw2)	9	0	0.0274	0.028	0.028	0.047	0.1	0.272	0.53	0.53	0.53
1323		Thallium (nfmw20)	8	0	0.028	0.0356	0.0423	0.0885	0.24	0.24	0.327	0.429	0.51
1324		Thallium (nfmw22)	4	0	0.047	0.047	0.047	0.144	0.24	0.24	0.24	0.24	0.24
1325		Thallium (nfmw23)	4	0	0.047	0.047	0.047	0.144	0.24	0.24	0.24	0.24	0.24
1326		Thallium (nfmw3)	9	0	0.0274	0.0394	0.047	0.047	0.13	0.134	0.218	0.374	0.499
1327		Thallium (nfmw4)	9	0	0.0214	0.0268	0.028	0.047	0.047	0.0682	0.186	0.358	0.496
1328		Thallium (nfmw7)	9	0	0.028	0.0394	0.047	0.047	0.047	0.0802	0.142	0.166	0.185
1329		Thallium (nfmw8)	8	0	0.0218	0.0356	0.0423	0.047	0.168	0.337	0.53	0.53	0.53
1330		Thallium (nfmw9)	8	0	0.0413	0.047	0.047	0.0735	0.133	0.136	0.257	0.394	0.503
1331		Thallium (smw10)	8	0	0.0218	0.0288	0.0295	0.047	0.047	0.047	0.192	0.361	0.496
1332		Thallium (smw11)	9	0	0.0408	0.0458	0.047	0.047	0.14	0.18	0.298	0.414	0.507
1333		Thallium (smw12)	8	0	0.0351	0.047	0.047	0.0735	0.133	0.136	0.257	0.394	0.503
1334		Thallium (smw13)	8	0	0.0365	0.047	0.047	0.0885	0.165	0.2	0.327	0.429	0.51

	A	B	C	D	E	F	G	H	I	J	K	L	M
1335		Thallium (smw14)	8	0	0.0218	0.0356	0.0423	0.047	0.158	0.196	0.327	0.429	0.51
1336		Thallium (smw15)	9	0	0.0494	0.0614	0.069	0.095	0.13	0.13	0.134	0.142	0.148
1337		Thallium (smw16)	9	0	0.0228	0.0382	0.047	0.1	0.14	0.18	0.298	0.414	0.507
1338		Thallium (smw16d)	8	0	0.0232	0.0368	0.0428	0.047	0.0603	0.0788	0.229	0.38	0.5
1339		Thallium (smw17)	8	0	0.0359	0.047	0.047	0.19	0.313	0.414	0.53	0.53	0.53
1340		Thallium (smw17d)	8	0	0.0232	0.0288	0.0295	0.047	0.047	0.047	0.192	0.361	0.496
1341		Thallium (smw18)	8	0	0.0351	0.047	0.047	0.12	0.313	0.414	0.53	0.53	0.53
1342		Thallium (smw18d)	8	0	0.0218	0.0288	0.0295	0.047	0.047	0.047	0.192	0.361	0.496
1343		Thallium (smw19)	8	0	0.0218	0.0356	0.0423	0.047	0.158	0.196	0.327	0.429	0.51
1344		Thallium (smw7)	8	0	0.0218	0.0288	0.0295	0.047	0.047	0.047	0.192	0.361	0.496
1345		Thallium (smw8)	8	0	0.0218	0.0288	0.0295	0.047	0.047	0.047	0.192	0.361	0.496
1346		Thallium (smw9)	9	0	0.0214	0.0268	0.028	0.047	0.047	0.0802	0.21	0.37	0.498
1347		Thallium (tw2r)	9	0	0.0214	0.0268	0.028	0.047	0.047	0.0802	0.152	0.196	0.231
1348		Thallium (tw5r)	8	0	0.0218	0.0288	0.0295	0.047	0.047	0.047	0.192	0.361	0.496
1349		Thallium (waste water clarifier well)	1	0	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
1350		Vanadium (atmw6)	9	0	5.24	5.56	5.6	8.8	11.3	12.3	14.44	15.72	16.74
1351		Vanadium (nfmw10)	8	0	12.33	14.2	15.6	24.85	32.63	36.02	41.4	43.15	44.55
1352		Vanadium (nfmw11)	8	0	1.034	1.14	1.175	1.5	3.425	4.02	4.88	5.09	5.258
1353		Vanadium (nfmw12)	8	0	0.333	0.4	0.435	0.535	0.91	0.952	1.09	1.195	1.279
1354		Vanadium (nfmw19)	8	0	1.07	1.18	1.25	1.45	2.425	3.16	4.39	4.845	5.209
1355		Vanadium (nfmw1d)	9	0	22.76	23.9	24.1	32.1	34.3	34.7	35.52	35.96	36.31
1356		Vanadium (nfmw1s)	7	0	45.04	50.7	58.35	83	102.5	113	143.2	160.6	174.5
1357		Vanadium (nfmw2)	9	0	0.824	0.938	0.97	1.1	5.3	5.3	5.68	6.44	7.048
1358		Vanadium (nfmw20)	8	0	2.97	3.2	3.375	4.5	5.75	6.24	6.8	6.8	6.8
1359		Vanadium (nfmw22)	4	0	33.96	34.02	34.05	34.15	34.53	34.72	35.11	35.31	35.46
1360		Vanadium (nfmw23)	4	0	43.73	45.56	46.48	49.35	51.7	52.3	53.5	54.1	54.58
1361		Vanadium (nfmw3)	9	0	7.5	7.98	8.1	8.6	12.5	12.86	14.08	15.44	16.53
1362		Vanadium (nfmw4)	9	0	1	1.06	1.1	1.3	1.5	1.62	2.5	3.9	5.02
1363		Vanadium (nfmw7)	9	0	3.7	4.24	4.6	5.7	8.7	13.38	22.68	27.24	30.89
1364		Vanadium (nfmw8)	8	0	5.51	5.8	5.975	6.65	7.2	7.34	7.95	8.475	8.895
1365		Vanadium (nfmw9)	8	0	14.82	16.48	16.73	20.95	26.1	28.2	31.35	32.23	32.93
1366		Vanadium (smw10)	8	0	9.86	10.22	10.33	15.3	15.43	15.46	15.59	15.7	15.78
1367		Vanadium (smw11)	9	0	6.14	14.08	18.8	21	22.1	22.78	23.8	23.8	23.8
1368		Vanadium (smw12)	8	0	8.7	10.26	11.1	12.5	17.18	18.82	22.53	24.67	26.37
1369		Vanadium (smw13)	8	0	2.95	3.18	3.25	3.9	13.9	14.32	15.67	16.69	17.5
1370		Vanadium (smw14)	8	0	9.37	9.84	10.23	11.15	13.23	13.26	13.72	14.21	14.6
1371		Vanadium (smw15)	9	0	0.746	0.852	0.92	1.3	3.8	12.2	24.96	25.28	25.54
1372		Vanadium (smw16)	9	0	28.24	31.74	32.5	44.4	52.9	58.1	69.42	76.46	82.09
1373		Vanadium (smw16d)	8	0	1.07	1.14	1.175	1.3	1.325	1.36	2.57	3.935	5.027
1374		Vanadium (smw17)	8	0	33.08	46.4	50.08	58.75	62.63	63.64	67.98	71.69	74.66
1375		Vanadium (smw17d)	8	0	1.67	1.74	1.775	2.25	3.55	3.62	4.18	4.74	5.188
1376		Vanadium (smw18)	8	0	11.05	12.94	13.68	18	19.95	21.14	25.41	28.81	31.52
1377		Vanadium (smw18d)	8	0	4.15	4.58	4.825	6.05	7.075	7.46	8.05	8.225	8.365
1378		Vanadium (smw19)	8	0	1.9	2.14	2.35	3.05	4.25	4.74	5.72	6.21	6.602
1379		Vanadium (smw7)	8	0	1.31	1.48	1.55	1.9	2.4	2.54	3.48	4.39	5.118
1380		Vanadium (smw8)	8	0	0.347	0.384	0.388	0.475	0.605	0.612	2.024	3.662	4.972
1381		Vanadium (smw9)	9	0	5	5.22	5.3	6.3	6.8	6.96	7.92	9.36	10.51
1382		Vanadium (tw2r)	9	0	0.302	0.508	0.64	1.3	1.4	1.76	4.7	9.5	13.34
1383		Vanadium (tw5r)	8	0	0.389	0.492	0.538	0.85	1.47	2.184	3.69	4.495	5.139
1384		Vanadium (waste water clarifier well)	1	0	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 10:37:12 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	57	Mean	208
Maximum	480	Median	161
SD	156.6	Std. Error of Mean	52.21
Coefficient of Variation	0.753	Skewness	1.175

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.247	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	305	95% Adjusted-CLT UCL (Chen-1995)	315.7
		95% Modified-t UCL (Johnson-1978)	308.5

Gamma GOF Test

A-D Test Statistic	0.358	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.163	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.282	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.241	k star (bias corrected MLE)	1.568
Theta hat (MLE)	92.81	Theta star (bias corrected MLE)	132.6
nu hat (MLE)	40.33	nu star (bias corrected)	28.22
MLE Mean (bias corrected)	208	MLE Sd (bias corrected)	166.1
		Approximate Chi Square Value (0.05)	17.1
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	15.3

53	**Assuming Gamma Distribution**											
54	95% Approximate Gamma UCL (use when n>=50))					343.2	95% Adjusted Gamma UCL (use when n<50)					383.5
55												
56	**Lognormal GOF Test**											
57	Shapiro Wilk Test Statistic					0.951	**Shapiro Wilk Lognormal GOF Test**					
58	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
59	Lilliefors Test Statistic					0.142	**Lilliefors Lognormal GOF Test**					
60	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64	Minimum of Logged Data					4.043	Mean of logged Data					5.098
65	Maximum of Logged Data					6.174	SD of logged Data					0.733
66												
67	**Assuming Lognormal Distribution**											
68	95% H-UCL					428.6	90% Chebyshev (MVUE) UCL					362
69	95% Chebyshev (MVUE) UCL					432.3	97.5% Chebyshev (MVUE) UCL					530
70	99% Chebyshev (MVUE) UCL					721.8						
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
74												
75	**Nonparametric Distribution Free UCLs**											
76	95% CLT UCL					293.8	95% Jackknife UCL					305
77	95% Standard Bootstrap UCL					287.4	95% Bootstrap-t UCL					417.3
78	95% Hall's Bootstrap UCL					873.5	95% Percentile Bootstrap UCL					298.1
79	95% BCA Bootstrap UCL					302.5						
80	90% Chebyshev(Mean, Sd) UCL					364.6	95% Chebyshev(Mean, Sd) UCL					435.5
81	97.5% Chebyshev(Mean, Sd) UCL					534	99% Chebyshev(Mean, Sd) UCL					727.4
82												
83	**Suggested UCL to Use**											
84	95% Student's-t UCL					305						
85												
86	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
87	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
88												
89	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
90	Recommendations are based upon data size, data distribution, and skewness.											
91	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
92	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
93												
94												
95	**Aluminum (nfmw10)**											
96												
97	**General Statistics**											
98	Total Number of Observations					8	Number of Distinct Observations					8
99							Number of Missing Observations					0
100	Minimum					56.4	Mean					119.4
101	Maximum					224	Median					112
102	SD					56.15	Std. Error of Mean					19.85
103	Coefficient of Variation					0.47	Skewness					0.78
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
106	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
107	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
108	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
109												
110	**Normal GOF Test**											
111					Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**					
112					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
113					Lilliefors Test Statistic	0.131	**Lilliefors GOF Test**					
114					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
115	**Data appear Normal at 5% Significance Level**											
116												
117	**Assuming Normal Distribution**											
118	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
119					95% Student's-t UCL	157				95% Adjusted-CLT UCL (Chen-1995)		157.9
120										95% Modified-t UCL (Johnson-1978)		157.9
121												
122	**Gamma GOF Test**											
123					A-D Test Statistic	0.188	**Anderson-Darling Gamma GOF Test**					
124					5% A-D Critical Value	0.719	Detected data appear Gamma Distributed at 5% Significance Level					
125					K-S Test Statistic	0.152	**Kolmogorov-Smirnov Gamma GOF Test**					
126					5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level					
127	**Detected data appear Gamma Distributed at 5% Significance Level**											
128												
129	**Gamma Statistics**											
130					k hat (MLE)	5.244				k star (bias corrected MLE)		3.361
131					Theta hat (MLE)	22.76				Theta star (bias corrected MLE)		35.52
132					nu hat (MLE)	83.9				nu star (bias corrected)		53.77
133					MLE Mean (bias corrected)	119.4				MLE Sd (bias corrected)		65.12
134										Approximate Chi Square Value (0.05)		37.92
135					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		34.59
136												
137	**Assuming Gamma Distribution**											
138					95% Approximate Gamma UCL (use when n>=50))	169.3				95% Adjusted Gamma UCL (use when n<50)		185.6
139												
140	**Lognormal GOF Test**											
141					Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**					
142					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
143					Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**					
144					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
145	**Data appear Lognormal at 5% Significance Level**											
146												
147	**Lognormal Statistics**											
148					Minimum of Logged Data	4.032				Mean of logged Data		4.684
149					Maximum of Logged Data	5.412				SD of logged Data		0.48
150												
151	**Assuming Lognormal Distribution**											
152					95% H-UCL	185				90% Chebyshev (MVUE) UCL		181
153					95% Chebyshev (MVUE) UCL	208.8				97.5% Chebyshev (MVUE) UCL		247.4
154					99% Chebyshev (MVUE) UCL	323.3						
155												
156	**Nonparametric Distribution Free UCL Statistics**											

157	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
158												
159	**Nonparametric Distribution Free UCLs**											
160					95% CLT UCL	152			95% Jackknife UCL	157		
161					95% Standard Bootstrap UCL	149.6			95% Bootstrap-t UCL	166		
162					95% Hall's Bootstrap UCL	164.7			95% Percentile Bootstrap UCL	151.8		
163					95% BCA Bootstrap UCL	151						
164					90% Chebyshev(Mean, Sd) UCL	178.9			95% Chebyshev(Mean, Sd) UCL	205.9		
165					97.5% Chebyshev(Mean, Sd) UCL	243.4			99% Chebyshev(Mean, Sd) UCL	316.9		
166												
167	**Suggested UCL to Use**											
168					95% Student's-t UCL	157						
169												
170	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
171	Recommendations are based upon data size, data distribution, and skewness.											
172	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
173	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
174												
175	**Aluminum (nfmw11)**											
176												
177	**General Statistics**											
178					Total Number of Observations	8			Number of Distinct Observations	8		
179					Number of Detects	4			Number of Non-Detects	4		
180					Number of Distinct Detects	4			Number of Distinct Non-Detects	4		
181					Minimum Detect	8.8			Minimum Non-Detect	8.1		
182					Maximum Detect	35.5			Maximum Non-Detect	113		
183					Variance Detects	158.5			Percent Non-Detects	50%		
184					Mean Detects	23.93			SD Detects	12.59		
185					Median Detects	25.7			CV Detects	0.526		
186					Skewness Detects	-0.444			Kurtosis Detects	-3.156		
187					Mean of Logged Detects	3.038			SD of Logged Detects	0.646		
188												
189	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
190	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
191	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
192	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
193												
194	**Normal GOF Test on Detects Only**											
195					Shapiro Wilk Test Statistic	0.909			**Shapiro Wilk GOF Test**			
196					5% Shapiro Wilk Critical Value	0.748			Detected Data appear Normal at 5% Significance Level			
197					Lilliefors Test Statistic	0.264			**Lilliefors GOF Test**			
198					5% Lilliefors Critical Value	0.375			Detected Data appear Normal at 5% Significance Level			
199	**Detected Data appear Normal at 5% Significance Level**											
200												
201	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
202					KM Mean	18.19			KM Standard Error of Mean	4.974		
203					KM SD	10.93			95% KM (BCA) UCL	N/A		
204					95% KM (t) UCL	27.61			95% KM (Percentile Bootstrap) UCL	N/A		
205					95% KM (z) UCL	26.37			95% KM Bootstrap t UCL	N/A		
206					90% KM Chebyshev UCL	33.11			95% KM Chebyshev UCL	39.87		
207					97.5% KM Chebyshev UCL	49.25			99% KM Chebyshev UCL	67.68		
208												

	A	B	C	D	E	F	G	H	I	J	K	L
209	**Gamma GOF Tests on Detected Observations Only**											
210					A-D Test Statistic	0.362	**Anderson-Darling GOF Test**					
211					5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level					
212					K-S Test Statistic	0.297	**Kolmogorov-Smirnov GOF**					
213					5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level					
214	**Detected data appear Gamma Distributed at 5% Significance Level**											
215												
216	**Gamma Statistics on Detected Data Only**											
217					k hat (MLE)	3.818	k star (bias corrected MLE)					1.121
218					Theta hat (MLE)	6.266	Theta star (bias corrected MLE)					21.34
219					nu hat (MLE)	30.54	nu star (bias corrected)					8.969
220					Mean (detects)	23.93						
221												
222	**Gamma ROS Statistics using Imputed Non-Detects**											
223	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
224	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
225	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
226	This is especially true when the sample size is small.											
227	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
228					Minimum	1.191	Mean					16.42
229					Maximum	35.5	Median					12.32
230					SD	12.08	CV					0.736
231					k hat (MLE)	1.579	k star (bias corrected MLE)					1.07
232					Theta hat (MLE)	10.4	Theta star (bias corrected MLE)					15.35
233					nu hat (MLE)	25.26	nu star (bias corrected)					17.12
234					Adjusted Level of Significance (β)	0.0195						
235					Approximate Chi Square Value (17.12, α)	8.758	Adjusted Chi Square Value (17.12, β)					7.297
236					95% Gamma Approximate UCL (use when n>=50)	32.11	95% Gamma Adjusted UCL (use when n<50)					N/A
237												
238	**Estimates of Gamma Parameters using KM Estimates**											
239					Mean (KM)	18.19	SD (KM)					10.93
240					Variance (KM)	119.4	SE of Mean (KM)					4.974
241					k hat (KM)	2.772	k star (KM)					1.816
242					nu hat (KM)	44.35	nu star (KM)					29.05
243					theta hat (KM)	6.563	theta star (KM)					10.02
244					80% gamma percentile (KM)	27.54	90% gamma percentile (KM)					36.2
245					95% gamma percentile (KM)	44.5	99% gamma percentile (KM)					63.03
246												
247	**Gamma Kaplan-Meier (KM) Statistics**											
248					Approximate Chi Square Value (29.05, α)	17.75	Adjusted Chi Square Value (29.05, β)					15.56
249					95% Gamma Approximate KM-UCL (use when n>=50)	29.77	95% Gamma Adjusted KM-UCL (use when n<50)					33.97
250												
251	**Lognormal GOF Test on Detected Observations Only**											
252					Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk GOF Test**					
253					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level					
254					Lilliefors Test Statistic	0.261	**Lilliefors GOF Test**					
255					5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level					
256	**Detected Data appear Lognormal at 5% Significance Level**											
257												
258	**Lognormal ROS Statistics Using Imputed Non-Detects**											
259					Mean in Original Scale	16.66	Mean in Log Scale					2.607
260					SD in Original Scale	11.56	SD in Log Scale					0.687

261				95% t UCL (assumes normality of ROS data)		24.4				95% Percentile Bootstrap UCL		23.22
262				95% BCA Bootstrap UCL		24.75				95% Bootstrap t UCL		31.41
263				95% H-UCL (Log ROS)		34.66						
264												
265				**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**								
266				KM Mean (logged)		2.719				KM Geo Mean		15.16
267				KM SD (logged)		0.602				95% Critical H Value (KM-Log)		2.538
268				KM Standard Error of Mean (logged)		0.285				95% H-UCL (KM -Log)		32.39
269				KM SD (logged)		0.602				95% Critical H Value (KM-Log)		2.538
270				KM Standard Error of Mean (logged)		0.285						
271												
272				**DL/2 Statistics**								
273				**DL/2 Normal**						**DL/2 Log-Transformed**		
274				Mean in Original Scale		22.54				Mean in Log Scale		2.817
275				SD in Original Scale		17.76				SD in Log Scale		0.865
276				95% t UCL (Assumes normality)		34.44				95% H-Stat UCL		66.99
277				**DL/2 is not a recommended method, provided for comparisons and historical reasons**								
278												
279				**Nonparametric Distribution Free UCL Statistics**								
280				**Detected Data appear Normal Distributed at 5% Significance Level**								
281												
282				**Suggested UCL to Use**								
283				95% KM (t) UCL		27.61						
284												
285				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
286				Recommendations are based upon data size, data distribution, and skewness.								
287				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
288				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
289												
290												
291	**Aluminum (nfmw12)**											
292												
293				**General Statistics**								
294				Total Number of Observations		8				Number of Distinct Observations		8
295										Number of Missing Observations		0
296				Minimum		8.7				Mean		57.43
297				Maximum		278				Median		25.15
298				SD		90.03				Std. Error of Mean		31.83
299				Coefficient of Variation		1.568				Skewness		2.719
300												
301				**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**								
302				**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**								
303				**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**								
304				**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**								
305												
306				**Normal GOF Test**								
307				Shapiro Wilk Test Statistic		0.548				**Shapiro Wilk GOF Test**		
308				5% Shapiro Wilk Critical Value		0.818				Data Not Normal at 5% Significance Level		
309				Lilliefors Test Statistic		0.401				**Lilliefors GOF Test**		
310				5% Lilliefors Critical Value		0.283				Data Not Normal at 5% Significance Level		
311				**Data Not Normal at 5% Significance Level**								
312												

313	**Assuming Normal Distribution**											
314	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
315				95% Student's-t UCL		117.7			95% Adjusted-CLT UCL (Chen-1995)			142.5
316									95% Modified-t UCL (Johnson-1978)			122.8
317												
318	**Gamma GOF Test**											
319				A-D Test Statistic		0.957	**Anderson-Darling Gamma GOF Test**					
320				5% A-D Critical Value		0.737	Data Not Gamma Distributed at 5% Significance Level					
321				K-S Test Statistic		0.306	**Kolmogorov-Smirnov Gamma GOF Test**					
322				5% K-S Critical Value		0.302	Data Not Gamma Distributed at 5% Significance Level					
323	**Data Not Gamma Distributed at 5% Significance Level**											
324												
325	**Gamma Statistics**											
326				k hat (MLE)		0.953			k star (bias corrected MLE)			0.679
327				Theta hat (MLE)		60.23			Theta star (bias corrected MLE)			84.54
328				nu hat (MLE)		15.26			nu star (bias corrected)			10.87
329				MLE Mean (bias corrected)		57.43			MLE Sd (bias corrected)			69.68
330									Approximate Chi Square Value (0.05)			4.491
331				Adjusted Level of Significance		0.0195			Adjusted Chi Square Value			3.513
332												
333	**Assuming Gamma Distribution**											
334				95% Approximate Gamma UCL (use when n>=50))		139			95% Adjusted Gamma UCL (use when n<50)			177.6
335												
336	**Lognormal GOF Test**											
337				Shapiro Wilk Test Statistic		0.88	**Shapiro Wilk Lognormal GOF Test**					
338				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
339				Lilliefors Test Statistic		0.23	**Lilliefors Lognormal GOF Test**					
340				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
341	**Data appear Lognormal at 5% Significance Level**											
342												
343	**Lognormal Statistics**											
344				Minimum of Logged Data		2.163			Mean of logged Data			3.442
345				Maximum of Logged Data		5.628			SD of logged Data			1.024
346												
347	**Assuming Lognormal Distribution**											
348				95% H-UCL		203.2			90% Chebyshev (MVUE) UCL			102
349				95% Chebyshev (MVUE) UCL		126.3			97.5% Chebyshev (MVUE) UCL			160.1
350				99% Chebyshev (MVUE) UCL		226.3						
351												
352	**Nonparametric Distribution Free UCL Statistics**											
353	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
354												
355	**Nonparametric Distribution Free UCLs**											
356				95% CLT UCL		109.8			95% Jackknife UCL			117.7
357				95% Standard Bootstrap UCL		106.4			95% Bootstrap-t UCL			456.6
358				95% Hall's Bootstrap UCL		400.3			95% Percentile Bootstrap UCL			117.8
359				95% BCA Bootstrap UCL		152.8						
360				90% Chebyshev(Mean, Sd) UCL		152.9			95% Chebyshev(Mean, Sd) UCL			196.2
361				97.5% Chebyshev(Mean, Sd) UCL		256.2			99% Chebyshev(Mean, Sd) UCL			374.1
362												
363	**Suggested UCL to Use**											
364				95% Chebyshev (Mean, Sd) UCL		196.2						

	A	B	C	D	E	F	G	H	I	J	K	L
365												
366	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
367	Recommendations are based upon data size, data distribution, and skewness.											
368	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
369	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
370												
371												
372	**Aluminum (nfmw19)**											
373												
374	**General Statistics**											
375						Total Number of Observations	8				Number of Distinct Observations	8	
376											Number of Missing Observations	0	
377						Minimum	76.3				Mean	3395	
378						Maximum	12800				Median	986	
379						SD	4505				Std. Error of Mean	1593	
380						Coefficient of Variation	1.327				Skewness	1.55	
381													
382	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
383	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
384	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
385	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
386												
387	**Normal GOF Test**											
388						Shapiro Wilk Test Statistic	0.772				**Shapiro Wilk GOF Test**		
389						5% Shapiro Wilk Critical Value	0.818				Data Not Normal at 5% Significance Level		
390						Lilliefors Test Statistic	0.328				**Lilliefors GOF Test**		
391						5% Lilliefors Critical Value	0.283				Data Not Normal at 5% Significance Level		
392	**Data Not Normal at 5% Significance Level**											
393												
394	**Assuming Normal Distribution**											
395						**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
396						95% Student's-t UCL	6412				95% Adjusted-CLT UCL (Chen-1995)	6947	
397											95% Modified-t UCL (Johnson-1978)	6558	
398													
399	**Gamma GOF Test**											
400						A-D Test Statistic	0.374				**Anderson-Darling Gamma GOF Test**		
401						5% A-D Critical Value	0.756				Detected data appear Gamma Distributed at 5% Significance Level		
402						K-S Test Statistic	0.251				**Kolmogorov-Smirnov Gamma GOF Test**		
403						5% K-S Critical Value	0.307				Detected data appear Gamma Distributed at 5% Significance Level		
404	**Detected data appear Gamma Distributed at 5% Significance Level**											
405													
406	**Gamma Statistics**											
407						k hat (MLE)	0.587				k star (bias corrected MLE)	0.45	
408						Theta hat (MLE)	5785				Theta star (bias corrected MLE)	7542	
409						nu hat (MLE)	9.389				nu star (bias corrected)	7.201	
410						MLE Mean (bias corrected)	3395				MLE Sd (bias corrected)	5060	
411											Approximate Chi Square Value (0.05)	2.282	
412						Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	1.646	
413													
414	**Assuming Gamma Distribution**											
415						95% Approximate Gamma UCL (use when n>=50)	10714				95% Adjusted Gamma UCL (use when n<50)	14849	
416													

417	**Lognormal GOF Test**											
418					Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk Lognormal GOF Test**					
419					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
420					Lilliefors Test Statistic	0.178	**Lilliefors Lognormal GOF Test**					
421					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
422	**Data appear Lognormal at 5% Significance Level**											
423												
424	**Lognormal Statistics**											
425					Minimum of Logged Data	4.335	Mean of logged Data	7.074				
426					Maximum of Logged Data	9.457	SD of logged Data	1.746				
427												
428	**Assuming Lognormal Distribution**											
429					95% H-UCL	194397	90% Chebyshev (MVUE) UCL	10895				
430					95% Chebyshev (MVUE) UCL	14085	97.5% Chebyshev (MVUE) UCL	18513				
431					99% Chebyshev (MVUE) UCL	27211						
432												
433	**Nonparametric Distribution Free UCL Statistics**											
434	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
435												
436	**Nonparametric Distribution Free UCLs**											
437					95% CLT UCL	6014	95% Jackknife UCL	6412				
438					95% Standard Bootstrap UCL	5875	95% Bootstrap-t UCL	9176				
439					95% Hall's Bootstrap UCL	7160	95% Percentile Bootstrap UCL	6204				
440					95% BCA Bootstrap UCL	6686						
441					90% Chebyshev(Mean, Sd) UCL	8173	95% Chebyshev(Mean, Sd) UCL	10337				
442					97.5% Chebyshev(Mean, Sd) UCL	13341	99% Chebyshev(Mean, Sd) UCL	19241				
443												
444	**Suggested UCL to Use**											
445					95% Adjusted Gamma UCL	14849						
446												
447	**Recommended UCL exceeds the maximum observation**											
448												
449	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
450	Recommendations are based upon data size, data distribution, and skewness.											
451	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
452	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
453												
454												
455	**Aluminum (nfmw1d)**											
456												
457	**General Statistics**											
458					Total Number of Observations	9	Number of Distinct Observations	9				
459							Number of Missing Observations	0				
460					Minimum	80	Mean	110.2				
461					Maximum	156	Median	105				
462					SD	24.87	Std. Error of Mean	8.289				
463					Coefficient of Variation	0.226	Skewness	0.809				
464												
465	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
466	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
467	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
468	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											

469												
470	**Normal GOF Test**											
471					Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**					
472					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
473					Lilliefors Test Statistic	0.186	**Lilliefors GOF Test**					
474					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
475	**Data appear Normal at 5% Significance Level**											
476												
477	**Assuming Normal Distribution**											
478	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
479					95% Student's-t UCL	125.6				95% Adjusted-CLT UCL (Chen-1995)	126.2	
480										95% Modified-t UCL (Johnson-1978)	126	
481												
482	**Gamma GOF Test**											
483					A-D Test Statistic	0.233	**Anderson-Darling Gamma GOF Test**					
484					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
485					K-S Test Statistic	0.16	**Kolmogorov-Smirnov Gamma GOF Test**					
486					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
487	**Detected data appear Gamma Distributed at 5% Significance Level**											
488												
489	**Gamma Statistics**											
490					k hat (MLE)	23.41				k star (bias corrected MLE)	15.68	
491					Theta hat (MLE)	4.706				Theta star (bias corrected MLE)	7.026	
492					nu hat (MLE)	421.4				nu star (bias corrected)	282.3	
493					MLE Mean (bias corrected)	110.2				MLE Sd (bias corrected)	27.82	
494										Approximate Chi Square Value (0.05)	244.4	
495					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	236.9	
496												
497	**Assuming Gamma Distribution**											
498					95% Approximate Gamma UCL (use when n>=50))	127.3				95% Adjusted Gamma UCL (use when n<50)	131.3	
499												
500	**Lognormal GOF Test**											
501					Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk Lognormal GOF Test**					
502					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
503					Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**					
504					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
505	**Data appear Lognormal at 5% Significance Level**											
506												
507	**Lognormal Statistics**											
508					Minimum of Logged Data	4.382				Mean of logged Data	4.681	
509					Maximum of Logged Data	5.05				SD of logged Data	0.217	
510												
511	**Assuming Lognormal Distribution**											
512					95% H-UCL	128				90% Chebyshev (MVUE) UCL	134.1	
513					95% Chebyshev (MVUE) UCL	145				97.5% Chebyshev (MVUE) UCL	160.1	
514					99% Chebyshev (MVUE) UCL	189.8						
515												
516	**Nonparametric Distribution Free UCL Statistics**											
517	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
518												
519	**Nonparametric Distribution Free UCLs**											
520					95% CLT UCL	123.8				95% Jackknife UCL	125.6	

521				95% Standard Bootstrap UCL		123.4				95% Bootstrap-t UCL		130
522				95% Hall's Bootstrap UCL		130.1				95% Percentile Bootstrap UCL		123.9
523				95% BCA Bootstrap UCL		125.7						
524				90% Chebyshev(Mean, Sd) UCL		135				95% Chebyshev(Mean, Sd) UCL		146.3
525				97.5% Chebyshev(Mean, Sd) UCL		161.9				99% Chebyshev(Mean, Sd) UCL		192.7
526												
527					**Suggested UCL to Use**							
528				95% Student's-t UCL		125.6						
529												
530					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
531					Recommendations are based upon data size, data distribution, and skewness.							
532					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
533					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
534												
535												
536	**Aluminum (nfmw1s)**											
537												
538					**General Statistics**							
539				Total Number of Observations		7				Number of Distinct Observations		7
540										Number of Missing Observations		0
541				Minimum		504				Mean		2302
542				Maximum		8860				Median		1160
543				SD		2992				Std. Error of Mean		1131
544				Coefficient of Variation		1.3				Skewness		2.312
545												
546					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
547					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
548					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
549					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
550												
551					**Normal GOF Test**							
552				Shapiro Wilk Test Statistic		0.663				**Shapiro Wilk GOF Test**		
553				5% Shapiro Wilk Critical Value		0.803				Data Not Normal at 5% Significance Level		
554				Lilliefors Test Statistic		0.326				**Lilliefors GOF Test**		
555				5% Lilliefors Critical Value		0.304				Data Not Normal at 5% Significance Level		
556					**Data Not Normal at 5% Significance Level**							
557												
558					**Assuming Normal Distribution**							
559				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
560				95% Student's-t UCL		4500				95% Adjusted-CLT UCL (Chen-1995)		5219
561										95% Modified-t UCL (Johnson-1978)		4665
562												
563					**Gamma GOF Test**							
564				A-D Test Statistic		0.566				**Anderson-Darling Gamma GOF Test**		
565				5% A-D Critical Value		0.726				Detected data appear Gamma Distributed at 5% Significance Level		
566				K-S Test Statistic		0.263				**Kolmogorov-Smirnov Gamma GOF Test**		
567				5% K-S Critical Value		0.319				Detected data appear Gamma Distributed at 5% Significance Level		
568					**Detected data appear Gamma Distributed at 5% Significance Level**							
569												
570					**Gamma Statistics**							
571				k hat (MLE)		1.107				k star (bias corrected MLE)		0.728
572				Theta hat (MLE)		2080				Theta star (bias corrected MLE)		3163

573					nu hat (MLE)	15.5				nu star (bias corrected)		10.19
574					MLE Mean (bias corrected)	2302				MLE Sd (bias corrected)		2699
575										Approximate Chi Square Value (0.05)		4.06
576					Adjusted Level of Significance	0.0158				Adjusted Chi Square Value		2.979
577												
578	**Assuming Gamma Distribution**											
579					95% Approximate Gamma UCL (use when n>=50)	5778				95% Adjusted Gamma UCL (use when n<50)		7874
580												
581	**Lognormal GOF Test**											
582					Shapiro Wilk Test Statistic	0.909				**Shapiro Wilk Lognormal GOF Test**		
583					5% Shapiro Wilk Critical Value	0.803				Data appear Lognormal at 5% Significance Level		
584					Lilliefors Test Statistic	0.193				**Lilliefors Lognormal GOF Test**		
585					5% Lilliefors Critical Value	0.304				Data appear Lognormal at 5% Significance Level		
586	**Data appear Lognormal at 5% Significance Level**											
587												
588	**Lognormal Statistics**											
589					Minimum of Logged Data	6.223				Mean of logged Data		7.226
590					Maximum of Logged Data	9.089				SD of logged Data		1.013
591												
592	**Assuming Lognormal Distribution**											
593					95% H-UCL	10769				90% Chebyshev (MVUE) UCL		4497
594					95% Chebyshev (MVUE) UCL	5588				97.5% Chebyshev (MVUE) UCL		7102
595					99% Chebyshev (MVUE) UCL	10077						
596												
597	**Nonparametric Distribution Free UCL Statistics**											
598	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
599												
600	**Nonparametric Distribution Free UCLs**											
601					95% CLT UCL	4163				95% Jackknife UCL		4500
602					95% Standard Bootstrap UCL	4032				95% Bootstrap-t UCL		13287
603					95% Hall's Bootstrap UCL	12662				95% Percentile Bootstrap UCL		4190
604					95% BCA Bootstrap UCL	5330						
605					90% Chebyshev(Mean, Sd) UCL	5695				95% Chebyshev(Mean, Sd) UCL		7232
606					97.5% Chebyshev(Mean, Sd) UCL	9366				99% Chebyshev(Mean, Sd) UCL		13556
607												
608	**Suggested UCL to Use**											
609					95% Adjusted Gamma UCL	7874						
610												
611	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
612	Recommendations are based upon data size, data distribution, and skewness.											
613	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
614	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
615												
616	**Aluminum (nfmw2)**											
617												
618	**General Statistics**											
619					Total Number of Observations	9				Number of Distinct Observations		9
620					Number of Detects	7				Number of Non-Detects		2
621					Number of Distinct Detects	7				Number of Distinct Non-Detects		2
622					Minimum Detect	9.7				Minimum Non-Detect		27.7
623					Maximum Detect	348				Maximum Non-Detect		113
624					Variance Detects	16627				Percent Non-Detects		22.22%

625					Mean Detects	79.24					SD Detects	128.9
626					Median Detects	11.7					CV Detects	1.627
627					Skewness Detects	1.98					Kurtosis Detects	3.621
628					Mean of Logged Detects	3.299					SD of Logged Detects	1.48
629												
630					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
631					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
632					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
633					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
634												
635					**Normal GOF Test on Detects Only**							
636					Shapiro Wilk Test Statistic	0.643	**Shapiro Wilk GOF Test**					
637					5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level					
638					Lilliefors Test Statistic	0.404	**Lilliefors GOF Test**					
639					5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level					
640					**Detected Data Not Normal at 5% Significance Level**							
641												
642					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
643					KM Mean	64.24					KM Standard Error of Mean	39.23
644					KM SD	109					95% KM (BCA) UCL	123.8
645					95% KM (t) UCL	137.2					95% KM (Percentile Bootstrap) UCL	131.4
646					95% KM (z) UCL	128.8					95% KM Bootstrap t UCL	2599
647					90% KM Chebyshev UCL	181.9					95% KM Chebyshev UCL	235.3
648					97.5% KM Chebyshev UCL	309.3					99% KM Chebyshev UCL	454.6
649												
650					**Gamma GOF Tests on Detected Observations Only**							
651					A-D Test Statistic	1.136	**Anderson-Darling GOF Test**					
652					5% A-D Critical Value	0.747	Detected Data Not Gamma Distributed at 5% Significance Level					
653					K-S Test Statistic	0.409	**Kolmogorov-Smirnov GOF**					
654					5% K-S Critical Value	0.326	Detected Data Not Gamma Distributed at 5% Significance Level					
655					**Detected Data Not Gamma Distributed at 5% Significance Level**							
656												
657					**Gamma Statistics on Detected Data Only**							
658					k hat (MLE)	0.579					k star (bias corrected MLE)	0.426
659					Theta hat (MLE)	136.9					Theta star (bias corrected MLE)	186
660					nu hat (MLE)	8.103					nu star (bias corrected)	5.964
661					Mean (detects)	79.24						
662												
663					**Gamma ROS Statistics using Imputed Non-Detects**							
664					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
665					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
666					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
667					This is especially true when the sample size is small.							
668					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
669					Minimum	3.052					Mean	62.31
670					Maximum	348					Median	11.6
671					SD	116.6					CV	1.871
672					k hat (MLE)	0.484					k star (bias corrected MLE)	0.397
673					Theta hat (MLE)	128.7					Theta star (bias corrected MLE)	157
674					nu hat (MLE)	8.717					nu star (bias corrected)	7.145
675					Adjusted Level of Significance (β)	0.0231						
676					Approximate Chi Square Value (7.14, α)	2.25					Adjusted Chi Square Value (7.14, β)	1.717

677	95% Gamma Approximate UCL (use when n>=50)					197.8	95% Gamma Adjusted UCL (use when n<50)					259.4
678												
679	**Estimates of Gamma Parameters using KM Estimates**											
680	Mean (KM)					64.24	SD (KM)					109
681	Variance (KM)					11873	SE of Mean (KM)					39.23
682	k hat (KM)					0.348	k star (KM)					0.306
683	nu hat (KM)					6.257	nu star (KM)					5.504
684	theta hat (KM)					184.8	theta star (KM)					210.1
685	80% gamma percentile (KM)					98.98	90% gamma percentile (KM)					189
686	95% gamma percentile (KM)					292.1	99% gamma percentile (KM)					559.2
687												
688	**Gamma Kaplan-Meier (KM) Statistics**											
689	Approximate Chi Square Value (5.50, α)					1.392	Adjusted Chi Square Value (5.50, β)					1.005
690	95% Gamma Approximate KM-UCL (use when n>=50)					254	95% Gamma Adjusted KM-UCL (use when n<50)					351.9
691												
692	**Lognormal GOF Test on Detected Observations Only**											
693	Shapiro Wilk Test Statistic					0.723	**Shapiro Wilk GOF Test**					
694	5% Shapiro Wilk Critical Value					0.803	Detected Data Not Lognormal at 5% Significance Level					
695	Lilliefors Test Statistic					0.361	**Lilliefors GOF Test**					
696	5% Lilliefors Critical Value					0.304	Detected Data Not Lognormal at 5% Significance Level					
697	**Detected Data Not Lognormal at 5% Significance Level**											
698												
699	**Lognormal ROS Statistics Using Imputed Non-Detects**											
700	Mean in Original Scale					64.98	Mean in Log Scale					3.169
701	SD in Original Scale					115.2	SD in Log Scale					1.308
702	95% t UCL (assumes normality of ROS data)					136.4	95% Percentile Bootstrap UCL					132.4
703	95% BCA Bootstrap UCL					160.7	95% Bootstrap t UCL					2644
704	95% H-UCL (Log ROS)					349.1						
705												
706	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
707	KM Mean (logged)					3.11	KM Geo Mean					22.43
708	KM SD (logged)					1.262	95% Critical H Value (KM-Log)					3.848
709	KM Standard Error of Mean (logged)					0.455	95% H-UCL (KM -Log)					276.6
710	KM SD (logged)					1.262	95% Critical H Value (KM-Log)					3.848
711	KM Standard Error of Mean (logged)					0.455						
712												
713	**DL/2 Statistics**											
714	**DL/2 Normal**						**DL/2 Log-Transformed**					
715	Mean in Original Scale					69.45	Mean in Log Scale					3.306
716	SD in Original Scale					113.8	SD in Log Scale					1.329
717	95% t UCL (Assumes normality)					140	95% H-Stat UCL					435.3
718	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
719												
720	**Nonparametric Distribution Free UCL Statistics**											
721	**Data do not follow a Discernible Distribution at 5% Significance Level**											
722												
723	**Suggested UCL to Use**											
724	95% KM (Chebyshev) UCL					235.3						
725												
726	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
727	Recommendations are based upon data size, data distribution, and skewness.											
728	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

729	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
730												
731	**Aluminum (nfmw20)**											
732												
733	**General Statistics**											
734						Total Number of Observations	8			Number of Distinct Observations	8	
735						Number of Detects	7			Number of Non-Detects	1	
736						Number of Distinct Detects	7			Number of Distinct Non-Detects	1	
737						Minimum Detect	24.9			Minimum Non-Detect	113	
738						Maximum Detect	62.6			Maximum Non-Detect	113	
739						Variance Detects	155.2			Percent Non-Detects	12.5%	
740						Mean Detects	41.21			SD Detects	12.46	
741						Median Detects	39.5			CV Detects	0.302	
742						Skewness Detects	0.564			Kurtosis Detects	0.301	
743						Mean of Logged Detects	3.679			SD of Logged Detects	0.305	
744												
745	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
746	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
747	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
748	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
749												
750	**Normal GOF Test on Detects Only**											
751						Shapiro Wilk Test Statistic	0.972			**Shapiro Wilk GOF Test**		
752						5% Shapiro Wilk Critical Value	0.803			Detected Data appear Normal at 5% Significance Level		
753						Lilliefors Test Statistic	0.156			**Lilliefors GOF Test**		
754						5% Lilliefors Critical Value	0.304			Detected Data appear Normal at 5% Significance Level		
755	**Detected Data appear Normal at 5% Significance Level**											
756												
757	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
758						KM Mean	41.21			KM Standard Error of Mean	4.709	
759						KM SD	11.54			95% KM (BCA) UCL	49.43	
760						95% KM (t) UCL	50.14			95% KM (Percentile Bootstrap) UCL	48.85	
761						95% KM (z) UCL	48.96			95% KM Bootstrap t UCL	52.51	
762						90% KM Chebyshev UCL	55.34			95% KM Chebyshev UCL	61.74	
763						97.5% KM Chebyshev UCL	70.62			99% KM Chebyshev UCL	88.07	
764												
765	**Gamma GOF Tests on Detected Observations Only**											
766						A-D Test Statistic	0.157			**Anderson-Darling GOF Test**		
767						5% A-D Critical Value	0.708			Detected data appear Gamma Distributed at 5% Significance Level		
768						K-S Test Statistic	0.137			**Kolmogorov-Smirnov GOF**		
769						5% K-S Critical Value	0.312			Detected data appear Gamma Distributed at 5% Significance Level		
770	**Detected data appear Gamma Distributed at 5% Significance Level**											
771												
772	**Gamma Statistics on Detected Data Only**											
773						k hat (MLE)	12.88			k star (bias corrected MLE)	7.454	
774						Theta hat (MLE)	3.2			Theta star (bias corrected MLE)	5.529	
775						nu hat (MLE)	180.3			nu star (bias corrected)	104.4	
776						Mean (detects)	41.21					
777												
778	**Gamma ROS Statistics using Imputed Non-Detects**											
779	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
780	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											

	A	B	C	D	E	F	G	H	I	J	K	L
781	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
782	This is especially true when the sample size is small.											
783	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
784					Minimum	24.9				Mean	41.12	
785					Maximum	62.6				Median	39.97	
786					SD	11.54				CV	0.281	
787					k hat (MLE)	14.69				k star (bias corrected MLE)	9.263	
788					Theta hat (MLE)	2.8				Theta star (bias corrected MLE)	4.439	
789					nu hat (MLE)	235				nu star (bias corrected)	148.2	
790					Adjusted Level of Significance (β)	0.0195						
791					Approximate Chi Square Value (148.20, α)	121.1				Adjusted Chi Square Value (148.20, β)	114.9	
792					95% Gamma Approximate UCL (use when n>=50)	50.33				95% Gamma Adjusted UCL (use when n<50)	53.05	
793												
794	**Estimates of Gamma Parameters using KM Estimates**											
795					Mean (KM)	41.21				SD (KM)	11.54	
796					Variance (KM)	133.1				SE of Mean (KM)	4.709	
797					k hat (KM)	12.77				k star (KM)	8.062	
798					nu hat (KM)	204.3				nu star (KM)	129	
799					theta hat (KM)	3.229				theta star (KM)	5.112	
800					80% gamma percentile (KM)	52.68				90% gamma percentile (KM)	60.56	
801					95% gamma percentile (KM)	67.63				99% gamma percentile (KM)	82.24	
802												
803	**Gamma Kaplan-Meier (KM) Statistics**											
804					Approximate Chi Square Value (128.99, α)	103.8				Adjusted Chi Square Value (128.99, β)	98.03	
805					95% Gamma Approximate KM-UCL (use when n>=50)	51.24				95% Gamma Adjusted KM-UCL (use when n<50)	54.23	
806												
807	**Lognormal GOF Test on Detected Observations Only**											
808					Shapiro Wilk Test Statistic	0.99				**Shapiro Wilk GOF Test**		
809					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
810					Lilliefors Test Statistic	0.134				**Lilliefors GOF Test**		
811					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
812	**Detected Data appear Lognormal at 5% Significance Level**											
813												
814	**Lognormal ROS Statistics Using Imputed Non-Detects**											
815					Mean in Original Scale	41.02				Mean in Log Scale	3.679	
816					SD in Original Scale	11.55				SD in Log Scale	0.282	
817					95% t UCL (assumes normality of ROS data)	48.75				95% Percentile Bootstrap UCL	47.6	
818					95% BCA Bootstrap UCL	48.28				95% Bootstrap t UCL	49.81	
819					95% H-UCL (Log ROS)	51.22						
820												
821	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
822					KM Mean (logged)	3.679				KM Geo Mean	39.62	
823					KM SD (logged)	0.282				95% Critical H Value (KM-Log)	2.036	
824					KM Standard Error of Mean (logged)	0.115				95% H-UCL (KM -Log)	51.22	
825					KM SD (logged)	0.282				95% Critical H Value (KM-Log)	2.036	
826					KM Standard Error of Mean (logged)	0.115						
827												
828	**DL/2 Statistics**											
829	**DL/2 Normal**									**DL/2 Log-Transformed**		
830					Mean in Original Scale	43.13				Mean in Log Scale	3.724	
831					SD in Original Scale	12.74				SD in Log Scale	0.309	
832					95% t UCL (Assumes normality)	51.66				95% H-Stat UCL	55.3	

833	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
834												
835	**Nonparametric Distribution Free UCL Statistics**											
836	**Detected Data appear Normal Distributed at 5% Significance Level**											
837												
838	**Suggested UCL to Use**											
839					95% KM (t) UCL	50.14						
840												
841	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
842	Recommendations are based upon data size, data distribution, and skewness.											
843	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
844	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
845												
846												
847	**Aluminum (nfmw22)**											
848												
849	**General Statistics**											
850					Total Number of Observations	4			Number of Distinct Observations	4		
851									Number of Missing Observations	0		
852					Minimum	132			Mean	149.3		
853					Maximum	174			Median	145.5		
854					SD	17.91			Std. Error of Mean	8.957		
855					Coefficient of Variation	0.12			Skewness	1.119		
856												
857	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
858	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
859	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
860	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
861												
862	**Normal GOF Test**											
863					Shapiro Wilk Test Statistic	0.937			**Shapiro Wilk GOF Test**			
864					5% Shapiro Wilk Critical Value	0.748			Data appear Normal at 5% Significance Level			
865					Lilliefors Test Statistic	0.256			**Lilliefors GOF Test**			
866					5% Lilliefors Critical Value	0.375			Data appear Normal at 5% Significance Level			
867	**Data appear Normal at 5% Significance Level**											
868												
869	**Assuming Normal Distribution**											
870					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
871					95% Student's-t UCL	170.3			95% Adjusted-CLT UCL (Chen-1995)	169.3		
872									95% Modified-t UCL (Johnson-1978)	171.2		
873												
874	**Gamma GOF Test**											
875					A-D Test Statistic	0.284			**Anderson-Darling Gamma GOF Test**			
876					5% A-D Critical Value	0.656			Detected data appear Gamma Distributed at 5% Significance Level			
877					K-S Test Statistic	0.243			**Kolmogorov-Smirnov Gamma GOF Test**			
878					5% K-S Critical Value	0.394			Detected data appear Gamma Distributed at 5% Significance Level			
879	**Detected data appear Gamma Distributed at 5% Significance Level**											
880												
881	**Gamma Statistics**											
882					k hat (MLE)	96.04			k star (bias corrected MLE)	24.18		
883					Theta hat (MLE)	1.554			Theta star (bias corrected MLE)	6.173		
884					nu hat (MLE)	768.3			nu star (bias corrected)	193.4		

	A	B	C	D	E	F	G	H	I	J	K	L
885	MLE Mean (bias corrected)					149.3	MLE Sd (bias corrected)					30.35
886							Approximate Chi Square Value (0.05)					162.2
887	Adjusted Level of Significance					N/A	Adjusted Chi Square Value					N/A
888												
889	**Assuming Gamma Distribution**											
890	95% Approximate Gamma UCL (use when n>=50))					177.9	95% Adjusted Gamma UCL (use when n<50)					N/A
891												
892	**Lognormal GOF Test**											
893	Shapiro Wilk Test Statistic					0.955	**Shapiro Wilk Lognormal GOF Test**					
894	5% Shapiro Wilk Critical Value					0.748	Data appear Lognormal at 5% Significance Level					
895	Lilliefors Test Statistic					0.238	**Lilliefors Lognormal GOF Test**					
896	5% Lilliefors Critical Value					0.375	Data appear Lognormal at 5% Significance Level					
897	**Data appear Lognormal at 5% Significance Level**											
898												
899	**Lognormal Statistics**											
900	Minimum of Logged Data					4.883	Mean of logged Data					5
901	Maximum of Logged Data					5.159	SD of logged Data					0.117
902												
903	**Assuming Lognormal Distribution**											
904	95% H-UCL					174.1	90% Chebyshev (MVUE) UCL					175.4
905	95% Chebyshev (MVUE) UCL					187.2	97.5% Chebyshev (MVUE) UCL					203.7
906	99% Chebyshev (MVUE) UCL					235.9						
907												
908	**Nonparametric Distribution Free UCL Statistics**											
909	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
910												
911	**Nonparametric Distribution Free UCLs**											
912	95% CLT UCL					164	95% Jackknife UCL					170.3
913	95% Standard Bootstrap UCL					N/A	95% Bootstrap-t UCL					N/A
914	95% Hall's Bootstrap UCL					N/A	95% Percentile Bootstrap UCL					N/A
915	95% BCA Bootstrap UCL					N/A						
916	90% Chebyshev(Mean, Sd) UCL					176.1	95% Chebyshev(Mean, Sd) UCL					188.3
917	97.5% Chebyshev(Mean, Sd) UCL					205.2	99% Chebyshev(Mean, Sd) UCL					238.4
918												
919	**Suggested UCL to Use**											
920	95% Student's-t UCL					170.3						
921												
922	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
923	Recommendations are based upon data size, data distribution, and skewness.											
924	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
925	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
926												
927												
928	**Aluminum (nfmw23)**											
929												
930	**General Statistics**											
931	Total Number of Observations					4	Number of Distinct Observations					4
932							Number of Missing Observations					0
933	Minimum					118	Mean					143.3
934	Maximum					176	Median					139.5
935	SD					24.24	Std. Error of Mean					12.12
936	Coefficient of Variation					0.169	Skewness					0.873

937												
938	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
939	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
940	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
941	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
942												
943	**Normal GOF Test**											
944						Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**				
945						5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level				
946						Lilliefors Test Statistic	0.254	**Lilliefors GOF Test**				
947						5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level				
948	**Data appear Normal at 5% Significance Level**											
949												
950	**Assuming Normal Distribution**											
951	**95% Normal UCL**							**95% UCLs (Adjusted for Skewness)**				
952						95% Student's-t UCL	171.8	95% Adjusted-CLT UCL (Chen-1995)	168.8			
953								95% Modified-t UCL (Johnson-1978)	172.7			
954												
955	**Gamma GOF Test**											
956						A-D Test Statistic	0.258	**Anderson-Darling Gamma GOF Test**				
957						5% A-D Critical Value	0.656	Detected data appear Gamma Distributed at 5% Significance Level				
958						K-S Test Statistic	0.236	**Kolmogorov-Smirnov Gamma GOF Test**				
959						5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level				
960	**Detected data appear Gamma Distributed at 5% Significance Level**											
961												
962	**Gamma Statistics**											
963						k hat (MLE)	48.13	k star (bias corrected MLE)	12.2			
964						Theta hat (MLE)	2.976	Theta star (bias corrected MLE)	11.74			
965						nu hat (MLE)	385	nu star (bias corrected)	97.6			
966						MLE Mean (bias corrected)	143.3	MLE Sd (bias corrected)	41.01			
967								Approximate Chi Square Value (0.05)	75.81			
968						Adjusted Level of Significance	N/A	Adjusted Chi Square Value	N/A			
969												
970	**Assuming Gamma Distribution**											
971						95% Approximate Gamma UCL (use when n>=50))	184.4	95% Adjusted Gamma UCL (use when n<50)	N/A			
972												
973	**Lognormal GOF Test**											
974						Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk Lognormal GOF Test**				
975						5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level				
976						Lilliefors Test Statistic	0.229	**Lilliefors Lognormal GOF Test**				
977						5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level				
978	**Data appear Lognormal at 5% Significance Level**											
979												
980	**Lognormal Statistics**											
981						Minimum of Logged Data	4.771	Mean of logged Data	4.954			
982						Maximum of Logged Data	5.17	SD of logged Data	0.166			
983												
984	**Assuming Lognormal Distribution**											
985						95% H-UCL	180.3	90% Chebyshev (MVUE) UCL	178.7			
986						95% Chebyshev (MVUE) UCL	194.8	97.5% Chebyshev (MVUE) UCL	217.1			
987						99% Chebyshev (MVUE) UCL	261					
988												

	A	B	C	D	E	F	G	H	I	J	K	L
989	**Nonparametric Distribution Free UCL Statistics**											
990	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
991												
992	**Nonparametric Distribution Free UCLs**											
993					95% CLT UCL	163.2				95% Jackknife UCL	171.8	
994					95% Standard Bootstrap UCL	N/A				95% Bootstrap-t UCL	N/A	
995					95% Hall's Bootstrap UCL	N/A				95% Percentile Bootstrap UCL	N/A	
996					95% BCA Bootstrap UCL	N/A						
997					90% Chebyshev(Mean, Sd) UCL	179.6				95% Chebyshev(Mean, Sd) UCL	196.1	
998					97.5% Chebyshev(Mean, Sd) UCL	218.9				99% Chebyshev(Mean, Sd) UCL	263.8	
999												
1000	**Suggested UCL to Use**											
1001					95% Student's-t UCL	171.8						
1002												
1003	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1004	Recommendations are based upon data size, data distribution, and skewness.											
1005	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1006	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1007												
1008	**Aluminum (nfmw3)**											
1009												
1010	**General Statistics**											
1011					Total Number of Observations	9				Number of Distinct Observations	9	
1012					Number of Detects	8				Number of Non-Detects	1	
1013					Number of Distinct Detects	8				Number of Distinct Non-Detects	1	
1014					Minimum Detect	35.6				Minimum Non-Detect	400	
1015					Maximum Detect	78.2				Maximum Non-Detect	400	
1016					Variance Detects	209.4				Percent Non-Detects	11.11%	
1017					Mean Detects	53.55				SD Detects	14.47	
1018					Median Detects	51.5				CV Detects	0.27	
1019					Skewness Detects	0.594				Kurtosis Detects	-0.43	
1020					Mean of Logged Detects	3.949				SD of Logged Detects	0.267	
1021												
1022	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1023	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1024	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1025	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1026												
1027	**Normal GOF Test on Detects Only**											
1028					Shapiro Wilk Test Statistic	0.955				**Shapiro Wilk GOF Test**		
1029					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Normal at 5% Significance Level		
1030					Lilliefors Test Statistic	0.176				**Lilliefors GOF Test**		
1031					5% Lilliefors Critical Value	0.283				Detected Data appear Normal at 5% Significance Level		
1032	**Detected Data appear Normal at 5% Significance Level**											
1033												
1034	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1035					KM Mean	53.55				KM Standard Error of Mean	5.116	
1036					KM SD	13.53				95% KM (BCA) UCL	62.17	
1037					95% KM (t) UCL	63.06				95% KM (Percentile Bootstrap) UCL	61.23	
1038					95% KM (z) UCL	61.96				95% KM Bootstrap t UCL	64.95	
1039					90% KM Chebyshev UCL	68.9				95% KM Chebyshev UCL	75.85	
1040					97.5% KM Chebyshev UCL	85.5				99% KM Chebyshev UCL	104.5	

	A	B	C	D	E	F	G	H	I	J	K	L
1041												
1042	**Gamma GOF Tests on Detected Observations Only**											
1043					A-D Test Statistic	0.185	**Anderson-Darling GOF Test**					
1044					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1045					K-S Test Statistic	0.148	**Kolmogorov-Smirnov GOF**					
1046					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1047	**Detected data appear Gamma Distributed at 5% Significance Level**											
1048												
1049	**Gamma Statistics on Detected Data Only**											
1050					k hat (MLE)	16.13	k star (bias corrected MLE)	10.16				
1051					Theta hat (MLE)	3.321	Theta star (bias corrected MLE)	5.27				
1052					nu hat (MLE)	258	nu star (bias corrected)	162.6				
1053					Mean (detects)	53.55						
1054												
1055	**Gamma ROS Statistics using Imputed Non-Detects**											
1056	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1057	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1058	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1059	This is especially true when the sample size is small.											
1060	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1061					Minimum	35.6	Mean	53.46				
1062					Maximum	78.2	Median	51.7				
1063					SD	13.54	CV	0.253				
1064					k hat (MLE)	18.11	k star (bias corrected MLE)	12.15				
1065					Theta hat (MLE)	2.951	Theta star (bias corrected MLE)	4.4				
1066					nu hat (MLE)	326	nu star (bias corrected)	218.7				
1067					Adjusted Level of Significance (β)	0.0231						
1068					Approximate Chi Square Value (218.70, α)	185.5	Adjusted Chi Square Value (218.70, β)	179				
1069					95% Gamma Approximate UCL (use when n>=50)	63.03	95% Gamma Adjusted UCL (use when n<50)	65.31				
1070												
1071	**Estimates of Gamma Parameters using KM Estimates**											
1072					Mean (KM)	53.55	SD (KM)	13.53				
1073					Variance (KM)	183.2	SE of Mean (KM)	5.116				
1074					k hat (KM)	15.65	k star (KM)	10.51				
1075					nu hat (KM)	281.8	nu star (KM)	189.2				
1076					theta hat (KM)	3.421	theta star (KM)	5.095				
1077					80% gamma percentile (KM)	66.73	90% gamma percentile (KM)	75.51				
1078					95% gamma percentile (KM)	83.3	99% gamma percentile (KM)	99.25				
1079												
1080	**Gamma Kaplan-Meier (KM) Statistics**											
1081					Approximate Chi Square Value (189.17, α)	158.4	Adjusted Chi Square Value (189.17, β)	152.4				
1082					95% Gamma Approximate KM-UCL (use when n>=50)	63.97	95% Gamma Adjusted KM-UCL (use when n<50)	66.47				
1083												
1084	**Lognormal GOF Test on Detected Observations Only**											
1085					Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk GOF Test**					
1086					5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level					
1087					Lilliefors Test Statistic	0.131	**Lilliefors GOF Test**					
1088					5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level					
1089	**Detected Data appear Lognormal at 5% Significance Level**											
1090												
1091	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1092					Mean in Original Scale	53.37	Mean in Log Scale	3.949				

1093				SD in Original Scale		13.55				SD in Log Scale		0.25
1094			95% t UCL (assumes normality of ROS data)			61.76				95% Percentile Bootstrap UCL		60.66
1095				95% BCA Bootstrap UCL		61.48				95% Bootstrap t UCL		64.35
1096				95% H-UCL (Log ROS)		63.63						
1097												
1098	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1099				KM Mean (logged)		3.949				KM Geo Mean		51.9
1100				KM SD (logged)		0.25				95% Critical H Value (KM-Log)		1.957
1101			KM Standard Error of Mean (logged)			0.0943				95% H-UCL (KM -Log)		63.63
1102				KM SD (logged)		0.25				95% Critical H Value (KM-Log)		1.957
1103			KM Standard Error of Mean (logged)			0.0943						
1104												
1105	**DL/2 Statistics**											
1106	**DL/2 Normal**						**DL/2 Log-Transformed**					
1107				Mean in Original Scale		69.82				Mean in Log Scale		4.099
1108				SD in Original Scale		50.66				SD in Log Scale		0.514
1109			95% t UCL (Assumes normality)			101.2				95% H-Stat UCL		103.6
1110	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1111												
1112	**Nonparametric Distribution Free UCL Statistics**											
1113	**Detected Data appear Normal Distributed at 5% Significance Level**											
1114												
1115	**Suggested UCL to Use**											
1116				95% KM (t) UCL		63.06						
1117												
1118	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1119	Recommendations are based upon data size, data distribution, and skewness.											
1120	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1121	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1122												
1123	**Aluminum (nfmw4)**											
1124												
1125	**General Statistics**											
1126				Total Number of Observations		9				Number of Distinct Observations		9
1127				Number of Detects		8				Number of Non-Detects		1
1128				Number of Distinct Detects		8				Number of Distinct Non-Detects		1
1129				Minimum Detect		9				Minimum Non-Detect		113
1130				Maximum Detect		45.1				Maximum Non-Detect		113
1131				Variance Detects		118.9				Percent Non-Detects		11.11%
1132				Mean Detects		22.26				SD Detects		10.9
1133				Median Detects		19.45				CV Detects		0.49
1134				Skewness Detects		1.359				Kurtosis Detects		2.58
1135				Mean of Logged Detects		3.005				SD of Logged Detects		0.473
1136												
1137	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1138	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1139	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1140	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1141												
1142	**Normal GOF Test on Detects Only**											
1143				Shapiro Wilk Test Statistic		0.899	**Shapiro Wilk GOF Test**					
1144				5% Shapiro Wilk Critical Value		0.818	Detected Data appear Normal at 5% Significance Level					

1145				Lilliefors Test Statistic		0.194	**Lilliefors GOF Test**					
1146				5% Lilliefors Critical Value		0.283	Detected Data appear Normal at 5% Significance Level					
1147	**Detected Data appear Normal at 5% Significance Level**											
1148												
1149	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1150				KM Mean		22.26	KM Standard Error of Mean					3.855
1151				KM SD		10.2	95% KM (BCA) UCL					28.61
1152				95% KM (t) UCL		29.43	95% KM (Percentile Bootstrap) UCL					29.17
1153				95% KM (z) UCL		28.6	95% KM Bootstrap t UCL					33.53
1154				90% KM Chebyshev UCL		33.83	95% KM Chebyshev UCL					39.07
1155				97.5% KM Chebyshev UCL		46.34	99% KM Chebyshev UCL					60.62
1156												
1157	**Gamma GOF Tests on Detected Observations Only**											
1158				A-D Test Statistic		0.232	**Anderson-Darling GOF Test**					
1159				5% A-D Critical Value		0.719	Detected data appear Gamma Distributed at 5% Significance Level					
1160				K-S Test Statistic		0.132	**Kolmogorov-Smirnov GOF**					
1161				5% K-S Critical Value		0.295	Detected data appear Gamma Distributed at 5% Significance Level					
1162	**Detected data appear Gamma Distributed at 5% Significance Level**											
1163												
1164	**Gamma Statistics on Detected Data Only**											
1165				k hat (MLE)		5.275	k star (bias corrected MLE)					3.38
1166				Theta hat (MLE)		4.221	Theta star (bias corrected MLE)					6.587
1167				nu hat (MLE)		84.39	nu star (bias corrected)					54.08
1168				Mean (detects)		22.26						
1169												
1170	**Gamma ROS Statistics using Imputed Non-Detects**											
1171	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1172	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1173	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1174	This is especially true when the sample size is small.											
1175	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1176				Minimum		9	Mean					22.14
1177				Maximum		45.1	Median					20.7
1178				SD		10.21	CV					0.461
1179				k hat (MLE)		5.906	k star (bias corrected MLE)					4.012
1180				Theta hat (MLE)		3.749	Theta star (bias corrected MLE)					5.519
1181				nu hat (MLE)		106.3	nu star (bias corrected)					72.21
1182				Adjusted Level of Significance (β)		0.0231						
1183				Approximate Chi Square Value (72.21, α)		53.64	Adjusted Chi Square Value (72.21, β)					50.28
1184				95% Gamma Approximate UCL (use when n>=50)		29.8	95% Gamma Adjusted UCL (use when n<50)					31.8
1185												
1186	**Estimates of Gamma Parameters using KM Estimates**											
1187				Mean (KM)		22.26	SD (KM)					10.2
1188				Variance (KM)		104	SE of Mean (KM)					3.855
1189				k hat (KM)		4.765	k star (KM)					3.25
1190				nu hat (KM)		85.76	nu star (KM)					58.51
1191				theta hat (KM)		4.673	theta star (KM)					6.849
1192				80% gamma percentile (KM)		31.45	90% gamma percentile (KM)					38.82
1193				95% gamma percentile (KM)		45.67	99% gamma percentile (KM)					60.45
1194												
1195	**Gamma Kaplan-Meier (KM) Statistics**											
1196				Approximate Chi Square Value (58.51, α)		41.92	Adjusted Chi Square Value (58.51, β)					38.98

1197	95% Gamma Approximate KM-UCL (use when n>=50)					31.07	95% Gamma Adjusted KM-UCL (use when n<50)					33.42
1198												
1199	**Lognormal GOF Test on Detected Observations Only**											
1200	Shapiro Wilk Test Statistic					0.98	**Shapiro Wilk GOF Test**					
1201	5% Shapiro Wilk Critical Value					0.818	Detected Data appear Lognormal at 5% Significance Level					
1202	Lilliefors Test Statistic					0.159	**Lilliefors GOF Test**					
1203	5% Lilliefors Critical Value					0.283	Detected Data appear Lognormal at 5% Significance Level					
1204	**Detected Data appear Lognormal at 5% Significance Level**											
1205												
1206	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1207	Mean in Original Scale					22.03	Mean in Log Scale					3.005
1208	SD in Original Scale					10.22	SD in Log Scale					0.443
1209	95% t UCL (assumes normality of ROS data)					28.37	95% Percentile Bootstrap UCL					27.67
1210	95% BCA Bootstrap UCL					28.54	95% Bootstrap t UCL					32.39
1211	95% H-UCL (Log ROS)					31.31						
1212												
1213	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1214	KM Mean (logged)					3.005	KM Geo Mean					20.19
1215	KM SD (logged)					0.443	95% Critical H Value (KM-Log)					2.177
1216	KM Standard Error of Mean (logged)					0.167	95% H-UCL (KM -Log)					31.31
1217	KM SD (logged)					0.443	95% Critical H Value (KM-Log)					2.177
1218	KM Standard Error of Mean (logged)					0.167						
1219												
1220	**DL/2 Statistics**											
1221	**DL/2 Normal**						**DL/2 Log-Transformed**					
1222	Mean in Original Scale					26.07	Mean in Log Scale					3.119
1223	SD in Original Scale					15.31	SD in Log Scale					0.56
1224	95% t UCL (Assumes normality)					35.55	95% H-Stat UCL					42.09
1225	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1226												
1227	**Nonparametric Distribution Free UCL Statistics**											
1228	**Detected Data appear Normal Distributed at 5% Significance Level**											
1229												
1230	**Suggested UCL to Use**											
1231	95% KM (t) UCL					29.43						
1232												
1233	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1234	Recommendations are based upon data size, data distribution, and skewness.											
1235	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1236	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1237												
1238	**Aluminum (nfmw7)**											
1239												
1240	**General Statistics**											
1241	Total Number of Observations					9	Number of Distinct Observations					9
1242	Number of Detects					8	Number of Non-Detects					1
1243	Number of Distinct Detects					8	Number of Distinct Non-Detects					1
1244	Minimum Detect					13.2	Minimum Non-Detect					28.2
1245	Maximum Detect					345	Maximum Non-Detect					28.2
1246	Variance Detects					13531	Percent Non-Detects					11.11%
1247	Mean Detects					110.9	SD Detects					116.3
1248	Median Detects					64.55	CV Detects					1.049

1249				Skewness Detects		1.313				Kurtosis Detects		1.251
1250				Mean of Logged Detects		4.142				SD of Logged Detects		1.205
1251												
1252	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1253	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1254	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1255	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1256												
1257	**Normal GOF Test on Detects Only**											
1258				Shapiro Wilk Test Statistic		0.827		**Shapiro Wilk GOF Test**				
1259				5% Shapiro Wilk Critical Value		0.818		Detected Data appear Normal at 5% Significance Level				
1260				Lilliefors Test Statistic		0.272		**Lilliefors GOF Test**				
1261				5% Lilliefors Critical Value		0.283		Detected Data appear Normal at 5% Significance Level				
1262	**Detected Data appear Normal at 5% Significance Level**											
1263												
1264	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1265				KM Mean		100.6				KM Standard Error of Mean		38.02
1266				KM SD		106.7				95% KM (BCA) UCL		167.3
1267				95% KM (t) UCL		171.3				95% KM (Percentile Bootstrap) UCL		167.7
1268				95% KM (z) UCL		163.1				95% KM Bootstrap t UCL		218.9
1269				90% KM Chebyshev UCL		214.6				95% KM Chebyshev UCL		266.3
1270				97.5% KM Chebyshev UCL		338				99% KM Chebyshev UCL		478.9
1271												
1272	**Gamma GOF Tests on Detected Observations Only**											
1273				A-D Test Statistic		0.385		**Anderson-Darling GOF Test**				
1274				5% A-D Critical Value		0.735		Detected data appear Gamma Distributed at 5% Significance Level				
1275				K-S Test Statistic		0.21		**Kolmogorov-Smirnov GOF**				
1276				5% K-S Critical Value		0.301		Detected data appear Gamma Distributed at 5% Significance Level				
1277	**Detected data appear Gamma Distributed at 5% Significance Level**											
1278												
1279	**Gamma Statistics on Detected Data Only**											
1280				k hat (MLE)		1.017				k star (bias corrected MLE)		0.719
1281				Theta hat (MLE)		109.1				Theta star (bias corrected MLE)		154.3
1282				nu hat (MLE)		16.27				nu star (bias corrected)		11.5
1283				Mean (detects)		110.9						
1284												
1285	**Gamma ROS Statistics using Imputed Non-Detects**											
1286	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1287	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1288	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1289	This is especially true when the sample size is small.											
1290	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1291				Minimum		4.101				Mean		99.06
1292				Maximum		345				Median		61.9
1293				SD		114.5				CV		1.156
1294				k hat (MLE)		0.786				k star (bias corrected MLE)		0.598
1295				Theta hat (MLE)		126				Theta star (bias corrected MLE)		165.6
1296				nu hat (MLE)		14.15				nu star (bias corrected)		10.77
1297				Adjusted Level of Significance (β)		0.0231						
1298				Approximate Chi Square Value (10.77, α)		4.426				Adjusted Chi Square Value (10.77, β)		3.609
1299				95% Gamma Approximate UCL (use when n>=50)		240.9				95% Gamma Adjusted UCL (use when n<50)		295.5
1300												

	A	B	C	D	E	F	G	H	I	J	K	L
1301	**Estimates of Gamma Parameters using KM Estimates**											
1302					Mean (KM)	100.6					SD (KM)	106.7
1303					Variance (KM)	11383					SE of Mean (KM)	38.02
1304					k hat (KM)	0.889					k star (KM)	0.667
1305					nu hat (KM)	16					nu star (KM)	12
1306					theta hat (KM)	113.2					theta star (KM)	150.9
1307					80% gamma percentile (KM)	165.5					90% gamma percentile (KM)	255.4
1308					95% gamma percentile (KM)	348.4					99% gamma percentile (KM)	571.5
1309												
1310	**Gamma Kaplan-Meier (KM) Statistics**											
1311					Approximate Chi Square Value (12.00, α)	5.225					Adjusted Chi Square Value (12.00, β)	4.321
1312					95% Gamma Approximate KM-UCL (use when n>=50)	230.9					95% Gamma Adjusted KM-UCL (use when n<50)	279.2
1313												
1314	**Lognormal GOF Test on Detected Observations Only**											
1315					Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**					
1316					5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level					
1317					Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**					
1318					5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level					
1319	**Detected Data appear Lognormal at 5% Significance Level**											
1320												
1321	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1322					Mean in Original Scale	100.7					Mean in Log Scale	4.01
1323					SD in Original Scale	113					SD in Log Scale	1.195
1324					95% t UCL (assumes normality of ROS data)	170.8					95% Percentile Bootstrap UCL	161.9
1325					95% BCA Bootstrap UCL	178.4					95% Bootstrap t UCL	216.6
1326					95% H-UCL (Log ROS)	534.6						
1327												
1328	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1329					KM Mean (logged)	4					KM Geo Mean	54.58
1330					KM SD (logged)	1.139					95% Critical H Value (KM-Log)	3.555
1331					KM Standard Error of Mean (logged)	0.407					95% H-UCL (KM -Log)	436.7
1332					KM SD (logged)	1.139					95% Critical H Value (KM-Log)	3.555
1333					KM Standard Error of Mean (logged)	0.407						
1334												
1335	**DL/2 Statistics**											
1336	**DL/2 Normal**						**DL/2 Log-Transformed**					
1337					Mean in Original Scale	100.2					Mean in Log Scale	3.976
1338					SD in Original Scale	113.5					SD in Log Scale	1.233
1339					95% t UCL (Assumes normality)	170.5					95% H-Stat UCL	591.4
1340	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1341												
1342	**Nonparametric Distribution Free UCL Statistics**											
1343	**Detected Data appear Normal Distributed at 5% Significance Level**											
1344												
1345	**Suggested UCL to Use**											
1346					95% KM (t) UCL	171.3						
1347												
1348	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1349	Recommendations are based upon data size, data distribution, and skewness.											
1350	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1351	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1352												

	A	B	C	D	E	F	G	H	I	J	K	L
1353	**Aluminum (nfmw8)**											
1354												
1355	**General Statistics**											
1356	Total Number of Observations					8	Number of Distinct Observations					7
1357	Number of Detects					5	Number of Non-Detects					3
1358	Number of Distinct Detects					5	Number of Distinct Non-Detects					2
1359	Minimum Detect					25.7	Minimum Non-Detect					35.5
1360	Maximum Detect					118	Maximum Non-Detect					113
1361	Variance Detects					1639	Percent Non-Detects					37.5%
1362	Mean Detects					45.62	SD Detects					40.48
1363	Median Detects					28.4	CV Detects					0.887
1364	Skewness Detects					2.23	Kurtosis Detects					4.98
1365	Mean of Logged Detects					3.605	SD of Logged Detects					0.653
1366												
1367	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1368	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1369	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1370	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1371												
1372	**Normal GOF Test on Detects Only**											
1373	Shapiro Wilk Test Statistic					0.583	**Shapiro Wilk GOF Test**					
1374	5% Shapiro Wilk Critical Value					0.762	Detected Data Not Normal at 5% Significance Level					
1375	Lilliefors Test Statistic					0.459	**Lilliefors GOF Test**					
1376	5% Lilliefors Critical Value					0.343	Detected Data Not Normal at 5% Significance Level					
1377	**Detected Data Not Normal at 5% Significance Level**											
1378												
1379	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1380	KM Mean					38.83	KM Standard Error of Mean					11.84
1381	KM SD					29.95	95% KM (BCA) UCL					61.44
1382	95% KM (t) UCL					61.27	95% KM (Percentile Bootstrap) UCL					61.13
1383	95% KM (z) UCL					58.32	95% KM Bootstrap t UCL					377
1384	90% KM Chebyshev UCL					74.37	95% KM Chebyshev UCL					90.46
1385	97.5% KM Chebyshev UCL					112.8	99% KM Chebyshev UCL					156.7
1386												
1387	**Gamma GOF Tests on Detected Observations Only**											
1388	A-D Test Statistic					1.167	**Anderson-Darling GOF Test**					
1389	5% A-D Critical Value					0.684	Detected Data Not Gamma Distributed at 5% Significance Level					
1390	K-S Test Statistic					0.471	**Kolmogorov-Smirnov GOF**					
1391	5% K-S Critical Value					0.36	Detected Data Not Gamma Distributed at 5% Significance Level					
1392	**Detected Data Not Gamma Distributed at 5% Significance Level**											
1393												
1394	**Gamma Statistics on Detected Data Only**											
1395	k hat (MLE)					2.479	k star (bias corrected MLE)					1.125
1396	Theta hat (MLE)					18.4	Theta star (bias corrected MLE)					40.55
1397	nu hat (MLE)					24.79	nu star (bias corrected)					11.25
1398	Mean (detects)					45.62						
1399												
1400	**Gamma ROS Statistics using Imputed Non-Detects**											
1401	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1402	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1403	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1404	This is especially true when the sample size is small.											

	A	B	C	D	E	F	G	H	I	J	K	L
1405	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1406					Minimum	18.65				Mean		39.78
1407					Maximum	118				Median		28.7
1408					SD	32.25				CV		0.811
1409					k hat (MLE)	3.031				k star (bias corrected MLE)		1.978
1410					Theta hat (MLE)	13.13				Theta star (bias corrected MLE)		20.12
1411					nu hat (MLE)	48.49				nu star (bias corrected)		31.64
1412					Adjusted Level of Significance (β)	0.0195						
1413					Approximate Chi Square Value (31.64, α)	19.79				Adjusted Chi Square Value (31.64, β)		17.46
1414					95% Gamma Approximate UCL (use when n>=50)	63.61				95% Gamma Adjusted UCL (use when n<50)		72.11
1415												
1416	**Estimates of Gamma Parameters using KM Estimates**											
1417					Mean (KM)	38.83				SD (KM)		29.95
1418					Variance (KM)	896.7				SE of Mean (KM)		11.84
1419					k hat (KM)	1.682				k star (KM)		1.134
1420					nu hat (KM)	26.91				nu star (KM)		18.15
1421					theta hat (KM)	23.09				theta star (KM)		34.23
1422					80% gamma percentile (KM)	61.82				90% gamma percentile (KM)		86.68
1423					95% gamma percentile (KM)	111.3				99% gamma percentile (KM)		167.9
1424												
1425	**Gamma Kaplan-Meier (KM) Statistics**											
1426					Approximate Chi Square Value (18.15, α)	9.5				Adjusted Chi Square Value (18.15, β)		7.967
1427					95% Gamma Approximate KM-UCL (use when n>=50)	74.2				95% Gamma Adjusted KM-UCL (use when n<50)		88.47
1428												
1429	**Lognormal GOF Test on Detected Observations Only**											
1430					Shapiro Wilk Test Statistic	0.622				**Shapiro Wilk GOF Test**		
1431					5% Shapiro Wilk Critical Value	0.762				Detected Data Not Lognormal at 5% Significance Level		
1432					Lilliefors Test Statistic	0.442				**Lilliefors GOF Test**		
1433					5% Lilliefors Critical Value	0.343				Detected Data Not Lognormal at 5% Significance Level		
1434	**Detected Data Not Lognormal at 5% Significance Level**											
1435												
1436	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1437					Mean in Original Scale	40.07				Mean in Log Scale		3.533
1438					SD in Original Scale	31.76				SD in Log Scale		0.518
1439					95% t UCL (assumes normality of ROS data)	61.35				95% Percentile Bootstrap UCL		61.82
1440					95% BCA Bootstrap UCL	73.01				95% Bootstrap t UCL		239.4
1441					95% H-UCL (Log ROS)	62.42						
1442												
1443	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1444					KM Mean (logged)	3.496				KM Geo Mean		32.99
1445					KM SD (logged)	0.484				95% Critical H Value (KM-Log)		2.327
1446					KM Standard Error of Mean (logged)	0.192				95% H-UCL (KM -Log)		56.74
1447					KM SD (logged)	0.484				95% Critical H Value (KM-Log)		2.327
1448					KM Standard Error of Mean (logged)	0.192						
1449												
1450	**DL/2 Statistics**											
1451	**DL/2 Normal**						**DL/2 Log-Transformed**					
1452					Mean in Original Scale	44.86				Mean in Log Scale		3.621
1453					SD in Original Scale	32.87				SD in Log Scale		0.61
1454					95% t UCL (Assumes normality)	66.88				95% H-Stat UCL		81.12
1455	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1456												

	A	B	C	D	E	F	G	H	I	J	K	L
1457	**Nonparametric Distribution Free UCL Statistics**											
1458	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1459												
1460	**Suggested UCL to Use**											
1461	95% KM (Chebyshev) UCL					90.46						
1462												
1463	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1464	Recommendations are based upon data size, data distribution, and skewness.											
1465	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1466	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1467												
1468												
1469	**Aluminum (nfmw9)**											
1470												
1471	**General Statistics**											
1472	Total Number of Observations					8				Number of Distinct Observations		8
1473										Number of Missing Observations		0
1474	Minimum					60.9				Mean		134.5
1475	Maximum					243				Median		110.8
1476	SD					71.69				Std. Error of Mean		25.35
1477	Coefficient of Variation					0.533				Skewness		0.805
1478												
1479	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1480	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1481	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1482	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1483												
1484	**Normal GOF Test**											
1485	Shapiro Wilk Test Statistic					0.86				**Shapiro Wilk GOF Test**		
1486	5% Shapiro Wilk Critical Value					0.818				Data appear Normal at 5% Significance Level		
1487	Lilliefors Test Statistic					0.197				**Lilliefors GOF Test**		
1488	5% Lilliefors Critical Value					0.283				Data appear Normal at 5% Significance Level		
1489	**Data appear Normal at 5% Significance Level**											
1490												
1491	**Assuming Normal Distribution**											
1492	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
1493	95% Student's-t UCL					182.6				95% Adjusted-CLT UCL (Chen-1995)		183.9
1494										95% Modified-t UCL (Johnson-1978)		183.8
1495												
1496	**Gamma GOF Test**											
1497	A-D Test Statistic					0.383				**Anderson-Darling Gamma GOF Test**		
1498	5% A-D Critical Value					0.719				Detected data appear Gamma Distributed at 5% Significance Level		
1499	K-S Test Statistic					0.18				**Kolmogorov-Smirnov Gamma GOF Test**		
1500	5% K-S Critical Value					0.295				Detected data appear Gamma Distributed at 5% Significance Level		
1501	**Detected data appear Gamma Distributed at 5% Significance Level**											
1502												
1503	**Gamma Statistics**											
1504	k hat (MLE)					4.308				k star (bias corrected MLE)		2.776
1505	Theta hat (MLE)					31.23				Theta star (bias corrected MLE)		48.46
1506	nu hat (MLE)					68.94				nu star (bias corrected)		44.42
1507	MLE Mean (bias corrected)					134.5				MLE Sd (bias corrected)		80.75
1508										Approximate Chi Square Value (0.05)		30.13

1509	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					27.19
1510												
1511	**Assuming Gamma Distribution**											
1512	95% Approximate Gamma UCL (use when n>=50))					198.3	95% Adjusted Gamma UCL (use when n<50)					219.8
1513												
1514	**Lognormal GOF Test**											
1515	Shapiro Wilk Test Statistic					0.925	**Shapiro Wilk Lognormal GOF Test**					
1516	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1517	Lilliefors Test Statistic					0.156	**Lilliefors Lognormal GOF Test**					
1518	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
1519	**Data appear Lognormal at 5% Significance Level**											
1520												
1521	**Lognormal Statistics**											
1522	Minimum of Logged Data					4.109	Mean of logged Data					4.781
1523	Maximum of Logged Data					5.493	SD of logged Data					0.521
1524												
1525	**Assuming Lognormal Distribution**											
1526	95% H-UCL					218.8	90% Chebyshev (MVUE) UCL					209
1527	95% Chebyshev (MVUE) UCL					243	97.5% Chebyshev (MVUE) UCL					290.1
1528	99% Chebyshev (MVUE) UCL					382.6						
1529												
1530	**Nonparametric Distribution Free UCL Statistics**											
1531	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1532												
1533	**Nonparametric Distribution Free UCLs**											
1534	95% CLT UCL					176.2	95% Jackknife UCL					182.6
1535	95% Standard Bootstrap UCL					173.4	95% Bootstrap-t UCL					210.7
1536	95% Hall's Bootstrap UCL					200.1	95% Percentile Bootstrap UCL					173.4
1537	95% BCA Bootstrap UCL					179.5						
1538	90% Chebyshev(Mean, Sd) UCL					210.6	95% Chebyshev(Mean, Sd) UCL					245
1539	97.5% Chebyshev(Mean, Sd) UCL					292.8	99% Chebyshev(Mean, Sd) UCL					386.7
1540												
1541	**Suggested UCL to Use**											
1542	95% Student's-t UCL					182.6						
1543												
1544	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1545	Recommendations are based upon data size, data distribution, and skewness.											
1546	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1547	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1548												
1549	**Aluminum (smw10)**											
1550												
1551	**General Statistics**											
1552	Total Number of Observations					8	Number of Distinct Observations					8
1553	Number of Detects					7	Number of Non-Detects					1
1554	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
1555	Minimum Detect					46.5	Minimum Non-Detect					113
1556	Maximum Detect					93.8	Maximum Non-Detect					113
1557	Variance Detects					331.4	Percent Non-Detects					12.5%
1558	Mean Detects					65.36	SD Detects					18.2
1559	Median Detects					63.1	CV Detects					0.279
1560	Skewness Detects					0.456	Kurtosis Detects					-1.317

1561				Mean of Logged Detects		4.147				SD of Logged Detects		0.276
1562												
1563	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1564	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1565	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1566	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1567												
1568	**Normal GOF Test on Detects Only**											
1569				Shapiro Wilk Test Statistic		0.896	**Shapiro Wilk GOF Test**					
1570				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Normal at 5% Significance Level					
1571				Lilliefors Test Statistic		0.226	**Lilliefors GOF Test**					
1572				5% Lilliefors Critical Value		0.304	Detected Data appear Normal at 5% Significance Level					
1573	**Detected Data appear Normal at 5% Significance Level**											
1574												
1575	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1576				KM Mean		65.36	KM Standard Error of Mean					6.88
1577				KM SD		16.85	95% KM (BCA) UCL					76.96
1578				95% KM (t) UCL		78.39	95% KM (Percentile Bootstrap) UCL					75.8
1579				95% KM (z) UCL		76.67	95% KM Bootstrap t UCL					81.9
1580				90% KM Chebyshev UCL		86	95% KM Chebyshev UCL					95.35
1581				97.5% KM Chebyshev UCL		108.3	99% KM Chebyshev UCL					133.8
1582												
1583	**Gamma GOF Tests on Detected Observations Only**											
1584				A-D Test Statistic		0.428	**Anderson-Darling GOF Test**					
1585				5% A-D Critical Value		0.708	Detected data appear Gamma Distributed at 5% Significance Level					
1586				K-S Test Statistic		0.245	**Kolmogorov-Smirnov GOF**					
1587				5% K-S Critical Value		0.312	Detected data appear Gamma Distributed at 5% Significance Level					
1588	**Detected data appear Gamma Distributed at 5% Significance Level**											
1589												
1590	**Gamma Statistics on Detected Data Only**											
1591				k hat (MLE)		15.35	k star (bias corrected MLE)					8.868
1592				Theta hat (MLE)		4.257	Theta star (bias corrected MLE)					7.37
1593				nu hat (MLE)		214.9	nu star (bias corrected)					124.2
1594				Mean (detects)		65.36						
1595												
1596	**Gamma ROS Statistics using Imputed Non-Detects**											
1597	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1598	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1599	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1600	This is especially true when the sample size is small.											
1601	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1602				Minimum		46.5	Mean					65.23
1603				Maximum		93.8	Median					63.72
1604				SD		16.86	CV					0.258
1605				k hat (MLE)		17.51	k star (bias corrected MLE)					11.03
1606				Theta hat (MLE)		3.724	Theta star (bias corrected MLE)					5.914
1607				nu hat (MLE)		280.2	nu star (bias corrected)					176.5
1608				Adjusted Level of Significance (β)		0.0195						
1609				Approximate Chi Square Value (176.48, α)		146.8	Adjusted Chi Square Value (176.48, β)					139.9
1610				95% Gamma Approximate UCL (use when n>=50)		78.44	95% Gamma Adjusted UCL (use when n<50)					82.29
1611												
1612	**Estimates of Gamma Parameters using KM Estimates**											

1613					Mean (KM)	65.36					SD (KM)	16.85
1614					Variance (KM)	284					SE of Mean (KM)	6.88
1615					k hat (KM)	15.04					k star (KM)	9.482
1616					nu hat (KM)	240.6					nu star (KM)	151.7
1617					theta hat (KM)	4.346					theta star (KM)	6.892
1618					80% gamma percentile (KM)	82.23					90% gamma percentile (KM)	93.6
1619					95% gamma percentile (KM)	103.7					99% gamma percentile (KM)	124.6
1620												
1621					**Gamma Kaplan-Meier (KM) Statistics**							
1622					Approximate Chi Square Value (151.72, α)	124.2					Adjusted Chi Square Value (151.72, β)	118
1623					95% Gamma Approximate KM-UCL (use when n>=50)	79.81					95% Gamma Adjusted KM-UCL (use when n<50)	84.06
1624												
1625					**Lognormal GOF Test on Detected Observations Only**							
1626					Shapiro Wilk Test Statistic	0.898					**Shapiro Wilk GOF Test**	
1627					5% Shapiro Wilk Critical Value	0.803					Detected Data appear Lognormal at 5% Significance Level	
1628					Lilliefors Test Statistic	0.227					**Lilliefors GOF Test**	
1629					5% Lilliefors Critical Value	0.304					Detected Data appear Lognormal at 5% Significance Level	
1630					**Detected Data appear Lognormal at 5% Significance Level**							
1631												
1632					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1633					Mean in Original Scale	65.09					Mean in Log Scale	4.147
1634					SD in Original Scale	16.87					SD in Log Scale	0.256
1635					95% t UCL (assumes normality of ROS data)	76.39					95% Percentile Bootstrap UCL	74.58
1636					95% BCA Bootstrap UCL	74.39					95% Bootstrap t UCL	78.86
1637					95% H-UCL (Log ROS)	79.33						
1638												
1639					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1640					KM Mean (logged)	4.147					KM Geo Mean	63.24
1641					KM SD (logged)	0.256					95% Critical H Value (KM-Log)	2.005
1642					KM Standard Error of Mean (logged)	0.104					95% H-UCL (KM -Log)	79.33
1643					KM SD (logged)	0.256					95% Critical H Value (KM-Log)	2.005
1644					KM Standard Error of Mean (logged)	0.104						
1645												
1646					**DL/2 Statistics**							
1647					**DL/2 Normal**						**DL/2 Log-Transformed**	
1648					Mean in Original Scale	64.25					Mean in Log Scale	4.133
1649					SD in Original Scale	17.14					SD in Log Scale	0.259
1650					95% t UCL (Assumes normality)	75.73					95% H-Stat UCL	78.49
1651					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1652												
1653					**Nonparametric Distribution Free UCL Statistics**							
1654					**Detected Data appear Normal Distributed at 5% Significance Level**							
1655												
1656					**Suggested UCL to Use**							
1657					95% KM (t) UCL	78.39						
1658												
1659					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1660					Recommendations are based upon data size, data distribution, and skewness.							
1661					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1662					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1663												
1664	**Aluminum (smw11)**											

1665												
1666	**General Statistics**											
1667					Total Number of Observations	9			Number of Distinct Observations	9		
1668					Number of Detects	8			Number of Non-Detects	1		
1669					Number of Distinct Detects	8			Number of Distinct Non-Detects	1		
1670					Minimum Detect	33.7			Minimum Non-Detect	400		
1671					Maximum Detect	175			Maximum Non-Detect	400		
1672					Variance Detects	2802			Percent Non-Detects	11.11%		
1673					Mean Detects	123.9			SD Detects	52.93		
1674					Median Detects	145.5			CV Detects	0.427		
1675					Skewness Detects	-1.268			Kurtosis Detects	-0.0585		
1676					Mean of Logged Detects	4.685			SD of Logged Detects	0.63		
1677												
1678	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1679	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1680	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1681	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1682												
1683	**Normal GOF Test on Detects Only**											
1684					Shapiro Wilk Test Statistic	0.763			**Shapiro Wilk GOF Test**			
1685					5% Shapiro Wilk Critical Value	0.818			Detected Data Not Normal at 5% Significance Level			
1686					Lilliefors Test Statistic	0.362			**Lilliefors GOF Test**			
1687					5% Lilliefors Critical Value	0.283			Detected Data Not Normal at 5% Significance Level			
1688	**Detected Data Not Normal at 5% Significance Level**											
1689												
1690	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1691					KM Mean	123.9			KM Standard Error of Mean	18.71		
1692					KM SD	49.51			95% KM (BCA) UCL	151.8		
1693					95% KM (t) UCL	158.7			95% KM (Percentile Bootstrap) UCL	151.9		
1694					95% KM (z) UCL	154.7			95% KM Bootstrap t UCL	149.8		
1695					90% KM Chebyshev UCL	180.1			95% KM Chebyshev UCL	205.5		
1696					97.5% KM Chebyshev UCL	240.8			99% KM Chebyshev UCL	310.1		
1697												
1698	**Gamma GOF Tests on Detected Observations Only**											
1699					A-D Test Statistic	1.253			**Anderson-Darling GOF Test**			
1700					5% A-D Critical Value	0.719			Detected Data Not Gamma Distributed at 5% Significance Level			
1701					K-S Test Statistic	0.405			**Kolmogorov-Smirnov GOF**			
1702					5% K-S Critical Value	0.295			Detected Data Not Gamma Distributed at 5% Significance Level			
1703	**Detected Data Not Gamma Distributed at 5% Significance Level**											
1704												
1705	**Gamma Statistics on Detected Data Only**											
1706					k hat (MLE)	3.87			k star (bias corrected MLE)	2.502		
1707					Theta hat (MLE)	32.02			Theta star (bias corrected MLE)	49.52		
1708					nu hat (MLE)	61.92			nu star (bias corrected)	40.03		
1709					Mean (detects)	123.9						
1710												
1711	**Gamma ROS Statistics using Imputed Non-Detects**											
1712	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1713	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1714	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1715	This is especially true when the sample size is small.											
1716	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											

	A	B	C	D	E	F	G	H	I	J	K	L
1717					Minimum	33.7					Mean	123.3
1718					Maximum	175					Median	144
1719					SD	49.55					CV	0.402
1720					k hat (MLE)	4.332					k star (bias corrected MLE)	2.962
1721					Theta hat (MLE)	28.47					Theta star (bias corrected MLE)	41.64
1722					nu hat (MLE)	77.97					nu star (bias corrected)	53.31
1723					Adjusted Level of Significance (β)	0.0231						
1724					Approximate Chi Square Value (53.31, α)	37.54					Adjusted Chi Square Value (53.31, β)	34.77
1725					95% Gamma Approximate UCL (use when n>=50)	175.1					95% Gamma Adjusted UCL (use when n<50)	189.1
1726												
1727					**Estimates of Gamma Parameters using KM Estimates**							
1728					Mean (KM)	123.9					SD (KM)	49.51
1729					Variance (KM)	2452					SE of Mean (KM)	18.71
1730					k hat (KM)	6.263					k star (KM)	4.249
1731					nu hat (KM)	112.7					nu star (KM)	76.49
1732					theta hat (KM)	19.79					theta star (KM)	29.16
1733					80% gamma percentile (KM)	169.7					90% gamma percentile (KM)	204.5
1734					95% gamma percentile (KM)	236.4					99% gamma percentile (KM)	304.4
1735												
1736					**Gamma Kaplan-Meier (KM) Statistics**							
1737					Approximate Chi Square Value (76.49, α)	57.34					Adjusted Chi Square Value (76.49, β)	53.86
1738					95% Gamma Approximate KM-UCL (use when n>=50)	165.3					95% Gamma Adjusted KM-UCL (use when n<50)	176
1739												
1740					**Lognormal GOF Test on Detected Observations Only**							
1741					Shapiro Wilk Test Statistic	0.699					**Shapiro Wilk GOF Test**	
1742					5% Shapiro Wilk Critical Value	0.818					Detected Data Not Lognormal at 5% Significance Level	
1743					Lilliefors Test Statistic	0.404					**Lilliefors GOF Test**	
1744					5% Lilliefors Critical Value	0.283					Detected Data Not Lognormal at 5% Significance Level	
1745					**Detected Data Not Lognormal at 5% Significance Level**							
1746												
1747					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1748					Mean in Original Scale	122.2					Mean in Log Scale	4.685
1749					SD in Original Scale	49.79					SD in Log Scale	0.59
1750					95% t UCL (assumes normality of ROS data)	153					95% Percentile Bootstrap UCL	146
1751					95% BCA Bootstrap UCL	142.4					95% Bootstrap t UCL	146.7
1752					95% H-UCL (Log ROS)	213						
1753												
1754					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1755					KM Mean (logged)	4.685					KM Geo Mean	108.3
1756					KM SD (logged)	0.59					95% Critical H Value (KM-Log)	2.411
1757					KM Standard Error of Mean (logged)	0.223					95% H-UCL (KM -Log)	213
1758					KM SD (logged)	0.59					95% Critical H Value (KM-Log)	2.411
1759					KM Standard Error of Mean (logged)	0.223						
1760												
1761					**DL/2 Statistics**							
1762					**DL/2 Normal**						**DL/2 Log-Transformed**	
1763					Mean in Original Scale	132.4					Mean in Log Scale	4.753
1764					SD in Original Scale	55.63					SD in Log Scale	0.624
1765					95% t UCL (Assumes normality)	166.9					95% H-Stat UCL	243.7
1766					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1767												
1768					**Nonparametric Distribution Free UCL Statistics**							

1769	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1770												
1771	**Suggested UCL to Use**											
1772	95% KM (Chebyshev) UCL				205.5							
1773	**Warning: Recommended UCL exceeds the maximum observation**											
1774												
1775	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1776	Recommendations are based upon data size, data distribution, and skewness.											
1777	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1778	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1779												
1780												
1781	**Aluminum (smw12)**											
1782												
1783	**General Statistics**											
1784	Total Number of Observations				8		Number of Distinct Observations				8	
1785							Number of Missing Observations				0	
1786	Minimum				92.6		Mean				237.6	
1787	Maximum				506		Median				197	
1788	SD				132.7		Std. Error of Mean				46.91	
1789	Coefficient of Variation				0.559		Skewness				1.34	
1790												
1791	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1792	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1793	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1794	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1795												
1796	**Normal GOF Test**											
1797	Shapiro Wilk Test Statistic				0.886		**Shapiro Wilk GOF Test**					
1798	5% Shapiro Wilk Critical Value				0.818		Data appear Normal at 5% Significance Level					
1799	Lilliefors Test Statistic				0.225		**Lilliefors GOF Test**					
1800	5% Lilliefors Critical Value				0.283		Data appear Normal at 5% Significance Level					
1801	**Data appear Normal at 5% Significance Level**											
1802												
1803	**Assuming Normal Distribution**											
1804	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1805	95% Student's-t UCL				326.5		95% Adjusted-CLT UCL (Chen-1995)				338.5	
1806							95% Modified-t UCL (Johnson-1978)				330.2	
1807												
1808	**Gamma GOF Test**											
1809	A-D Test Statistic				0.241		**Anderson-Darling Gamma GOF Test**					
1810	5% A-D Critical Value				0.719		Detected data appear Gamma Distributed at 5% Significance Level					
1811	K-S Test Statistic				0.158		**Kolmogorov-Smirnov Gamma GOF Test**					
1812	5% K-S Critical Value				0.295		Detected data appear Gamma Distributed at 5% Significance Level					
1813	**Detected data appear Gamma Distributed at 5% Significance Level**											
1814												
1815	**Gamma Statistics**											
1816	k hat (MLE)				4.197		k star (bias corrected MLE)				2.707	
1817	Theta hat (MLE)				56.6		Theta star (bias corrected MLE)				87.77	
1818	nu hat (MLE)				67.16		nu star (bias corrected)				43.31	
1819	MLE Mean (bias corrected)				237.6		MLE Sd (bias corrected)				144.4	
1820							Approximate Chi Square Value (0.05)				29.22	

1821	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					26.32
1822												
1823	**Assuming Gamma Distribution**											
1824	95% Approximate Gamma UCL (use when n>=50))					352.1	95% Adjusted Gamma UCL (use when n<50)					390.9
1825												
1826	**Lognormal GOF Test**											
1827	Shapiro Wilk Test Statistic					0.984	**Shapiro Wilk Lognormal GOF Test**					
1828	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1829	Lilliefors Test Statistic					0.132	**Lilliefors Lognormal GOF Test**					
1830	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
1831	**Data appear Lognormal at 5% Significance Level**											
1832												
1833	**Lognormal Statistics**											
1834	Minimum of Logged Data					4.528	Mean of logged Data					5.347
1835	Maximum of Logged Data					6.227	SD of logged Data					0.526
1836												
1837	**Assuming Lognormal Distribution**											
1838	95% H-UCL					388.5	90% Chebyshev (MVUE) UCL					370
1839	95% Chebyshev (MVUE) UCL					430.5	97.5% Chebyshev (MVUE) UCL					514.4
1840	99% Chebyshev (MVUE) UCL					679.3						
1841												
1842	**Nonparametric Distribution Free UCL Statistics**											
1843	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1844												
1845	**Nonparametric Distribution Free UCLs**											
1846	95% CLT UCL					314.7	95% Jackknife UCL					326.5
1847	95% Standard Bootstrap UCL					309.9	95% Bootstrap-t UCL					412.7
1848	95% Hall's Bootstrap UCL					812.9	95% Percentile Bootstrap UCL					315
1849	95% BCA Bootstrap UCL					329.5						
1850	90% Chebyshev(Mean, Sd) UCL					378.3	95% Chebyshev(Mean, Sd) UCL					442.1
1851	97.5% Chebyshev(Mean, Sd) UCL					530.6	99% Chebyshev(Mean, Sd) UCL					704.4
1852												
1853	**Suggested UCL to Use**											
1854	95% Student's-t UCL					326.5						
1855												
1856	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1857	Recommendations are based upon data size, data distribution, and skewness.											
1858	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1859	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1860												
1861	**Aluminum (smw13)**											
1862												
1863	**General Statistics**											
1864	Total Number of Observations					8	Number of Distinct Observations					8
1865	Number of Detects					7	Number of Non-Detects					1
1866	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
1867	Minimum Detect					10.9	Minimum Non-Detect					113
1868	Maximum Detect					161	Maximum Non-Detect					113
1869	Variance Detects					3141	Percent Non-Detects					12.5%
1870	Mean Detects					84.6	SD Detects					56.05
1871	Median Detects					89.7	CV Detects					0.662
1872	Skewness Detects					0.0695	Kurtosis Detects					-1.414

1873				Mean of Logged Detects		4.138				SD of Logged Detects		0.963
1874												
1875	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1876	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1877	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1878	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1879												
1880	**Normal GOF Test on Detects Only**											
1881				Shapiro Wilk Test Statistic		0.959	**Shapiro Wilk GOF Test**					
1882				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Normal at 5% Significance Level					
1883				Lilliefors Test Statistic		0.133	**Lilliefors GOF Test**					
1884				5% Lilliefors Critical Value		0.304	Detected Data appear Normal at 5% Significance Level					
1885	**Detected Data appear Normal at 5% Significance Level**											
1886												
1887	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1888				KM Mean		81.26	KM Standard Error of Mean					20.1
1889				KM SD		50.87	95% KM (BCA) UCL					112.2
1890				95% KM (t) UCL		119.3	95% KM (Percentile Bootstrap) UCL					114.2
1891				95% KM (z) UCL		114.3	95% KM Bootstrap t UCL					119.7
1892				90% KM Chebyshev UCL		141.6	95% KM Chebyshev UCL					168.9
1893				97.5% KM Chebyshev UCL		206.8	99% KM Chebyshev UCL					281.3
1894												
1895	**Gamma GOF Tests on Detected Observations Only**											
1896				A-D Test Statistic		0.269	**Anderson-Darling GOF Test**					
1897				5% A-D Critical Value		0.717	Detected data appear Gamma Distributed at 5% Significance Level					
1898				K-S Test Statistic		0.2	**Kolmogorov-Smirnov GOF**					
1899				5% K-S Critical Value		0.316	Detected data appear Gamma Distributed at 5% Significance Level					
1900	**Detected data appear Gamma Distributed at 5% Significance Level**											
1901												
1902	**Gamma Statistics on Detected Data Only**											
1903				k hat (MLE)		1.818	k star (bias corrected MLE)					1.134
1904				Theta hat (MLE)		46.55	Theta star (bias corrected MLE)					74.61
1905				nu hat (MLE)		25.45	nu star (bias corrected)					15.87
1906				Mean (detects)		84.6						
1907												
1908	**Gamma ROS Statistics using Imputed Non-Detects**											
1909	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1910	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1911	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1912	This is especially true when the sample size is small.											
1913	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1914				Minimum		10.9	Mean					80.83
1915				Maximum		161	Median					72.15
1916				SD		52.98	CV					0.655
1917				k hat (MLE)		1.991	k star (bias corrected MLE)					1.327
1918				Theta hat (MLE)		40.6	Theta star (bias corrected MLE)					60.89
1919				nu hat (MLE)		31.85	nu star (bias corrected)					21.24
1920				Adjusted Level of Significance (β)		0.0195						
1921				Approximate Chi Square Value (21.24, α)		11.77	Adjusted Chi Square Value (21.24, β)					10.03
1922				95% Gamma Approximate UCL (use when n>=50)		145.9	95% Gamma Adjusted UCL (use when n<50)					171.1
1923												
1924	**Estimates of Gamma Parameters using KM Estimates**											

1925					Mean (KM)	81.26					SD (KM)	50.87
1926					Variance (KM)	2588					SE of Mean (KM)	20.1
1927					k hat (KM)	2.552					k star (KM)	1.678
1928					nu hat (KM)	40.83					nu star (KM)	26.85
1929					theta hat (KM)	31.84					theta star (KM)	48.42
1930					80% gamma percentile (KM)	124.2					90% gamma percentile (KM)	164.8
1931					95% gamma percentile (KM)	203.9					99% gamma percentile (KM)	291.8
1932												
1933					**Gamma Kaplan-Meier (KM) Statistics**							
1934					Approximate Chi Square Value (26.85, α)	16.03					Adjusted Chi Square Value (26.85, β)	13.96
1935					95% Gamma Approximate KM-UCL (use when n>=50)	136.1					95% Gamma Adjusted KM-UCL (use when n<50)	156.2
1936												
1937					**Lognormal GOF Test on Detected Observations Only**							
1938					Shapiro Wilk Test Statistic	0.901					**Shapiro Wilk GOF Test**	
1939					5% Shapiro Wilk Critical Value	0.803					Detected Data appear Lognormal at 5% Significance Level	
1940					Lilliefors Test Statistic	0.216					**Lilliefors GOF Test**	
1941					5% Lilliefors Critical Value	0.304					Detected Data appear Lognormal at 5% Significance Level	
1942					**Detected Data appear Lognormal at 5% Significance Level**							
1943												
1944					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1945					Mean in Original Scale	79.3					Mean in Log Scale	4.089
1946					SD in Original Scale	54.01					SD in Log Scale	0.903
1947					95% t UCL (assumes normality of ROS data)	115.5					95% Percentile Bootstrap UCL	109.3
1948					95% BCA Bootstrap UCL	110.9					95% Bootstrap t UCL	120.5
1949					95% H-UCL (Log ROS)	266.2						
1950												
1951					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1952					KM Mean (logged)	4.094					KM Geo Mean	60
1953					KM SD (logged)	0.891					95% Critical H Value (KM-Log)	3.163
1954					KM Standard Error of Mean (logged)	0.361					95% H-UCL (KM -Log)	258.9
1955					KM SD (logged)	0.891					95% Critical H Value (KM-Log)	3.163
1956					KM Standard Error of Mean (logged)	0.361						
1957												
1958					**DL/2 Statistics**							
1959					**DL/2 Normal**						**DL/2 Log-Transformed**	
1960					Mean in Original Scale	81.09					Mean in Log Scale	4.125
1961					SD in Original Scale	52.83					SD in Log Scale	0.892
1962					95% t UCL (Assumes normality)	116.5					95% H-Stat UCL	268.1
1963					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1964												
1965					**Nonparametric Distribution Free UCL Statistics**							
1966					**Detected Data appear Normal Distributed at 5% Significance Level**							
1967												
1968					**Suggested UCL to Use**							
1969					95% KM (t) UCL	119.3						
1970												
1971					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1972					Recommendations are based upon data size, data distribution, and skewness.							
1973					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1974					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1975												
1976	**Aluminum (smw14)**											

1977												
1978	**General Statistics**											
1979					Total Number of Observations	8			Number of Distinct Observations	8		
1980					Number of Detects	5			Number of Non-Detects	3		
1981					Number of Distinct Detects	5			Number of Distinct Non-Detects	3		
1982					Minimum Detect	9.3			Minimum Non-Detect	23.2		
1983					Maximum Detect	357			Maximum Non-Detect	113		
1984					Variance Detects	23090			Percent Non-Detects	37.5%		
1985					Mean Detects	85.56			SD Detects	152		
1986					Median Detects	20.3			CV Detects	1.776		
1987					Skewness Detects	2.22			Kurtosis Detects	4.943		
1988					Mean of Logged Detects	3.39			SD of Logged Detects	1.464		
1989												
1990	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1991	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1992	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1993	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1994												
1995	**Normal GOF Test on Detects Only**											
1996					Shapiro Wilk Test Statistic	0.6			**Shapiro Wilk GOF Test**			
1997					5% Shapiro Wilk Critical Value	0.762			Detected Data Not Normal at 5% Significance Level			
1998					Lilliefors Test Statistic	0.443			**Lilliefors GOF Test**			
1999					5% Lilliefors Critical Value	0.343			Detected Data Not Normal at 5% Significance Level			
2000	**Detected Data Not Normal at 5% Significance Level**											
2001												
2002	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2003					KM Mean	59.41			KM Standard Error of Mean	44.6		
2004					KM SD	112.7			95% KM (BCA) UCL	146.8		
2005					95% KM (t) UCL	143.9			95% KM (Percentile Bootstrap) UCL	143.8		
2006					95% KM (z) UCL	132.8			95% KM Bootstrap t UCL	905.4		
2007					90% KM Chebyshev UCL	193.2			95% KM Chebyshev UCL	253.8		
2008					97.5% KM Chebyshev UCL	337.9			99% KM Chebyshev UCL	503.2		
2009												
2010	**Gamma GOF Tests on Detected Observations Only**											
2011					A-D Test Statistic	0.786			**Anderson-Darling GOF Test**			
2012					5% A-D Critical Value	0.707			Detected Data Not Gamma Distributed at 5% Significance Level			
2013					K-S Test Statistic	0.39			**Kolmogorov-Smirnov GOF**			
2014					5% K-S Critical Value	0.37			Detected Data Not Gamma Distributed at 5% Significance Level			
2015	**Detected Data Not Gamma Distributed at 5% Significance Level**											
2016												
2017	**Gamma Statistics on Detected Data Only**											
2018					k hat (MLE)	0.586			k star (bias corrected MLE)	0.368		
2019					Theta hat (MLE)	146.1			Theta star (bias corrected MLE)	232.8		
2020					nu hat (MLE)	5.856			nu star (bias corrected)	3.676		
2021					Mean (detects)	85.56						
2022												
2023	**Gamma ROS Statistics using Imputed Non-Detects**											
2024	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2025	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2026	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2027	This is especially true when the sample size is small.											
2028	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											

	A	B	C	D	E	F	G	H	I	J	K	L
2029					Minimum	0.01					Mean	54.87
2030					Maximum	357					Median	10.4
2031					SD	122.4					CV	2.231
2032					k hat (MLE)	0.334					k star (bias corrected MLE)	0.292
2033					Theta hat (MLE)	164.5					Theta star (bias corrected MLE)	188
2034					nu hat (MLE)	5.337					nu star (bias corrected)	4.669
2035					Adjusted Level of Significance (β)	0.0195						
2036					Approximate Chi Square Value (4.67, α)	1.002					Adjusted Chi Square Value (4.67, β)	0.643
2037					95% Gamma Approximate UCL (use when n>=50)	255.6					95% Gamma Adjusted UCL (use when n<50)	398.2
2038												
2039					**Estimates of Gamma Parameters using KM Estimates**							
2040					Mean (KM)	59.41					SD (KM)	112.7
2041					Variance (KM)	12703					SE of Mean (KM)	44.6
2042					k hat (KM)	0.278					k star (KM)	0.257
2043					nu hat (KM)	4.446					nu star (KM)	4.112
2044					theta hat (KM)	213.8					theta star (KM)	231.2
2045					80% gamma percentile (KM)	87.12					90% gamma percentile (KM)	178
2046					95% gamma percentile (KM)	285.2					99% gamma percentile (KM)	569.6
2047												
2048					**Gamma Kaplan-Meier (KM) Statistics**							
2049					Approximate Chi Square Value (4.11, α)	0.766					Adjusted Chi Square Value (4.11, β)	0.473
2050					95% Gamma Approximate KM-UCL (use when n>=50)	318.7					95% Gamma Adjusted KM-UCL (use when n<50)	516.1
2051												
2052					**Lognormal GOF Test on Detected Observations Only**							
2053					Shapiro Wilk Test Statistic	0.821					**Shapiro Wilk GOF Test**	
2054					5% Shapiro Wilk Critical Value	0.762					Detected Data appear Lognormal at 5% Significance Level	
2055					Lilliefors Test Statistic	0.3					**Lilliefors GOF Test**	
2056					5% Lilliefors Critical Value	0.343					Detected Data appear Lognormal at 5% Significance Level	
2057					**Detected Data appear Lognormal at 5% Significance Level**							
2058												
2059					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2060					Mean in Original Scale	59.52					Mean in Log Scale	3.158
2061					SD in Original Scale	120.4					SD in Log Scale	1.157
2062					95% t UCL (assumes normality of ROS data)	140.1					95% Percentile Bootstrap UCL	143.2
2063					95% BCA Bootstrap UCL	147.2					95% Bootstrap t UCL	1452
2064					95% H-UCL (Log ROS)	244.1						
2065												
2066					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2067					KM Mean (logged)	3.121					KM Geo Mean	22.67
2068					KM SD (logged)	1.122					95% Critical H Value (KM-Log)	3.732
2069					KM Standard Error of Mean (logged)	0.461					95% H-UCL (KM -Log)	206.9
2070					KM SD (logged)	1.122					95% Critical H Value (KM-Log)	3.732
2071					KM Standard Error of Mean (logged)	0.461						
2072												
2073					**DL/2 Statistics**							
2074					**DL/2 Normal**						**DL/2 Log-Transformed**	
2075					Mean in Original Scale	64.51					Mean in Log Scale	3.305
2076					SD in Original Scale	119.2					SD in Log Scale	1.193
2077					95% t UCL (Assumes normality)	144.3					95% H-Stat UCL	324.9
2078					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2079												
2080					**Nonparametric Distribution Free UCL Statistics**							

2081	**Detected Data appear Lognormal Distributed at 5% Significance Level**											
2082												
2083	**Suggested UCL to Use**											
2084	95% KM (Chebyshev) UCL				253.8							
2085												
2086	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2087	Recommendations are based upon data size, data distribution, and skewness.											
2088	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2089	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2090												
2091												
2092	**Aluminum (smw15)**											
2093												
2094	**General Statistics**											
2095	Total Number of Observations				9		Number of Distinct Observations				9	
2096							Number of Missing Observations				0	
2097	Minimum				246		Mean				788.7	
2098	Maximum				1720		Median				570	
2099	SD				503.7		Std. Error of Mean				167.9	
2100	Coefficient of Variation				0.639		Skewness				1.054	
2101												
2102	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2103	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2104	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2105	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2106												
2107	**Normal GOF Test**											
2108	Shapiro Wilk Test Statistic				0.874		**Shapiro Wilk GOF Test**					
2109	5% Shapiro Wilk Critical Value				0.829		Data appear Normal at 5% Significance Level					
2110	Lilliefors Test Statistic				0.223		**Lilliefors GOF Test**					
2111	5% Lilliefors Critical Value				0.274		Data appear Normal at 5% Significance Level					
2112	**Data appear Normal at 5% Significance Level**											
2113												
2114	**Assuming Normal Distribution**											
2115	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2116	95% Student's-t UCL				1101		95% Adjusted-CLT UCL (Chen-1995)				1128	
2117							95% Modified-t UCL (Johnson-1978)				1111	
2118												
2119	**Gamma GOF Test**											
2120	A-D Test Statistic				0.318		**Anderson-Darling Gamma GOF Test**					
2121	5% A-D Critical Value				0.727		Detected data appear Gamma Distributed at 5% Significance Level					
2122	K-S Test Statistic				0.188		**Kolmogorov-Smirnov Gamma GOF Test**					
2123	5% K-S Critical Value				0.281		Detected data appear Gamma Distributed at 5% Significance Level					
2124	**Detected data appear Gamma Distributed at 5% Significance Level**											
2125												
2126	**Gamma Statistics**											
2127	k hat (MLE)				3.03		k star (bias corrected MLE)				2.094	
2128	Theta hat (MLE)				260.3		Theta star (bias corrected MLE)				376.6	
2129	nu hat (MLE)				54.55		nu star (bias corrected)				37.7	
2130	MLE Mean (bias corrected)				788.7		MLE Sd (bias corrected)				545	
2131							Approximate Chi Square Value (0.05)				24.64	
2132	Adjusted Level of Significance				0.0231		Adjusted Chi Square Value				22.44	

	A	B	C	D	E	F	G	H	I	J	K	L
2133												
2134	**Assuming Gamma Distribution**											
2135	95% Approximate Gamma UCL (use when n>=50))					1207	95% Adjusted Gamma UCL (use when n<50)					1325
2136												
2137	**Lognormal GOF Test**											
2138	Shapiro Wilk Test Statistic					0.964	**Shapiro Wilk Lognormal GOF Test**					
2139	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
2140	Lilliefors Test Statistic					0.151	**Lilliefors Lognormal GOF Test**					
2141	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
2142	**Data appear Lognormal at 5% Significance Level**											
2143												
2144	**Lognormal Statistics**											
2145	Minimum of Logged Data					5.505	Mean of logged Data					6.496
2146	Maximum of Logged Data					7.45	SD of logged Data					0.626
2147												
2148	**Assuming Lognormal Distribution**											
2149	95% H-UCL					1397	90% Chebyshev (MVUE) UCL					1288
2150	95% Chebyshev (MVUE) UCL					1516	97.5% Chebyshev (MVUE) UCL					1831
2151	99% Chebyshev (MVUE) UCL					2451						
2152												
2153	**Nonparametric Distribution Free UCL Statistics**											
2154	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2155												
2156	**Nonparametric Distribution Free UCLs**											
2157	95% CLT UCL					1065	95% Jackknife UCL					1101
2158	95% Standard Bootstrap UCL					1053	95% Bootstrap-t UCL					1390
2159	95% Hall's Bootstrap UCL					1326	95% Percentile Bootstrap UCL					1076
2160	95% BCA Bootstrap UCL					1134						
2161	90% Chebyshev(Mean, Sd) UCL					1292	95% Chebyshev(Mean, Sd) UCL					1521
2162	97.5% Chebyshev(Mean, Sd) UCL					1837	99% Chebyshev(Mean, Sd) UCL					2459
2163												
2164	**Suggested UCL to Use**											
2165	95% Student's-t UCL					1101						
2166												
2167	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2168	Recommendations are based upon data size, data distribution, and skewness.											
2169	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2170	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2171												
2172												
2173	**Aluminum (smw16)**											
2174												
2175	**General Statistics**											
2176	Total Number of Observations					9	Number of Distinct Observations					9
2177							Number of Missing Observations					0
2178	Minimum					74.9	Mean					210.5
2179	Maximum					384	Median					199
2180	SD					86.71	Std. Error of Mean					28.9
2181	Coefficient of Variation					0.412	Skewness					0.643
2182												
2183	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2184	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											

2185	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
2186	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
2187												
2188	Normal GOF Test											
2189					Shapiro Wilk Test Statistic	0.963	Shapiro Wilk GOF Test					
2190					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
2191					Lilliefors Test Statistic	0.176	Lilliefors GOF Test					
2192					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
2193	Data appear Normal at 5% Significance Level											
2194												
2195	Assuming Normal Distribution											
2196	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
2197					95% Student's-t UCL	264.3				95% Adjusted-CLT UCL (Chen-1995)	264.7	
2198										95% Modified-t UCL (Johnson-1978)	265.3	
2199												
2200	Gamma GOF Test											
2201					A-D Test Statistic	0.228	Anderson-Darling Gamma GOF Test					
2202					5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level					
2203					K-S Test Statistic	0.126	Kolmogorov-Smirnov Gamma GOF Test					
2204					5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level					
2205	Detected data appear Gamma Distributed at 5% Significance Level											
2206												
2207	Gamma Statistics											
2208					k hat (MLE)	6.137				k star (bias corrected MLE)	4.166	
2209					Theta hat (MLE)	34.31				Theta star (bias corrected MLE)	50.54	
2210					nu hat (MLE)	110.5				nu star (bias corrected)	74.98	
2211					MLE Mean (bias corrected)	210.5				MLE Sd (bias corrected)	103.2	
2212										Approximate Chi Square Value (0.05)	56.04	
2213					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	52.6	
2214												
2215	Assuming Gamma Distribution											
2216					95% Approximate Gamma UCL (use when n>=50))	281.7				95% Adjusted Gamma UCL (use when n<50)	300.1	
2217												
2218	Lognormal GOF Test											
2219					Shapiro Wilk Test Statistic	0.945	Shapiro Wilk Lognormal GOF Test					
2220					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
2221					Lilliefors Test Statistic	0.152	Lilliefors Lognormal GOF Test					
2222					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
2223	Data appear Lognormal at 5% Significance Level											
2224												
2225	Lognormal Statistics											
2226					Minimum of Logged Data	4.316				Mean of logged Data	5.266	
2227					Maximum of Logged Data	5.951				SD of logged Data	0.456	
2228												
2229	Assuming Lognormal Distribution											
2230					95% H-UCL	305.7				90% Chebyshev (MVUE) UCL	310.1	
2231					95% Chebyshev (MVUE) UCL	354.4				97.5% Chebyshev (MVUE) UCL	415.9	
2232					99% Chebyshev (MVUE) UCL	536.8						
2233												
2234	Nonparametric Distribution Free UCL Statistics											
2235	Data appear to follow a Discernible Distribution at 5% Significance Level											
2236												

	A	B	C	D	E	F	G	H	I	J	K	L
2237	**Nonparametric Distribution Free UCLs**											
2238					95% CLT UCL	258.1				95% Jackknife UCL		264.3
2239					95% Standard Bootstrap UCL	256.2				95% Bootstrap-t UCL		273.4
2240					95% Hall's Bootstrap UCL	298.6				95% Percentile Bootstrap UCL		254.4
2241					95% BCA Bootstrap UCL	264.1						
2242					90% Chebyshev(Mean, Sd) UCL	297.3				95% Chebyshev(Mean, Sd) UCL		336.5
2243					97.5% Chebyshev(Mean, Sd) UCL	391				99% Chebyshev(Mean, Sd) UCL		498.1
2244												
2245	**Suggested UCL to Use**											
2246					95% Student's-t UCL	264.3						
2247												
2248	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2249	Recommendations are based upon data size, data distribution, and skewness.											
2250	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2251	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2252												
2253	**Aluminum (smw16d)**											
2254												
2255	**General Statistics**											
2256					Total Number of Observations	8				Number of Distinct Observations		6
2257					Number of Detects	4				Number of Non-Detects		4
2258					Number of Distinct Detects	4				Number of Distinct Non-Detects		2
2259					Minimum Detect	5.3				Minimum Non-Detect		8.1
2260					Maximum Detect	99.2				Maximum Non-Detect		113
2261					Variance Detects	2050				Percent Non-Detects		50%
2262					Mean Detects	31.45				SD Detects		45.28
2263					Median Detects	10.65				CV Detects		1.44
2264					Skewness Detects	1.971				Kurtosis Detects		3.901
2265					Mean of Logged Detects	2.737				SD of Logged Detects		1.293
2266												
2267	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2268	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2269	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2270	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2271												
2272	**Normal GOF Test on Detects Only**											
2273					Shapiro Wilk Test Statistic	0.694				**Shapiro Wilk GOF Test**		
2274					5% Shapiro Wilk Critical Value	0.748				Detected Data Not Normal at 5% Significance Level		
2275					Lilliefors Test Statistic	0.408				**Lilliefors GOF Test**		
2276					5% Lilliefors Critical Value	0.375				Detected Data Not Normal at 5% Significance Level		
2277	**Detected Data Not Normal at 5% Significance Level**											
2278												
2279	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2280					KM Mean	20.24				KM Standard Error of Mean		14.12
2281					KM SD	32.34				95% KM (BCA) UCL		N/A
2282					95% KM (t) UCL	46.99				95% KM (Percentile Bootstrap) UCL		N/A
2283					95% KM (z) UCL	43.46				95% KM Bootstrap t UCL		N/A
2284					90% KM Chebyshev UCL	62.59				95% KM Chebyshev UCL		81.77
2285					97.5% KM Chebyshev UCL	108.4				99% KM Chebyshev UCL		160.7
2286												
2287	**Gamma GOF Tests on Detected Observations Only**											
2288					A-D Test Statistic	0.567				**Anderson-Darling GOF Test**		

	A	B	C	D	E	F	G	H	I	J	K	L
2289				5% A-D Critical Value		0.669	Detected data appear Gamma Distributed at 5% Significance Level					
2290				K-S Test Statistic		0.373	**Kolmogorov-Smirnov GOF**					
2291				5% K-S Critical Value		0.404	Detected data appear Gamma Distributed at 5% Significance Level					
2292	**Detected data appear Gamma Distributed at 5% Significance Level**											
2293												
2294	**Gamma Statistics on Detected Data Only**											
2295				k hat (MLE)		0.83	k star (bias corrected MLE)					0.374
2296				Theta hat (MLE)		37.9	Theta star (bias corrected MLE)					84.07
2297				nu hat (MLE)		6.638	nu star (bias corrected)					2.993
2298				Mean (detects)		31.45						
2299												
2300	**Gamma ROS Statistics using Imputed Non-Detects**											
2301	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2302	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2303	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2304	This is especially true when the sample size is small.											
2305	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2306				Minimum		0.01	Mean					15.95
2307				Maximum		99.2	Median					3.517
2308				SD		33.97	CV					2.13
2309				k hat (MLE)		0.235	k star (bias corrected MLE)					0.23
2310				Theta hat (MLE)		67.97	Theta star (bias corrected MLE)					69.34
2311				nu hat (MLE)		3.753	nu star (bias corrected)					3.679
2312				Adjusted Level of Significance (β)		0.0195						
2313				Approximate Chi Square Value (3.68, α)		0.599	Adjusted Chi Square Value (3.68, β)					0.358
2314				95% Gamma Approximate UCL (use when n>=50)		97.91	95% Gamma Adjusted UCL (use when n<50)					N/A
2315												
2316	**Estimates of Gamma Parameters using KM Estimates**											
2317				Mean (KM)		20.24	SD (KM)					32.34
2318				Variance (KM)		1046	SE of Mean (KM)					14.12
2319				k hat (KM)		0.392	k star (KM)					0.328
2320				nu hat (KM)		6.268	nu star (KM)					5.251
2321				theta hat (KM)		51.68	theta star (KM)					61.69
2322				80% gamma percentile (KM)		31.67	90% gamma percentile (KM)					59.01
2323				95% gamma percentile (KM)		89.93	99% gamma percentile (KM)					169.4
2324												
2325	**Gamma Kaplan-Meier (KM) Statistics**											
2326				Approximate Chi Square Value (5.25, α)		1.27	Adjusted Chi Square Value (5.25, β)					0.844
2327				95% Gamma Approximate KM-UCL (use when n>=50)		83.71	95% Gamma Adjusted KM-UCL (use when n<50)					126
2328												
2329	**Lognormal GOF Test on Detected Observations Only**											
2330				Shapiro Wilk Test Statistic		0.869	**Shapiro Wilk GOF Test**					
2331				5% Shapiro Wilk Critical Value		0.748	Detected Data appear Lognormal at 5% Significance Level					
2332				Lilliefors Test Statistic		0.303	**Lilliefors GOF Test**					
2333				5% Lilliefors Critical Value		0.375	Detected Data appear Lognormal at 5% Significance Level					
2334	**Detected Data appear Lognormal at 5% Significance Level**											
2335												
2336	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2337				Mean in Original Scale		18.12	Mean in Log Scale					2.078
2338				SD in Original Scale		32.94	SD in Log Scale					1.184
2339				95% t UCL (assumes normality of ROS data)		40.18	95% Percentile Bootstrap UCL					40.26
2340				95% BCA Bootstrap UCL		52.53	95% Bootstrap t UCL					205.9

2341					95% H-UCL (Log ROS)	91.94						
2342												
2343	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2344					KM Mean (logged)	2.278				KM Geo Mean	9.762	
2345					KM SD (logged)	0.998				95% Critical H Value (KM-Log)	3.422	
2346					KM Standard Error of Mean (logged)	0.436				95% H-UCL (KM -Log)	58.44	
2347					KM SD (logged)	0.998				95% Critical H Value (KM-Log)	3.422	
2348					KM Standard Error of Mean (logged)	0.436						
2349												
2350	**DL/2 Statistics**											
2351	**DL/2 Normal**									**DL/2 Log-Transformed**		
2352					Mean in Original Scale	24.31				Mean in Log Scale	2.397	
2353					SD in Original Scale	35.1				SD in Log Scale	1.262	
2354					95% t UCL (Assumes normality)	47.81				95% H-Stat UCL	172.3	
2355	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2356												
2357	**Nonparametric Distribution Free UCL Statistics**											
2358	**Detected Data appear Gamma Distributed at 5% Significance Level**											
2359												
2360	**Suggested UCL to Use**											
2361					95% KM Bootstrap t UCL	N/A				ı Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	126	
2362												
2363	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2364	Recommendations are based upon data size, data distribution, and skewness.											
2365	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2366	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2367												
2368												
2369	**Aluminum (smw17)**											
2370												
2371	**General Statistics**											
2372					Total Number of Observations	8				Number of Distinct Observations	8	
2373										Number of Missing Observations	0	
2374					Minimum	58.2				Mean	394.2	
2375					Maximum	537				Median	438	
2376					SD	157				Std. Error of Mean	55.51	
2377					Coefficient of Variation	0.398				Skewness	-1.611	
2378												
2379	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2380	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2381	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2382	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2383												
2384	**Normal GOF Test**											
2385					Shapiro Wilk Test Statistic	0.847				**Shapiro Wilk GOF Test**		
2386					5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level		
2387					Lilliefors Test Statistic	0.207				**Lilliefors GOF Test**		
2388					5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
2389	**Data appear Normal at 5% Significance Level**											
2390												
2391	**Assuming Normal Distribution**											
2392	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		

2393				95% Student's-t UCL	499.3			95% Adjusted-CLT UCL (Chen-1995)				451.7
2394								95% Modified-t UCL (Johnson-1978)				494.1
2395												
2396	**Gamma GOF Test**											
2397				A-D Test Statistic	1.035	**Anderson-Darling Gamma GOF Test**						
2398				5% A-D Critical Value	0.72	Data Not Gamma Distributed at 5% Significance Level						
2399				K-S Test Statistic	0.29	**Kolmogorov-Smirnov Gamma GOF Test**						
2400				5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level						
2401	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
2402												
2403	**Gamma Statistics**											
2404				k hat (MLE)	3.405			k star (bias corrected MLE)				2.211
2405				Theta hat (MLE)	115.8			Theta star (bias corrected MLE)				178.2
2406				nu hat (MLE)	54.47			nu star (bias corrected)				35.38
2407				MLE Mean (bias corrected)	394.2			MLE Sd (bias corrected)				265.1
2408								Approximate Chi Square Value (0.05)				22.77
2409				Adjusted Level of Significance	0.0195			Adjusted Chi Square Value				20.25
2410												
2411	**Assuming Gamma Distribution**											
2412			95% Approximate Gamma UCL (use when n>=50))		612.4			95% Adjusted Gamma UCL (use when n<50)				688.7
2413												
2414	**Lognormal GOF Test**											
2415				Shapiro Wilk Test Statistic	0.651	**Shapiro Wilk Lognormal GOF Test**						
2416				5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level						
2417				Lilliefors Test Statistic	0.309	**Lilliefors Lognormal GOF Test**						
2418				5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level						
2419	**Data Not Lognormal at 5% Significance Level**											
2420												
2421	**Lognormal Statistics**											
2422				Minimum of Logged Data	4.064			Mean of logged Data				5.823
2423				Maximum of Logged Data	6.286			SD of logged Data				0.736
2424												
2425	**Assuming Lognormal Distribution**											
2426				95% H-UCL	969.3			90% Chebyshev (MVUE) UCL				764.1
2427				95% Chebyshev (MVUE) UCL	917.4			97.5% Chebyshev (MVUE) UCL				1130
2428				99% Chebyshev (MVUE) UCL	1548							
2429												
2430	**Nonparametric Distribution Free UCL Statistics**											
2431	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2432												
2433	**Nonparametric Distribution Free UCLs**											
2434				95% CLT UCL	485.5			95% Jackknife UCL				499.3
2435				95% Standard Bootstrap UCL	483.5			95% Bootstrap-t UCL				471
2436				95% Hall's Bootstrap UCL	458.4			95% Percentile Bootstrap UCL				471.6
2437				95% BCA Bootstrap UCL	465							
2438				90% Chebyshev(Mean, Sd) UCL	560.7			95% Chebyshev(Mean, Sd) UCL				636.1
2439				97.5% Chebyshev(Mean, Sd) UCL	740.8			99% Chebyshev(Mean, Sd) UCL				946.5
2440												
2441	**Suggested UCL to Use**											
2442				95% Student's-t UCL	499.3							
2443												
2444	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
2445	Recommendations are based upon data size, data distribution, and skewness.											
2446	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2447	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2448												
2449	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
2450	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
2451												
2452	**Aluminum (smw17d)**											
2453												
2454	**General Statistics**											
2455					Total Number of Observations	8				Number of Distinct Observations	7	
2456					Number of Detects	5				Number of Non-Detects	3	
2457					Number of Distinct Detects	5				Number of Distinct Non-Detects	2	
2458					Minimum Detect	7.1				Minimum Non-Detect	8.1	
2459					Maximum Detect	23.2				Maximum Non-Detect	113	
2460					Variance Detects	41.11				Percent Non-Detects	37.5%	
2461					Mean Detects	15.5				SD Detects	6.412	
2462					Median Detects	15				CV Detects	0.414	
2463					Skewness Detects	-0.119				Kurtosis Detects	-1.246	
2464					Mean of Logged Detects	2.661				SD of Logged Detects	0.468	
2465												
2466	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2467	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2468	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2469	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2470												
2471	**Normal GOF Test on Detects Only**											
2472					Shapiro Wilk Test Statistic	0.978				**Shapiro Wilk GOF Test**		
2473					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Normal at 5% Significance Level		
2474					Lilliefors Test Statistic	0.168				**Lilliefors GOF Test**		
2475					5% Lilliefors Critical Value	0.343				Detected Data appear Normal at 5% Significance Level		
2476	**Detected Data appear Normal at 5% Significance Level**											
2477												
2478	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2479					KM Mean	13.1				KM Standard Error of Mean	2.601	
2480					KM SD	6.156				95% KM (BCA) UCL	17.38	
2481					95% KM (t) UCL	18.03				95% KM (Percentile Bootstrap) UCL	17.23	
2482					95% KM (z) UCL	17.38				95% KM Bootstrap t UCL	17.8	
2483					90% KM Chebyshev UCL	20.9				95% KM Chebyshev UCL	24.44	
2484					97.5% KM Chebyshev UCL	29.34				99% KM Chebyshev UCL	38.98	
2485												
2486	**Gamma GOF Tests on Detected Observations Only**											
2487					A-D Test Statistic	0.22				**Anderson-Darling GOF Test**		
2488					5% A-D Critical Value	0.68				Detected data appear Gamma Distributed at 5% Significance Level		
2489					K-S Test Statistic	0.197				**Kolmogorov-Smirnov GOF**		
2490					5% K-S Critical Value	0.358				Detected data appear Gamma Distributed at 5% Significance Level		
2491	**Detected data appear Gamma Distributed at 5% Significance Level**											
2492												
2493	**Gamma Statistics on Detected Data Only**											
2494					k hat (MLE)	6.392				k star (bias corrected MLE)	2.69	
2495					Theta hat (MLE)	2.425				Theta star (bias corrected MLE)	5.762	
2496					nu hat (MLE)	63.92				nu star (bias corrected)	26.9	

2497					Mean (detects)	15.5						
2498												
2499					**Gamma ROS Statistics using Imputed Non-Detects**							
2500					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2501					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2502					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2503					This is especially true when the sample size is small.							
2504					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2505					Minimum	4.859				Mean	12.82	
2506					Maximum	23.2				Median	12.11	
2507					SD	6.404				CV	0.499	
2508					k hat (MLE)	4.405				k star (bias corrected MLE)	2.837	
2509					Theta hat (MLE)	2.911				Theta star (bias corrected MLE)	4.521	
2510					nu hat (MLE)	70.49				nu star (bias corrected)	45.39	
2511					Adjusted Level of Significance (β)	0.0195						
2512					Approximate Chi Square Value (45.39, α)	30.93				Adjusted Chi Square Value (45.39, β)	27.95	
2513					95% Gamma Approximate UCL (use when n>=50)	18.82				95% Gamma Adjusted UCL (use when n<50)	20.83	
2514												
2515					**Estimates of Gamma Parameters using KM Estimates**							
2516					Mean (KM)	13.1				SD (KM)	6.156	
2517					Variance (KM)	37.89				SE of Mean (KM)	2.601	
2518					k hat (KM)	4.529				k star (KM)	2.914	
2519					nu hat (KM)	72.46				nu star (KM)	46.62	
2520					theta hat (KM)	2.892				theta star (KM)	4.496	
2521					80% gamma percentile (KM)	18.75				90% gamma percentile (KM)	23.39	
2522					95% gamma percentile (KM)	27.72				99% gamma percentile (KM)	37.13	
2523												
2524					**Gamma Kaplan-Meier (KM) Statistics**							
2525					Approximate Chi Square Value (46.62, α)	31.96				Adjusted Chi Square Value (46.62, β)	28.92	
2526					95% Gamma Approximate KM-UCL (use when n>=50)	19.11				95% Gamma Adjusted KM-UCL (use when n<50)	21.12	
2527												
2528					**Lognormal GOF Test on Detected Observations Only**							
2529					Shapiro Wilk Test Statistic	0.95				**Shapiro Wilk GOF Test**		
2530					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
2531					Lilliefors Test Statistic	0.169				**Lilliefors GOF Test**		
2532					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
2533					**Detected Data appear Lognormal at 5% Significance Level**							
2534												
2535					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2536					Mean in Original Scale	12.92				Mean in Log Scale	2.456	
2537					SD in Original Scale	6.206				SD in Log Scale	0.486	
2538					95% t UCL (assumes normality of ROS data)	17.07				95% Percentile Bootstrap UCL	16.47	
2539					95% BCA Bootstrap UCL	16.98				95% Bootstrap t UCL	18.79	
2540					95% H-UCL (Log ROS)	20.13						
2541												
2542					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2543					KM Mean (logged)	2.46				KM Geo Mean	11.71	
2544					KM SD (logged)	0.475				95% Critical H Value (KM-Log)	2.312	
2545					KM Standard Error of Mean (logged)	0.201				95% H-UCL (KM -Log)	19.84	
2546					KM SD (logged)	0.475				95% Critical H Value (KM-Log)	2.312	
2547					KM Standard Error of Mean (logged)	0.201						
2548												

	A	B	C	D	E	F	G	H	I	J	K	L
2549	**DL/2 Statistics**											
2550	**DL/2 Normal**						**DL/2 Log-Transformed**					
2551	Mean in Original Scale					17.76	Mean in Log Scale					2.517
2552	SD in Original Scale					17.18	SD in Log Scale					0.909
2553	95% t UCL (Assumes normality)					29.27	95% H-Stat UCL					56.32
2554	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2555												
2556	**Nonparametric Distribution Free UCL Statistics**											
2557	**Detected Data appear Normal Distributed at 5% Significance Level**											
2558												
2559	**Suggested UCL to Use**											
2560	95% KM (t) UCL					18.03						
2561												
2562	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2563	Recommendations are based upon data size, data distribution, and skewness.											
2564	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2565	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2566												
2567												
2568	**Aluminum (smw18)**											
2569												
2570	**General Statistics**											
2571	Total Number of Observations					8	Number of Distinct Observations					8
2572							Number of Missing Observations					0
2573	Minimum					124	Mean					231.1
2574	Maximum					388	Median					200
2575	SD					102.6	Std. Error of Mean					36.28
2576	Coefficient of Variation					0.444	Skewness					0.829
2577												
2578	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2579	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2580	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2581	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2582												
2583	**Normal GOF Test**											
2584	Shapiro Wilk Test Statistic					0.863	**Shapiro Wilk GOF Test**					
2585	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					
2586	Lilliefors Test Statistic					0.189	**Lilliefors GOF Test**					
2587	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
2588	**Data appear Normal at 5% Significance Level**											
2589												
2590	**Assuming Normal Distribution**											
2591	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2592	95% Student's-t UCL					299.9	95% Adjusted-CLT UCL (Chen-1995)					302.2
2593							95% Modified-t UCL (Johnson-1978)					301.6
2594												
2595	**Gamma GOF Test**											
2596	A-D Test Statistic					0.379	**Anderson-Darling Gamma GOF Test**					
2597	5% A-D Critical Value					0.718	Detected data appear Gamma Distributed at 5% Significance Level					
2598	K-S Test Statistic					0.181	**Kolmogorov-Smirnov Gamma GOF Test**					
2599	5% K-S Critical Value					0.295	Detected data appear Gamma Distributed at 5% Significance Level					
2600	**Detected data appear Gamma Distributed at 5% Significance Level**											

2601												
2602	**Gamma Statistics**											
2603					k hat (MLE)	6.234			k star (bias corrected MLE)	3.98		
2604					Theta hat (MLE)	37.08			Theta star (bias corrected MLE)	58.08		
2605					nu hat (MLE)	99.74			nu star (bias corrected)	63.67		
2606					MLE Mean (bias corrected)	231.1			MLE Sd (bias corrected)	115.9		
2607									Approximate Chi Square Value (0.05)	46.32		
2608					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	42.6		
2609												
2610	**Assuming Gamma Distribution**											
2611					95% Approximate Gamma UCL (use when n>=50))	317.7			95% Adjusted Gamma UCL (use when n<50)	345.5		
2612												
2613	**Lognormal GOF Test**											
2614					Shapiro Wilk Test Statistic	0.921			**Shapiro Wilk Lognormal GOF Test**			
2615					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
2616					Lilliefors Test Statistic	0.161			**Lilliefors Lognormal GOF Test**			
2617					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
2618	**Data appear Lognormal at 5% Significance Level**											
2619												
2620	**Lognormal Statistics**											
2621					Minimum of Logged Data	4.82			Mean of logged Data	5.361		
2622					Maximum of Logged Data	5.961			SD of logged Data	0.43		
2623												
2624	**Assuming Lognormal Distribution**											
2625					95% H-UCL	335.9			90% Chebyshev (MVUE) UCL	336.5		
2626					95% Chebyshev (MVUE) UCL	384.5			97.5% Chebyshev (MVUE) UCL	451.1		
2627					99% Chebyshev (MVUE) UCL	581.9						
2628												
2629	**Nonparametric Distribution Free UCL Statistics**											
2630	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2631												
2632	**Nonparametric Distribution Free UCLs**											
2633					95% CLT UCL	290.8			95% Jackknife UCL	299.9		
2634					95% Standard Bootstrap UCL	286.8			95% Bootstrap-t UCL	346		
2635					95% Hall's Bootstrap UCL	376.4			95% Percentile Bootstrap UCL	290.5		
2636					95% BCA Bootstrap UCL	297.5						
2637					90% Chebyshev(Mean, Sd) UCL	340			95% Chebyshev(Mean, Sd) UCL	389.3		
2638					97.5% Chebyshev(Mean, Sd) UCL	457.7			99% Chebyshev(Mean, Sd) UCL	592.1		
2639												
2640	**Suggested UCL to Use**											
2641					95% Student's-t UCL	299.9						
2642												
2643	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2644	Recommendations are based upon data size, data distribution, and skewness.											
2645	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2646	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2647												
2648	**Aluminum (smw18d)**											
2649												
2650	**General Statistics**											
2651					Total Number of Observations	8			Number of Distinct Observations	8		
2652					Number of Detects	6			Number of Non-Detects	2		

2653				Number of Distinct Detects	6					Number of Distinct Non-Detects	2	
2654				Minimum Detect	20.1					Minimum Non-Detect	25.5	
2655				Maximum Detect	110					Maximum Non-Detect	113	
2656				Variance Detects	1046					Percent Non-Detects	25%	
2657				Mean Detects	60.77					SD Detects	32.35	
2658				Median Detects	55.35					CV Detects	0.532	
2659				Skewness Detects	0.469					Kurtosis Detects	-0.423	
2660				Mean of Logged Detects	3.971					SD of Logged Detects	0.601	
2661												
2662	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2663	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2664	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2665	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2666												
2667	**Normal GOF Test on Detects Only**											
2668				Shapiro Wilk Test Statistic	0.978					**Shapiro Wilk GOF Test**		
2669				5% Shapiro Wilk Critical Value	0.788					Detected Data appear Normal at 5% Significance Level		
2670				Lilliefors Test Statistic	0.163					**Lilliefors GOF Test**		
2671				5% Lilliefors Critical Value	0.325					Detected Data appear Normal at 5% Significance Level		
2672	**Detected Data appear Normal at 5% Significance Level**											
2673												
2674	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2675				KM Mean	54.96					KM Standard Error of Mean	12.76	
2676				KM SD	30.82					95% KM (BCA) UCL	75.45	
2677				95% KM (t) UCL	79.13					95% KM (Percentile Bootstrap) UCL	75.67	
2678				95% KM (z) UCL	75.95					95% KM Bootstrap t UCL	87.24	
2679				90% KM Chebyshev UCL	93.24					95% KM Chebyshev UCL	110.6	
2680				97.5% KM Chebyshev UCL	134.6					99% KM Chebyshev UCL	181.9	
2681												
2682	**Gamma GOF Tests on Detected Observations Only**											
2683				A-D Test Statistic	0.158					**Anderson-Darling GOF Test**		
2684				5% A-D Critical Value	0.7					Detected data appear Gamma Distributed at 5% Significance Level		
2685				K-S Test Statistic	0.13					**Kolmogorov-Smirnov GOF**		
2686				5% K-S Critical Value	0.334					Detected data appear Gamma Distributed at 5% Significance Level		
2687	**Detected data appear Gamma Distributed at 5% Significance Level**											
2688												
2689	**Gamma Statistics on Detected Data Only**											
2690				k hat (MLE)	3.825					k star (bias corrected MLE)	2.024	
2691				Theta hat (MLE)	15.89					Theta star (bias corrected MLE)	30.03	
2692				nu hat (MLE)	45.9					nu star (bias corrected)	24.28	
2693				Mean (detects)	60.77							
2694												
2695	**Gamma ROS Statistics using Imputed Non-Detects**											
2696	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2697	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2698	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2699	This is especially true when the sample size is small.											
2700	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2701				Minimum	15.5					Mean	53.79	
2702				Maximum	110					Median	48.72	
2703				SD	31.63					CV	0.588	
2704				k hat (MLE)	3.014					k star (bias corrected MLE)	1.967	

2705					Theta hat (MLE)	17.84				Theta star (bias corrected MLE)		27.34
2706					nu hat (MLE)	48.23				nu star (bias corrected)		31.48
2707					Adjusted Level of Significance (β)	0.0195						
2708					Approximate Chi Square Value (31.48, α)	19.66				Adjusted Chi Square Value (31.48, β)		17.34
2709					95% Gamma Approximate UCL (use when n>=50)	86.13				95% Gamma Adjusted UCL (use when n<50)		97.67
2710												
2711					**Estimates of Gamma Parameters using KM Estimates**							
2712					Mean (KM)	54.96				SD (KM)		30.82
2713					Variance (KM)	949.8				SE of Mean (KM)		12.76
2714					k hat (KM)	3.18				k star (KM)		2.071
2715					nu hat (KM)	50.88				nu star (KM)		33.13
2716					theta hat (KM)	17.28				theta star (KM)		26.54
2717					80% gamma percentile (KM)	81.94				90% gamma percentile (KM)		106
2718					95% gamma percentile (KM)	128.9				99% gamma percentile (KM)		179.7
2719												
2720					**Gamma Kaplan-Meier (KM) Statistics**							
2721					Approximate Chi Square Value (33.13, α)	20.97				Adjusted Chi Square Value (33.13, β)		18.56
2722					95% Gamma Approximate KM-UCL (use when n>=50)	86.82				95% Gamma Adjusted KM-UCL (use when n<50)		98.08
2723												
2724					**Lognormal GOF Test on Detected Observations Only**							
2725					Shapiro Wilk Test Statistic	0.973				**Shapiro Wilk GOF Test**		
2726					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
2727					Lilliefors Test Statistic	0.153				**Lilliefors GOF Test**		
2728					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
2729					**Detected Data appear Lognormal at 5% Significance Level**							
2730												
2731					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2732					Mean in Original Scale	53.97				Mean in Log Scale		3.836
2733					SD in Original Scale	30.89				SD in Log Scale		0.607
2734					95% t UCL (assumes normality of ROS data)	74.66				95% Percentile Bootstrap UCL		71.44
2735					95% BCA Bootstrap UCL	73.22				95% Bootstrap t UCL		82.75
2736					95% H-UCL (Log ROS)	99.93						
2737												
2738					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2739					KM Mean (logged)	3.832				KM Geo Mean		46.16
2740					KM SD (logged)	0.611				95% Critical H Value (KM-Log)		2.555
2741					KM Standard Error of Mean (logged)	0.253				95% H-UCL (KM -Log)		100.4
2742					KM SD (logged)	0.611				95% Critical H Value (KM-Log)		2.555
2743					KM Standard Error of Mean (logged)	0.253						
2744												
2745					**DL/2 Statistics**							
2746					**DL/2 Normal**					**DL/2 Log-Transformed**		
2747					Mean in Original Scale	54.23				Mean in Log Scale		3.8
2748					SD in Original Scale	32.1				SD in Log Scale		0.718
2749					95% t UCL (Assumes normality)	75.73				95% H-Stat UCL		122.9
2750					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2751												
2752					**Nonparametric Distribution Free UCL Statistics**							
2753					**Detected Data appear Normal Distributed at 5% Significance Level**							
2754												
2755					**Suggested UCL to Use**							
2756					95% KM (t) UCL	79.13						

	A	B	C	D	E	F	G	H	I	J	K	L
2757												
2758	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2759	Recommendations are based upon data size, data distribution, and skewness.											
2760	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2761	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2762												
2763	**Aluminum (smw19)**											
2764												
2765	**General Statistics**											
2766	Total Number of Observations					8	Number of Distinct Observations					8
2767	Number of Detects					6	Number of Non-Detects					2
2768	Number of Distinct Detects					6	Number of Distinct Non-Detects					2
2769	Minimum Detect					22.1	Minimum Non-Detect					35.5
2770	Maximum Detect					78	Maximum Non-Detect					113
2771	Variance Detects					495.6	Percent Non-Detects					25%
2772	Mean Detects					53.43	SD Detects					22.26
2773	Median Detects					58.55	CV Detects					0.417
2774	Skewness Detects					-0.539	Kurtosis Detects					-1.446
2775	Mean of Logged Detects					3.886	SD of Logged Detects					0.502
2776												
2777	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2778	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2779	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2780	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2781												
2782	**Normal GOF Test on Detects Only**											
2783	Shapiro Wilk Test Statistic					0.92	**Shapiro Wilk GOF Test**					
2784	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
2785	Lilliefors Test Statistic					0.218	**Lilliefors GOF Test**					
2786	5% Lilliefors Critical Value					0.325	Detected Data appear Normal at 5% Significance Level					
2787	**Detected Data appear Normal at 5% Significance Level**											
2788												
2789	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2790	KM Mean					49.62	KM Standard Error of Mean					8.772
2791	KM SD					21.08	95% KM (BCA) UCL					63.86
2792	95% KM (t) UCL					66.24	95% KM (Percentile Bootstrap) UCL					63.5
2793	95% KM (z) UCL					64.05	95% KM Bootstrap t UCL					64.5
2794	90% KM Chebyshev UCL					75.94	95% KM Chebyshev UCL					87.86
2795	97.5% KM Chebyshev UCL					104.4	99% KM Chebyshev UCL					136.9
2796												
2797	**Gamma GOF Tests on Detected Observations Only**											
2798	A-D Test Statistic					0.422	**Anderson-Darling GOF Test**					
2799	5% A-D Critical Value					0.698	Detected data appear Gamma Distributed at 5% Significance Level					
2800	K-S Test Statistic					0.271	**Kolmogorov-Smirnov GOF**					
2801	5% K-S Critical Value					0.333	Detected data appear Gamma Distributed at 5% Significance Level					
2802	**Detected data appear Gamma Distributed at 5% Significance Level**											
2803												
2804	**Gamma Statistics on Detected Data Only**											
2805	k hat (MLE)					5.552	k star (bias corrected MLE)					2.887
2806	Theta hat (MLE)					9.625	Theta star (bias corrected MLE)					18.51
2807	nu hat (MLE)					66.62	nu star (bias corrected)					34.64
2808	Mean (detects)					53.43						

	A	B	C	D	E	F	G	H	I	J	K	L
2809												
2810	**Gamma ROS Statistics using Imputed Non-Detects**											
2811	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2812	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2813	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2814	This is especially true when the sample size is small.											
2815	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2816					Minimum	22.1				Mean	49.77	
2817					Maximum	78				Median	51.99	
2818					SD	20.56				CV	0.413	
2819					k hat (MLE)	6.01				k star (bias corrected MLE)	3.839	
2820					Theta hat (MLE)	8.281				Theta star (bias corrected MLE)	12.96	
2821					nu hat (MLE)	96.16				nu star (bias corrected)	61.43	
2822					Adjusted Level of Significance (β)	0.0195						
2823					Approximate Chi Square Value (61.43, α)	44.4				Adjusted Chi Square Value (61.43, β)	40.77	
2824					95% Gamma Approximate UCL (use when n>=50)	68.85				95% Gamma Adjusted UCL (use when n<50)	74.99	
2825												
2826	**Estimates of Gamma Parameters using KM Estimates**											
2827					Mean (KM)	49.62				SD (KM)	21.08	
2828					Variance (KM)	444.3				SE of Mean (KM)	8.772	
2829					k hat (KM)	5.542				k star (KM)	3.547	
2830					nu hat (KM)	88.68				nu star (KM)	56.76	
2831					theta hat (KM)	8.953				theta star (KM)	13.99	
2832					80% gamma percentile (KM)	69.38				90% gamma percentile (KM)	84.95	
2833					95% gamma percentile (KM)	99.35				99% gamma percentile (KM)	130.3	
2834												
2835	**Gamma Kaplan-Meier (KM) Statistics**											
2836					Approximate Chi Square Value (56.76, α)	40.44				Adjusted Chi Square Value (56.76, β)	36.98	
2837					95% Gamma Approximate KM-UCL (use when n>=50)	69.64				95% Gamma Adjusted KM-UCL (use when n<50)	76.15	
2838												
2839	**Lognormal GOF Test on Detected Observations Only**											
2840					Shapiro Wilk Test Statistic	0.875				**Shapiro Wilk GOF Test**		
2841					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
2842					Lilliefors Test Statistic	0.28				**Lilliefors GOF Test**		
2843					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
2844	**Detected Data appear Lognormal at 5% Significance Level**											
2845												
2846	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2847					Mean in Original Scale	49.23				Mean in Log Scale	3.808	
2848					SD in Original Scale	20.84				SD in Log Scale	0.465	
2849					95% t UCL (assumes normality of ROS data)	63.19				95% Percentile Bootstrap UCL	60.26	
2850					95% BCA Bootstrap UCL	60.33				95% Bootstrap t UCL	62.4	
2851					95% H-UCL (Log ROS)	75.15						
2852												
2853	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2854					KM Mean (logged)	3.798				KM Geo Mean	44.61	
2855					KM SD (logged)	0.481				95% Critical H Value (KM-Log)	2.321	
2856					KM Standard Error of Mean (logged)	0.202				95% H-UCL (KM -Log)	76.32	
2857					KM SD (logged)	0.481				95% Critical H Value (KM-Log)	2.321	
2858					KM Standard Error of Mean (logged)	0.202						
2859												
2860	**DL/2 Statistics**											

2861	**DL/2 Normal**						**DL/2 Log-Transformed**					
2862					Mean in Original Scale	49.36				Mean in Log Scale		3.778
2863					SD in Original Scale	22.76				SD in Log Scale		0.562
2864					95% t UCL (Assumes normality)	64.6				95% H-Stat UCL		86.4
2865	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2866												
2867	**Nonparametric Distribution Free UCL Statistics**											
2868	**Detected Data appear Normal Distributed at 5% Significance Level**											
2869												
2870	**Suggested UCL to Use**											
2871					95% KM (t) UCL	66.24						
2872												
2873	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2874	Recommendations are based upon data size, data distribution, and skewness.											
2875	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2876	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2877												
2878	**Aluminum (smw7)**											
2879												
2880	**General Statistics**											
2881					Total Number of Observations	8				Number of Distinct Observations		6
2882					Number of Detects	2				Number of Non-Detects		6
2883					Number of Distinct Detects	2				Number of Distinct Non-Detects		4
2884					Minimum Detect	3.2				Minimum Non-Detect		5.6
2885					Maximum Detect	5.1				Maximum Non-Detect		113
2886					Variance Detects	1.805				Percent Non-Detects		75%
2887					Mean Detects	4.15				SD Detects		1.344
2888					Median Detects	4.15				CV Detects		0.324
2889					Skewness Detects	N/A				Kurtosis Detects		N/A
2890					Mean of Logged Detects	1.396				SD of Logged Detects		0.33
2891												
2892	**Warning: Data set has only 2 Detected Values.**											
2893	**This is not enough to compute meaningful or reliable statistics and estimates.**											
2894												
2895												
2896	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2897	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2898	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2899	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2900												
2901	**Normal GOF Test on Detects Only**											
2902	**Not Enough Data to Perform GOF Test**											
2903												
2904	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2905					KM Mean	4.15				KM Standard Error of Mean		0.95
2906					KM SD	0.95				95% KM (BCA) UCL		N/A
2907					95% KM (t) UCL	5.95				95% KM (Percentile Bootstrap) UCL		N/A
2908					95% KM (z) UCL	5.713				95% KM Bootstrap t UCL		N/A
2909					90% KM Chebyshev UCL	7				95% KM Chebyshev UCL		8.291
2910					97.5% KM Chebyshev UCL	10.08				99% KM Chebyshev UCL		13.6
2911												
2912	**Gamma GOF Tests on Detected Observations Only**											

	A	B	C	D	E	F	G	H	I	J	K	L
2913	**Not Enough Data to Perform GOF Test**											
2914												
2915	**Gamma Statistics on Detected Data Only**											
2916					k hat (MLE)	18.74			k star (bias corrected MLE)			N/A
2917					Theta hat (MLE)	0.221			Theta star (bias corrected MLE)			N/A
2918					nu hat (MLE)	74.98			nu star (bias corrected)			N/A
2919					Mean (detects)	4.15						
2920												
2921	**Estimates of Gamma Parameters using KM Estimates**											
2922					Mean (KM)	4.15			SD (KM)			0.95
2923					Variance (KM)	0.903			SE of Mean (KM)			0.95
2924					k hat (KM)	19.08			k star (KM)			12.01
2925					nu hat (KM)	305.3			nu star (KM)			192.2
2926					theta hat (KM)	0.217			theta star (KM)			0.346
2927					80% gamma percentile (KM)	5.11			90% gamma percentile (KM)			5.739
2928					95% gamma percentile (KM)	6.296			99% gamma percentile (KM)			7.43
2929												
2930	**Gamma Kaplan-Meier (KM) Statistics**											
2931									Adjusted Level of Significance (β)			0.0195
2932					Approximate Chi Square Value (192.16, α)	161.1			Adjusted Chi Square Value (192.16, β)			153.9
2933					95% Gamma Approximate KM-UCL (use when n>=50)	4.95			95% Gamma Adjusted KM-UCL (use when n<50)			5.182
2934												
2935	**Lognormal GOF Test on Detected Observations Only**											
2936	**Not Enough Data to Perform GOF Test**											
2937												
2938	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2939					Mean in Original Scale	4.135			Mean in Log Scale			1.396
2940					SD in Original Scale	0.96			SD in Log Scale			0.231
2941					95% t UCL (assumes normality of ROS data)	4.778			95% Percentile Bootstrap UCL			4.685
2942					95% BCA Bootstrap UCL	4.728			95% Bootstrap t UCL			4.972
2943					95% H-UCL (Log ROS)	4.933						
2944												
2945	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2946					KM Mean (logged)	1.396			KM Geo Mean			4.04
2947					KM SD (logged)	0.233			95% Critical H Value (KM-Log)			1.979
2948					KM Standard Error of Mean (logged)	0.233			95% H-UCL (KM -Log)			4.941
2949					KM SD (logged)	0.233			95% Critical H Value (KM-Log)			1.979
2950					KM Standard Error of Mean (logged)	0.233						
2951												
2952	**DL/2 Statistics**											
2953	**DL/2 Normal**								**DL/2 Log-Transformed**			
2954					Mean in Original Scale	10.41			Mean in Log Scale			1.665
2955					SD in Original Scale	18.63			SD in Log Scale			0.974
2956					95% t UCL (Assumes normality)	22.89			95% H-Stat UCL			29.29
2957	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2958												
2959	**Nonparametric Distribution Free UCL Statistics**											
2960	**Data do not follow a Discernible Distribution at 5% Significance Level**											
2961												
2962	**Suggested UCL to Use**											
2963					95% KM (t) UCL	5.95			KM H-UCL			4.941
2964					95% KM (BCA) UCL	N/A						

	A	B	C	D	E	F	G	H	I	J	K	L
2965	**Warning: One or more Recommended UCL(s) not available!**											
2966	**Warning: Recommended UCL exceeds the maximum observation**											
2967												
2968	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2969	Recommendations are based upon data size, data distribution, and skewness.											
2970	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2971	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2972												
2973	**Aluminum (smw8)**											
2974												
2975	**General Statistics**											
2976						Total Number of Observations	8			Number of Distinct Observations	6	
2977						Number of Detects	4			Number of Non-Detects	4	
2978						Number of Distinct Detects	4			Number of Distinct Non-Detects	2	
2979						Minimum Detect	3.8			Minimum Non-Detect	8.1	
2980						Maximum Detect	273			Maximum Non-Detect	20	
2981						Variance Detects	16427			Percent Non-Detects	50%	
2982						Mean Detects	81.88			SD Detects	128.2	
2983						Median Detects	25.35			CV Detects	1.565	
2984						Skewness Detects	1.931			Kurtosis Detects	3.757	
2985						Mean of Logged Detects	3.294			SD of Logged Detects	1.802	
2986												
2987	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2988	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2989	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2990	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2991												
2992	**Normal GOF Test on Detects Only**											
2993						Shapiro Wilk Test Statistic	0.724			**Shapiro Wilk GOF Test**		
2994						5% Shapiro Wilk Critical Value	0.748			Detected Data Not Normal at 5% Significance Level		
2995						Lilliefors Test Statistic	0.387			**Lilliefors GOF Test**		
2996						5% Lilliefors Critical Value	0.375			Detected Data Not Normal at 5% Significance Level		
2997	**Detected Data Not Normal at 5% Significance Level**											
2998												
2999	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3000						KM Mean	43.09			KM Standard Error of Mean	35.75	
3001						KM SD	87.56			95% KM (BCA) UCL	N/A	
3002						95% KM (t) UCL	110.8			95% KM (Percentile Bootstrap) UCL	N/A	
3003						95% KM (z) UCL	101.9			95% KM Bootstrap t UCL	N/A	
3004						90% KM Chebyshev UCL	150.3			95% KM Chebyshev UCL	198.9	
3005						97.5% KM Chebyshev UCL	266.4			99% KM Chebyshev UCL	398.8	
3006												
3007	**Gamma GOF Tests on Detected Observations Only**											
3008						A-D Test Statistic	0.332			**Anderson-Darling GOF Test**		
3009						5% A-D Critical Value	0.678			Detected data appear Gamma Distributed at 5% Significance Level		
3010						K-S Test Statistic	0.274			**Kolmogorov-Smirnov GOF**		
3011						5% K-S Critical Value	0.409			Detected data appear Gamma Distributed at 5% Significance Level		
3012	**Detected data appear Gamma Distributed at 5% Significance Level**											
3013												
3014	**Gamma Statistics on Detected Data Only**											
3015						k hat (MLE)	0.562			k star (bias corrected MLE)	0.307	
3016						Theta hat (MLE)	145.8			Theta star (bias corrected MLE)	266.6	

	A	B	C	D	E	F	G	H	I	J	K	L
3017					nu hat (MLE)	4.494				nu star (bias corrected)		2.457
3018					Mean (detects)	81.88						
3019												
3020	**Gamma ROS Statistics using Imputed Non-Detects**											
3021	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3022	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3023	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3024	This is especially true when the sample size is small.											
3025	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3026					Minimum	0.01				Mean		40.94
3027					Maximum	273				Median		1.905
3028					SD	94.63				CV		2.311
3029					k hat (MLE)	0.172				k star (bias corrected MLE)		0.191
3030					Theta hat (MLE)	237.5				Theta star (bias corrected MLE)		214.3
3031					nu hat (MLE)	2.758				nu star (bias corrected)		3.057
3032					Adjusted Level of Significance (β)	0.0195						
3033					Approximate Chi Square Value (3.06, α)	0.39				Adjusted Chi Square Value (3.06, β)		0.224
3034					95% Gamma Approximate UCL (use when n>=50)	321.3				95% Gamma Adjusted UCL (use when n<50)		N/A
3035												
3036	**Estimates of Gamma Parameters using KM Estimates**											
3037					Mean (KM)	43.09				SD (KM)		87.56
3038					Variance (KM)	7667				SE of Mean (KM)		35.75
3039					k hat (KM)	0.242				k star (KM)		0.235
3040					nu hat (KM)	3.874				nu star (KM)		3.755
3041					theta hat (KM)	177.9				theta star (KM)		183.6
3042					80% gamma percentile (KM)	61.11				90% gamma percentile (KM)		129.8
3043					95% gamma percentile (KM)	212.5				99% gamma percentile (KM)		434.4
3044												
3045	**Gamma Kaplan-Meier (KM) Statistics**											
3046					Approximate Chi Square Value (3.75, α)	0.627				Adjusted Chi Square Value (3.75, β)		0.377
3047					95% Gamma Approximate KM-UCL (use when n>=50)	257.9				95% Gamma Adjusted KM-UCL (use when n<50)		428.9
3048												
3049	**Lognormal GOF Test on Detected Observations Only**											
3050					Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk GOF Test**					
3051					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level					
3052					Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**					
3053					5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level					
3054	**Detected Data appear Lognormal at 5% Significance Level**											
3055												
3056	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3057					Mean in Original Scale	42.72				Mean in Log Scale		2.179
3058					SD in Original Scale	93.78				SD in Log Scale		1.761
3059					95% t UCL (assumes normality of ROS data)	105.5				95% Percentile Bootstrap UCL		108
3060					95% BCA Bootstrap UCL	140.2				95% Bootstrap t UCL		910
3061					95% H-UCL (Log ROS)	1580						
3062												
3063	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3064					KM Mean (logged)	2.347				KM Geo Mean		10.45
3065					KM SD (logged)	1.468				95% Critical H Value (KM-Log)		4.653
3066					KM Standard Error of Mean (logged)	0.605				95% H-UCL (KM -Log)		406.2
3067					KM SD (logged)	1.468				95% Critical H Value (KM-Log)		4.653
3068					KM Standard Error of Mean (logged)	0.605						

	A	B	C	D	E	F	G	H	I	J	K	L
3069												
3070	**DL/2 Statistics**											
3071	**DL/2 Normal**						**DL/2 Log-Transformed**					
3072					Mean in Original Scale	43.71				Mean in Log Scale	2.46	
3073					SD in Original Scale	93.32				SD in Log Scale	1.509	
3074					95% t UCL (Assumes normality)	106.2				95% H-Stat UCL	552.7	
3075	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3076												
3077	**Nonparametric Distribution Free UCL Statistics**											
3078	**Detected Data appear Gamma Distributed at 5% Significance Level**											
3079												
3080	**Suggested UCL to Use**											
3081					95% KM Bootstrap t UCL	N/A				a Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	428.9	
3082												
3083	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3084	Recommendations are based upon data size, data distribution, and skewness.											
3085	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3086	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3087												
3088	**Aluminum (smw9)**											
3089												
3090	**General Statistics**											
3091					Total Number of Observations	9				Number of Distinct Observations	8	
3092					Number of Detects	5				Number of Non-Detects	4	
3093					Number of Distinct Detects	5				Number of Distinct Non-Detects	3	
3094					Minimum Detect	20.1				Minimum Non-Detect	8.1	
3095					Maximum Detect	35.3				Maximum Non-Detect	113	
3096					Variance Detects	35.27				Percent Non-Detects	44.44%	
3097					Mean Detects	29.42				SD Detects	5.939	
3098					Median Detects	29.7				CV Detects	0.202	
3099					Skewness Detects	-1.053				Kurtosis Detects	1.121	
3100					Mean of Logged Detects	3.363				SD of Logged Detects	0.222	
3101												
3102	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3103	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3104	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3105	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3106												
3107	**Normal GOF Test on Detects Only**											
3108					Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**					
3109					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level					
3110					Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**					
3111					5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level					
3112	**Detected Data appear Normal at 5% Significance Level**											
3113												
3114	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3115					KM Mean	21.93				KM Standard Error of Mean	4.365	
3116					KM SD	10.8				95% KM (BCA) UCL	28.5	
3117					95% KM (t) UCL	30.04				95% KM (Percentile Bootstrap) UCL	28.7	
3118					95% KM (z) UCL	29.1				95% KM Bootstrap t UCL	26.08	
3119					90% KM Chebyshev UCL	35.02				95% KM Chebyshev UCL	40.95	
3120					97.5% KM Chebyshev UCL	49.18				99% KM Chebyshev UCL	65.35	

	A	B	C	D	E	F	G	H	I	J	K	L
3121												
3122	**Gamma GOF Tests on Detected Observations Only**											
3123					A-D Test Statistic	0.369	**Anderson-Darling GOF Test**					
3124					5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level					
3125					K-S Test Statistic	0.245	**Kolmogorov-Smirnov GOF**					
3126					5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level					
3127	**Detected data appear Gamma Distributed at 5% Significance Level**											
3128												
3129	**Gamma Statistics on Detected Data Only**											
3130					k hat (MLE)	27.26			k star (bias corrected MLE)	11.04		
3131					Theta hat (MLE)	1.079			Theta star (bias corrected MLE)	2.665		
3132					nu hat (MLE)	272.6			nu star (bias corrected)	110.4		
3133					Mean (detects)	29.42						
3134												
3135	**Gamma ROS Statistics using Imputed Non-Detects**											
3136	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3137	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3138	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3139	This is especially true when the sample size is small.											
3140	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3141					Minimum	13.55			Mean	24.45		
3142					Maximum	35.3			Median	24.06		
3143					SD	7.715			CV	0.316		
3144					k hat (MLE)	10.78			k star (bias corrected MLE)	7.262		
3145					Theta hat (MLE)	2.268			Theta star (bias corrected MLE)	3.367		
3146					nu hat (MLE)	194.1			nu star (bias corrected)	130.7		
3147					Adjusted Level of Significance (β)	0.0231						
3148					Approximate Chi Square Value (130.71, α)	105.3			Adjusted Chi Square Value (130.71, β)	100.5		
3149					95% Gamma Approximate UCL (use when n>=50)	30.35			95% Gamma Adjusted UCL (use when n<50)	31.8		
3150												
3151	**Estimates of Gamma Parameters using KM Estimates**											
3152					Mean (KM)	21.93			SD (KM)	10.8		
3153					Variance (KM)	116.6			SE of Mean (KM)	4.365		
3154					k hat (KM)	4.123			k star (KM)	2.823		
3155					nu hat (KM)	74.21			nu star (KM)	50.81		
3156					theta hat (KM)	5.318			theta star (KM)	7.767		
3157					80% gamma percentile (KM)	31.5			90% gamma percentile (KM)	39.42		
3158					95% gamma percentile (KM)	46.83			99% gamma percentile (KM)	62.95		
3159												
3160	**Gamma Kaplan-Meier (KM) Statistics**											
3161					Approximate Chi Square Value (50.81, α)	35.44			Adjusted Chi Square Value (50.81, β)	32.75		
3162					95% Gamma Approximate KM-UCL (use when n>=50)	31.43			95% Gamma Adjusted KM-UCL (use when n<50)	34.01		
3163												
3164	**Lognormal GOF Test on Detected Observations Only**											
3165					Shapiro Wilk Test Statistic	0.882	**Shapiro Wilk GOF Test**					
3166					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level					
3167					Lilliefors Test Statistic	0.263	**Lilliefors GOF Test**					
3168					5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level					
3169	**Detected Data appear Lognormal at 5% Significance Level**											
3170												
3171	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3172					Mean in Original Scale	24.7			Mean in Log Scale	3.167		

3173				SD in Original Scale		7.33				SD in Log Scale		0.303
3174			95% t UCL (assumes normality of ROS data)			29.25				95% Percentile Bootstrap UCL		28.44
3175				95% BCA Bootstrap UCL		28.7				95% Bootstrap t UCL		29.5
3176				95% H-UCL (Log ROS)		30.82						
3177												
3178	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3179				KM Mean (logged)		2.924				KM Geo Mean		18.62
3180				KM SD (logged)		0.613				95% Critical H Value (KM-Log)		2.465
3181			KM Standard Error of Mean (logged)			0.252				95% H-UCL (KM -Log)		38.36
3182				KM SD (logged)		0.613				95% Critical H Value (KM-Log)		2.465
3183			KM Standard Error of Mean (logged)			0.252						
3184												
3185	**DL/2 Statistics**											
3186	**DL/2 Normal**									**DL/2 Log-Transformed**		
3187				Mean in Original Scale		24.94				Mean in Log Scale		2.91
3188				SD in Original Scale		16.8				SD in Log Scale		0.948
3189				95% t UCL (Assumes normality)		35.35				95% H-Stat UCL		82
3190	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3191												
3192	**Nonparametric Distribution Free UCL Statistics**											
3193	**Detected Data appear Normal Distributed at 5% Significance Level**											
3194												
3195	**Suggested UCL to Use**											
3196				95% KM (t) UCL		30.04						
3197												
3198	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3199	Recommendations are based upon data size, data distribution, and skewness.											
3200	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3201	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3202												
3203	**Aluminum (tw2r)**											
3204												
3205	**General Statistics**											
3206				Total Number of Observations		9				Number of Distinct Observations		9
3207				Number of Detects		3				Number of Non-Detects		6
3208				Number of Distinct Detects		3				Number of Distinct Non-Detects		6
3209				Minimum Detect		16				Minimum Non-Detect		8.2
3210				Maximum Detect		200				Maximum Non-Detect		40.3
3211				Variance Detects		10294				Percent Non-Detects		66.67%
3212				Mean Detects		83.3				SD Detects		101.5
3213				Median Detects		33.9				CV Detects		1.218
3214				Skewness Detects		1.672				Kurtosis Detects		N/A
3215				Mean of Logged Detects		3.865				SD of Logged Detects		1.297
3216												
3217	**Warning: Data set has only 3 Detected Values.**											
3218	**This is not enough to compute meaningful or reliable statistics and estimates.**											
3219												
3220												
3221	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3222	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3223	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3224	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											

	A	B	C	D	E	F	G	H	I	J	K	L
3225												
3226	**Normal GOF Test on Detects Only**											
3227					Shapiro Wilk Test Statistic	0.822	**Shapiro Wilk GOF Test**					
3228					5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level					
3229					Lilliefors Test Statistic	0.353	**Lilliefors GOF Test**					
3230					5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level					
3231	**Detected Data appear Normal at 5% Significance Level**											
3232												
3233	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3234					KM Mean	34.76			KM Standard Error of Mean			24.16
3235					KM SD	59.01			95% KM (BCA) UCL			N/A
3236					95% KM (t) UCL	79.69			95% KM (Percentile Bootstrap) UCL			N/A
3237					95% KM (z) UCL	74.5			95% KM Bootstrap t UCL			N/A
3238					90% KM Chebyshev UCL	107.2			95% KM Chebyshev UCL			140.1
3239					97.5% KM Chebyshev UCL	185.7			99% KM Chebyshev UCL			275.2
3240												
3241	**Gamma GOF Tests on Detected Observations Only**											
3242	**Not Enough Data to Perform GOF Test**											
3243												
3244	**Gamma Statistics on Detected Data Only**											
3245					k hat (MLE)	1.031			k star (bias corrected MLE)			N/A
3246					Theta hat (MLE)	80.77			Theta star (bias corrected MLE)			N/A
3247					nu hat (MLE)	6.188			nu star (bias corrected)			N/A
3248					Mean (detects)	83.3						
3249												
3250	**Gamma ROS Statistics using Imputed Non-Detects**											
3251	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3252	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3253	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3254	This is especially true when the sample size is small.											
3255	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3256					Minimum	0.01			Mean			27.77
3257					Maximum	200			Median			0.01
3258					SD	65.63			CV			2.363
3259					k hat (MLE)	0.15			k star (bias corrected MLE)			0.174
3260					Theta hat (MLE)	184.6			Theta star (bias corrected MLE)			159.3
3261					nu hat (MLE)	2.708			nu star (bias corrected)			3.139
3262					Adjusted Level of Significance (β)	0.0231						
3263					Approximate Chi Square Value (3.14, α)	0.415			Adjusted Chi Square Value (3.14, β)			0.263
3264					95% Gamma Approximate UCL (use when n>=50)	210.2			95% Gamma Adjusted UCL (use when n<50)			N/A
3265												
3266	**Estimates of Gamma Parameters using KM Estimates**											
3267					Mean (KM)	34.76			SD (KM)			59.01
3268					Variance (KM)	3482			SE of Mean (KM)			24.16
3269					k hat (KM)	0.347			k star (KM)			0.305
3270					nu hat (KM)	6.245			nu star (KM)			5.497
3271					theta hat (KM)	100.2			theta star (KM)			113.8
3272					80% gamma percentile (KM)	53.53			90% gamma percentile (KM)			102.3
3273					95% gamma percentile (KM)	158.1			99% gamma percentile (KM)			302.8
3274												
3275	**Gamma Kaplan-Meier (KM) Statistics**											
3276					Approximate Chi Square Value (5.50, α)	1.388			Adjusted Chi Square Value (5.50, β)			1.002

	A	B	C	D	E	F	G	H	I	J	K	L
3277	95% Gamma Approximate KM-UCL (use when n>=50)					137.6	95% Gamma Adjusted KM-UCL (use when n<50)					190.7
3278												
3279	**Lognormal GOF Test on Detected Observations Only**											
3280	Shapiro Wilk Test Statistic					0.948	**Shapiro Wilk GOF Test**					
3281	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Lognormal at 5% Significance Level					
3282	Lilliefors Test Statistic					0.27	**Lilliefors GOF Test**					
3283	5% Lilliefors Critical Value					0.425	Detected Data appear Lognormal at 5% Significance Level					
3284	**Detected Data appear Lognormal at 5% Significance Level**											
3285												
3286	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3287	Mean in Original Scale					29.95	Mean in Log Scale					2.028
3288	SD in Original Scale					64.62	SD in Log Scale					1.562
3289	95% t UCL (assumes normality of ROS data)					70	95% Percentile Bootstrap UCL					69.85
3290	95% BCA Bootstrap UCL					94.07	95% Bootstrap t UCL					397.7
3291	95% H-UCL (Log ROS)					325.8						
3292												
3293	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3294	KM Mean (logged)					2.809	KM Geo Mean					16.59
3295	KM SD (logged)					1.003	95% Critical H Value (KM-Log)					3.246
3296	KM Standard Error of Mean (logged)					0.433	95% H-UCL (KM -Log)					86.75
3297	KM SD (logged)					1.003	95% Critical H Value (KM-Log)					3.246
3298	KM Standard Error of Mean (logged)					0.433						
3299												
3300	**DL/2 Statistics**											
3301	**DL/2 Normal**						**DL/2 Log-Transformed**					
3302	Mean in Original Scale					34.86	Mean in Log Scale					2.78
3303	SD in Original Scale					62.56	SD in Log Scale					1.133
3304	95% t UCL (Assumes normality)					73.64	95% H-Stat UCL					126.3
3305	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3306												
3307	**Nonparametric Distribution Free UCL Statistics**											
3308	**Detected Data appear Normal Distributed at 5% Significance Level**											
3309												
3310	**Suggested UCL to Use**											
3311	95% KM (t) UCL					79.69						
3312												
3313	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3314	Recommendations are based upon data size, data distribution, and skewness.											
3315	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3316	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3317												
3318	**Aluminum (tw5r)**											
3319												
3320	**General Statistics**											
3321	Total Number of Observations					8	Number of Distinct Observations					8
3322	Number of Detects					6	Number of Non-Detects					2
3323	Number of Distinct Detects					6	Number of Distinct Non-Detects					2
3324	Minimum Detect					4.6	Minimum Non-Detect					5.6
3325	Maximum Detect					1050	Maximum Non-Detect					8.1
3326	Variance Detects					153442	Percent Non-Detects					25%
3327	Mean Detects					282.1	SD Detects					391.7
3328	Median Detects					121	CV Detects					1.388

3329					Skewness Detects	2.061					Kurtosis Detects	4.369
3330					Mean of Logged Detects	4.677					SD of Logged Detects	1.825
3331												
3332	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3333	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3334	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3335	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3336												
3337	**Normal GOF Test on Detects Only**											
3338					Shapiro Wilk Test Statistic	0.73	**Shapiro Wilk GOF Test**					
3339					5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level					
3340					Lilliefors Test Statistic	0.308	**Lilliefors GOF Test**					
3341					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
3342	**Detected Data appear Approximate Normal at 5% Significance Level**											
3343												
3344	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3345					KM Mean	212.7	KM Standard Error of Mean	128.7				
3346					KM SD	332.2	95% KM (BCA) UCL	433.3				
3347					95% KM (t) UCL	456.5	95% KM (Percentile Bootstrap) UCL	433.9				
3348					95% KM (z) UCL	424.4	95% KM Bootstrap t UCL	1221				
3349					90% KM Chebyshev UCL	598.7	95% KM Chebyshev UCL	773.5				
3350					97.5% KM Chebyshev UCL	1016	99% KM Chebyshev UCL	1493				
3351												
3352	**Gamma GOF Tests on Detected Observations Only**											
3353					A-D Test Statistic	0.232	**Anderson-Darling GOF Test**					
3354					5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level					
3355					K-S Test Statistic	0.191	**Kolmogorov-Smirnov GOF**					
3356					5% K-S Critical Value	0.346	Detected data appear Gamma Distributed at 5% Significance Level					
3357	**Detected data appear Gamma Distributed at 5% Significance Level**											
3358												
3359	**Gamma Statistics on Detected Data Only**											
3360					k hat (MLE)	0.635	k star (bias corrected MLE)	0.429				
3361					Theta hat (MLE)	444.3	Theta star (bias corrected MLE)	658.3				
3362					nu hat (MLE)	7.619	nu star (bias corrected)	5.143				
3363					Mean (detects)	282.1						
3364												
3365	**Gamma ROS Statistics using Imputed Non-Detects**											
3366	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3367	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3368	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3369	This is especially true when the sample size is small.											
3370	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3371					Minimum	0.01	Mean	211.6				
3372					Maximum	1050	Median	85.05				
3373					SD	355.9	CV	1.682				
3374					k hat (MLE)	0.239	k star (bias corrected MLE)	0.233				
3375					Theta hat (MLE)	886.5	Theta star (bias corrected MLE)	910				
3376					nu hat (MLE)	3.819	nu star (bias corrected)	3.72				
3377					Adjusted Level of Significance (β)	0.0195						
3378					Approximate Chi Square Value (3.72, α)	0.614	Adjusted Chi Square Value (3.72, β)	0.369				
3379					95% Gamma Approximate UCL (use when n>=50)	1281	95% Gamma Adjusted UCL (use when n<50)	2136				
3380												

	A	B	C	D	E	F	G	H	I	J	K	L
3381	**Estimates of Gamma Parameters using KM Estimates**											
3382					Mean (KM)	212.7				SD (KM)		332.2
3383					Variance (KM)	110341				SE of Mean (KM)		128.7
3384					k hat (KM)	0.41				k star (KM)		0.34
3385					nu hat (KM)	6.563				nu star (KM)		5.435
3386					theta hat (KM)	518.7				theta star (KM)		626.3
3387					80% gamma percentile (KM)	335.1				90% gamma percentile (KM)		617.1
3388					95% gamma percentile (KM)	934.4				99% gamma percentile (KM)		1747
3389												
3390	**Gamma Kaplan-Meier (KM) Statistics**											
3391					Approximate Chi Square Value (5.43, α)	1.358				Adjusted Chi Square Value (5.43, β)		0.912
3392					95% Gamma Approximate KM-UCL (use when n>=50)	851.3				95% Gamma Adjusted KM-UCL (use when n<50)		1268
3393												
3394	**Lognormal GOF Test on Detected Observations Only**											
3395					Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**					
3396					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level					
3397					Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**					
3398					5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level					
3399	**Detected Data appear Lognormal at 5% Significance Level**											
3400												
3401	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3402					Mean in Original Scale	213.1				Mean in Log Scale		3.952
3403					SD in Original Scale	354.9				SD in Log Scale		2.045
3404					95% t UCL (assumes normality of ROS data)	450.8				95% Percentile Bootstrap UCL		431
3405					95% BCA Bootstrap UCL	556.7				95% Bootstrap t UCL		1206
3406					95% H-UCL (Log ROS)	53372						
3407												
3408	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3409					KM Mean (logged)	3.889				KM Geo Mean		48.88
3410					KM SD (logged)	1.986				95% Critical H Value (KM-Log)		6.095
3411					KM Standard Error of Mean (logged)	0.769				95% H-UCL (KM -Log)		34039
3412					KM SD (logged)	1.986				95% Critical H Value (KM-Log)		6.095
3413					KM Standard Error of Mean (logged)	0.769						
3414												
3415	**DL/2 Statistics**											
3416					**DL/2 Normal**					**DL/2 Log-Transformed**		
3417					Mean in Original Scale	212.4				Mean in Log Scale		3.811
3418					SD in Original Scale	355.3				SD in Log Scale		2.227
3419					95% t UCL (Assumes normality)	450.4				95% H-Stat UCL		162077
3420	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3421												
3422	**Nonparametric Distribution Free UCL Statistics**											
3423	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
3424												
3425	**Suggested UCL to Use**											
3426					95% KM (t) UCL	456.5						
3427												
3428	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
3429	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
3430												
3431	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3432	Recommendations are based upon data size, data distribution, and skewness.											

	A	B	C	D	E	F	G	H	I	J	K	L
3433	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3434	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3435												
3436												
3437	**Aluminum (waste water clarifier well)**											
3438												
3439	**General Statistics**											
3440	Total Number of Observations					1	Number of Distinct Observations					1
3441							Number of Missing Observations					0
3442	Minimum					65.3	Mean					65.3
3443	Maximum					65.3	Median					65.3
3444												
3445	**Warning: This data set only has 1 observations!**											
3446	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
3447	**The data set for variable Aluminum (waste water clarifier well) was not processed!**											
3448												
3449	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
3450	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
3451												
3452												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 10:40:46 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Antimony (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	2	Number of Non-Detects	7
Number of Distinct Detects	2	Number of Distinct Non-Detects	7
Minimum Detect	0.26	Minimum Non-Detect	0.11
Maximum Detect	0.46	Maximum Non-Detect	0.38
Variance Detects	0.02	Percent Non-Detects	77.78%
Mean Detects	0.36	SD Detects	0.141
Median Detects	0.36	CV Detects	0.393
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.062	SD of Logged Detects	0.403

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.168	KM Standard Error of Mean	0.0547
KM SD	0.115	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.27	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.258	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.332	95% KM Chebyshev UCL	0.406
97.5% KM Chebyshev UCL	0.51	99% KM Chebyshev UCL	0.712

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	12.62	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0285	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	50.47	nu star (bias corrected)	N/A
Mean (detects)	0.36		

	A	B	C	D	E	F	G	H	I	J	K	L
53	**Estimates of Gamma Parameters using KM Estimates**											
54					Mean (KM)	0.168					SD (KM)	0.115
55					Variance (KM)	0.0131					SE of Mean (KM)	0.0547
56					k hat (KM)	2.151					k star (KM)	1.508
57					nu hat (KM)	38.72					nu star (KM)	27.14
58					theta hat (KM)	0.0781					theta star (KM)	0.111
59					80% gamma percentile (KM)	0.26					90% gamma percentile (KM)	0.349
60					95% gamma percentile (KM)	0.437					99% gamma percentile (KM)	0.633
61												
62	**Gamma Kaplan-Meier (KM) Statistics**											
63											Adjusted Level of Significance (β)	0.0231
64					Approximate Chi Square Value (27.14, α)	16.26					Adjusted Chi Square Value (27.14, β)	14.52
65					95% Gamma Approximate KM-UCL (use when n>=50)	0.28					95% Gamma Adjusted KM-UCL (use when n<50)	0.314
66												
67	**Lognormal GOF Test on Detected Observations Only**											
68	**Not Enough Data to Perform GOF Test**											
69												
70	**Lognormal ROS Statistics Using Imputed Non-Detects**											
71					Mean in Original Scale	0.15					Mean in Log Scale	-2.105
72					SD in Original Scale	0.129					SD in Log Scale	0.61
73					95% t UCL (assumes normality of ROS data)	0.23					95% Percentile Bootstrap UCL	N/A
74					95% BCA Bootstrap UCL	N/A					95% Bootstrap t UCL	N/A
75					95% H-UCL (Log ROS)	0.249						
76												
77	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
78					KM Mean (logged)	-1.939					KM Geo Mean	0.144
79					KM SD (logged)	0.499					95% Critical H Value (KM-Log)	2.227
80					KM Standard Error of Mean (logged)	0.241					95% H-UCL (KM -Log)	0.241
81					KM SD (logged)	0.499					95% Critical H Value (KM-Log)	2.227
82					KM Standard Error of Mean (logged)	0.241						
83												
84	**DL/2 Statistics**											
85	**DL/2 Normal**						**DL/2 Log-Transformed**					
86					Mean in Original Scale	0.161					Mean in Log Scale	-2.058
87					SD in Original Scale	0.13					SD in Log Scale	0.695
88					95% t UCL (Assumes normality)	0.242					95% H-Stat UCL	0.309
89	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
90												
91	**Nonparametric Distribution Free UCL Statistics**											
92	**Data do not follow a Discernible Distribution at 5% Significance Level**											
93												
94	**Suggested UCL to Use**											
95					95% KM (t) UCL	0.27					KM H-UCL	0.241
96					95% KM (BCA) UCL	N/A						
97	**Warning: One or more Recommended UCL(s) not available!**											
98												
99	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
100	Recommendations are based upon data size, data distribution, and skewness.											
101	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
102	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
103												
104	**Antimony (nfmw10)**											

105												
106	**General Statistics**											
107					Total Number of Observations	8			Number of Distinct Observations	8		
108					Number of Detects	5			Number of Non-Detects	3		
109					Number of Distinct Detects	5			Number of Distinct Non-Detects	3		
110					Minimum Detect	0.19			Minimum Non-Detect	0.24		
111					Maximum Detect	0.61			Maximum Non-Detect	1.5		
112					Variance Detects	0.0335			Percent Non-Detects	37.5%		
113					Mean Detects	0.416			SD Detects	0.183		
114					Median Detects	0.47			CV Detects	0.44		
115					Skewness Detects	-0.372			Kurtosis Detects	-2.482		
116					Mean of Logged Detects	-0.971			SD of Logged Detects	0.508		
117												
118	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
119	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
120	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
121	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
122												
123	**Normal GOF Test on Detects Only**											
124					Shapiro Wilk Test Statistic	0.91			**Shapiro Wilk GOF Test**			
125					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
126					Lilliefors Test Statistic	0.216			**Lilliefors GOF Test**			
127					5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			
128	**Detected Data appear Normal at 5% Significance Level**											
129												
130	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
131					KM Mean	0.372			KM Standard Error of Mean	0.0762		
132					KM SD	0.169			95% KM (BCA) UCL	0.495		
133					95% KM (t) UCL	0.516			95% KM (Percentile Bootstrap) UCL	0.488		
134					95% KM (z) UCL	0.497			95% KM Bootstrap t UCL	0.498		
135					90% KM Chebyshev UCL	0.6			95% KM Chebyshev UCL	0.704		
136					97.5% KM Chebyshev UCL	0.848			99% KM Chebyshev UCL	1.13		
137												
138	**Gamma GOF Tests on Detected Observations Only**											
139					A-D Test Statistic	0.392			**Anderson-Darling GOF Test**			
140					5% A-D Critical Value	0.681			Detected data appear Gamma Distributed at 5% Significance Level			
141					K-S Test Statistic	0.268			**Kolmogorov-Smirnov GOF**			
142					5% K-S Critical Value	0.358			Detected data appear Gamma Distributed at 5% Significance Level			
143	**Detected data appear Gamma Distributed at 5% Significance Level**											
144												
145	**Gamma Statistics on Detected Data Only**											
146					k hat (MLE)	5.485			k star (bias corrected MLE)	2.327		
147					Theta hat (MLE)	0.0758			Theta star (bias corrected MLE)	0.179		
148					nu hat (MLE)	54.85			nu star (bias corrected)	23.27		
149					Mean (detects)	0.416						
150												
151	**Gamma ROS Statistics using Imputed Non-Detects**											
152	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
153	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
154	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
155	This is especially true when the sample size is small.											
156	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											

	A	B	C	D	E	F	G	H	I	J	K	L
157					Minimum	0.19					Mean	0.371
158					Maximum	0.61					Median	0.337
159					SD	0.157					CV	0.424
160					k hat (MLE)	6.329					k star (bias corrected MLE)	4.039
161					Theta hat (MLE)	0.0586					Theta star (bias corrected MLE)	0.0918
162					nu hat (MLE)	101.3					nu star (bias corrected)	64.63
163					Adjusted Level of Significance (β)	0.0195						
164					Approximate Chi Square Value (64.63, α)	47.13					Adjusted Chi Square Value (64.63, β)	43.38
165					95% Gamma Approximate UCL (use when n>=50)	0.508					95% Gamma Adjusted UCL (use when n<50)	0.552
166												
167					**Estimates of Gamma Parameters using KM Estimates**							
168					Mean (KM)	0.372					SD (KM)	0.169
169					Variance (KM)	0.0287					SE of Mean (KM)	0.0762
170					k hat (KM)	4.818					k star (KM)	3.095
171					nu hat (KM)	77.09					nu star (KM)	49.52
172					theta hat (KM)	0.0771					theta star (KM)	0.12
173					80% gamma percentile (KM)	0.528					90% gamma percentile (KM)	0.655
174					95% gamma percentile (KM)	0.773					99% gamma percentile (KM)	1.029
175												
176					**Gamma Kaplan-Meier (KM) Statistics**							
177					Approximate Chi Square Value (49.52, α)	34.36					Adjusted Chi Square Value (49.52, β)	31.2
178					95% Gamma Approximate KM-UCL (use when n>=50)	0.536					95% Gamma Adjusted KM-UCL (use when n<50)	0.59
179												
180					**Lognormal GOF Test on Detected Observations Only**							
181					Shapiro Wilk Test Statistic	0.887					**Shapiro Wilk GOF Test**	
182					5% Shapiro Wilk Critical Value	0.762					Detected Data appear Lognormal at 5% Significance Level	
183					Lilliefors Test Statistic	0.265					**Lilliefors GOF Test**	
184					5% Lilliefors Critical Value	0.343					Detected Data appear Lognormal at 5% Significance Level	
185					**Detected Data appear Lognormal at 5% Significance Level**							
186												
187					**Lognormal ROS Statistics Using Imputed Non-Detects**							
188					Mean in Original Scale	0.364					Mean in Log Scale	-1.097
189					SD in Original Scale	0.16					SD in Log Scale	0.445
190					95% t UCL (assumes normality of ROS data)	0.471					95% Percentile Bootstrap UCL	0.451
191					95% BCA Bootstrap UCL	0.455					95% Bootstrap t UCL	0.491
192					95% H-UCL (Log ROS)	0.539						
193												
194					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
195					KM Mean (logged)	-1.103					KM Geo Mean	0.332
196					KM SD (logged)	0.484					95% Critical H Value (KM-Log)	2.327
197					KM Standard Error of Mean (logged)	0.219					95% H-UCL (KM -Log)	0.571
198					KM SD (logged)	0.484					95% Critical H Value (KM-Log)	2.327
199					KM Standard Error of Mean (logged)	0.219						
200												
201					**DL/2 Statistics**							
202					**DL/2 Normal**						**DL/2 Log-Transformed**	
203					Mean in Original Scale	0.405					Mean in Log Scale	-1.063
204					SD in Original Scale	0.223					SD in Log Scale	0.635
205					95% t UCL (Assumes normality)	0.554					95% H-Stat UCL	0.789
206					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
207												
208					**Nonparametric Distribution Free UCL Statistics**							

	A	B	C	D	E	F	G	H	I	J	K	L
209	Detected Data appear Normal Distributed at 5% Significance Level											
210												
211	Suggested UCL to Use											
212					95% KM (t) UCL	0.516						
213												
214	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
215	Recommendations are based upon data size, data distribution, and skewness.											
216	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
217	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
218												
219	Antimony (nfmw11)											
220												
221	General Statistics											
222					Total Number of Observations	8			Number of Distinct Observations	4		
223					Number of Detects	0			Number of Non-Detects	8		
224					Number of Distinct Detects	0			Number of Distinct Non-Detects	4		
225												
226	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
227	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
228	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
229												
230	The data set for variable Antimony (nfmw11) was not processed!											
231												
232												
233	Antimony (nfmw12)											
234												
235	General Statistics											
236					Total Number of Observations	8			Number of Distinct Observations	5		
237					Number of Detects	2			Number of Non-Detects	6		
238					Number of Distinct Detects	2			Number of Distinct Non-Detects	3		
239					Minimum Detect	0.083			Minimum Non-Detect	0.077		
240					Maximum Detect	0.13			Maximum Non-Detect	0.38		
241					Variance Detects	0.0011			Percent Non-Detects	75%		
242					Mean Detects	0.107			SD Detects	0.0332		
243					Median Detects	0.107			CV Detects	0.312		
244					Skewness Detects	N/A			Kurtosis Detects	N/A		
245					Mean of Logged Detects	-2.265			SD of Logged Detects	0.317		
246												
247	Warning: Data set has only 2 Detected Values.											
248	This is not enough to compute meaningful or reliable statistics and estimates.											
249												
250												
251	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
252	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
253	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
254	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
255												
256	Normal GOF Test on Detects Only											
257	Not Enough Data to Perform GOF Test											
258												
259	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
260					KM Mean	0.0859			KM Standard Error of Mean	0.00976		

261					KM SD	0.0182				95% KM (BCA) UCL		N/A
262					95% KM (t) UCL	0.104				95% KM (Percentile Bootstrap) UCL		N/A
263					95% KM (z) UCL	0.102				95% KM Bootstrap t UCL		N/A
264					90% KM Chebyshev UCL	0.115				95% KM Chebyshev UCL		0.128
265					97.5% KM Chebyshev UCL	0.147				99% KM Chebyshev UCL		0.183
266												
267					**Gamma GOF Tests on Detected Observations Only**							
268					**Not Enough Data to Perform GOF Test**							
269												
270					**Gamma Statistics on Detected Data Only**							
271					k hat (MLE)	20.2				k star (bias corrected MLE)		N/A
272					Theta hat (MLE)	0.00527				Theta star (bias corrected MLE)		N/A
273					nu hat (MLE)	80.8				nu star (bias corrected)		N/A
274					Mean (detects)	0.107						
275												
276					**Estimates of Gamma Parameters using KM Estimates**							
277					Mean (KM)	0.0859				SD (KM)		0.0182
278					Variance (KM)	3.3055E-4				SE of Mean (KM)		0.00976
279					k hat (KM)	22.3				k star (KM)		14.02
280					nu hat (KM)	356.8				nu star (KM)		224.3
281					theta hat (KM)	0.00385				theta star (KM)		0.00612
282					80% gamma percentile (KM)	0.104				90% gamma percentile (KM)		0.116
283					95% gamma percentile (KM)	0.127				99% gamma percentile (KM)		0.148
284												
285					**Gamma Kaplan-Meier (KM) Statistics**							
286										Adjusted Level of Significance (β)		0.0195
287					Approximate Chi Square Value (224.34, α)	190.7				Adjusted Chi Square Value (224.34, β)		182.8
288					95% Gamma Approximate KM-UCL (use when n>=50)	0.101				95% Gamma Adjusted KM-UCL (use when n<50)		0.105
289												
290					**Lognormal GOF Test on Detected Observations Only**							
291					**Not Enough Data to Perform GOF Test**							
292												
293					**Lognormal ROS Statistics Using Imputed Non-Detects**							
294					Mean in Original Scale	0.063				Mean in Log Scale		-2.854
295					SD in Original Scale	0.0312				SD in Log Scale		0.437
296					95% t UCL (assumes normality of ROS data)	0.0839				95% Percentile Bootstrap UCL		0.0821
297					95% BCA Bootstrap UCL	0.0864				95% Bootstrap t UCL		0.104
298					95% H-UCL (Log ROS)	0.0919						
299												
300					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
301					KM Mean (logged)	-2.473				KM Geo Mean		0.0843
302					KM SD (logged)	0.179				95% Critical H Value (KM-Log)		1.922
303					KM Standard Error of Mean (logged)	0.0965				95% H-UCL (KM -Log)		0.0976
304					KM SD (logged)	0.179				95% Critical H Value (KM-Log)		1.922
305					KM Standard Error of Mean (logged)	0.0965						
306												
307					**DL/2 Statistics**							
308					**DL/2 Normal**					**DL/2 Log-Transformed**		
309					Mean in Original Scale	0.0798				Mean in Log Scale		-2.698
310					SD in Original Scale	0.0542				SD in Log Scale		0.6
311					95% t UCL (Assumes normality)	0.116				95% H-Stat UCL		0.143
312					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							

313											
314	**Nonparametric Distribution Free UCL Statistics**										
315	**Data do not follow a Discernible Distribution at 5% Significance Level**										
316											
317	**Suggested UCL to Use**										
318				95% KM (t) UCL	0.104			KM H-UCL	0.0976		
319				95% KM (BCA) UCL	N/A						
320	**Warning: One or more Recommended UCL(s) not available!**										
321											
322	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
323	Recommendations are based upon data size, data distribution, and skewness.										
324	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).										
325	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.										
326											
327	**Antimony (nfmw19)**										
328											
329	**General Statistics**										
330				Total Number of Observations	8			Number of Distinct Observations	5		
331				Number of Detects	0			Number of Non-Detects	8		
332				Number of Distinct Detects	0			Number of Distinct Non-Detects	5		
333											
334	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**										
335	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**										
336	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**										
337											
338	**The data set for variable Antimony (nfmw19) was not processed!**										
339											
340											
341	**Antimony (nfmw1d)**										
342											
343	**General Statistics**										
344				Total Number of Observations	9			Number of Distinct Observations	8		
345				Number of Detects	5			Number of Non-Detects	4		
346				Number of Distinct Detects	5			Number of Distinct Non-Detects	3		
347				Minimum Detect	0.28			Minimum Non-Detect	0.25		
348				Maximum Detect	0.5			Maximum Non-Detect	1.5		
349				Variance Detects	0.00875			Percent Non-Detects	44.44%		
350				Mean Detects	0.38			SD Detects	0.0935		
351				Median Detects	0.41			CV Detects	0.246		
352				Skewness Detects	0.0458			Kurtosis Detects	-1.856		
353				Mean of Logged Detects	-0.993			SD of Logged Detects	0.252		
354											
355	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**										
356	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**										
357	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**										
358	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**										
359											
360	**Normal GOF Test on Detects Only**										
361				Shapiro Wilk Test Statistic	0.901			**Shapiro Wilk GOF Test**			
362				5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
363				Lilliefors Test Statistic	0.232			**Lilliefors GOF Test**			
364				5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			

365	**Detected Data appear Normal at 5% Significance Level**											
366												
367	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
368					KM Mean	0.346			KM Standard Error of Mean	0.0378		
369					KM SD	0.0891			95% KM (BCA) UCL	0.406		
370					95% KM (t) UCL	0.416			95% KM (Percentile Bootstrap) UCL	0.408		
371					95% KM (z) UCL	0.408			95% KM Bootstrap t UCL	0.411		
372					90% KM Chebyshev UCL	0.46			95% KM Chebyshev UCL	0.511		
373					97.5% KM Chebyshev UCL	0.582			99% KM Chebyshev UCL	0.722		
374												
375	**Gamma GOF Tests on Detected Observations Only**											
376					A-D Test Statistic	0.417			**Anderson-Darling GOF Test**			
377					5% A-D Critical Value	0.679			Detected data appear Gamma Distributed at 5% Significance Level			
378					K-S Test Statistic	0.262			**Kolmogorov-Smirnov GOF**			
379					5% K-S Critical Value	0.357			Detected data appear Gamma Distributed at 5% Significance Level			
380	**Detected data appear Gamma Distributed at 5% Significance Level**											
381												
382	**Gamma Statistics on Detected Data Only**											
383					k hat (MLE)	20.14			k star (bias corrected MLE)	8.189		
384					Theta hat (MLE)	0.0189			Theta star (bias corrected MLE)	0.0464		
385					nu hat (MLE)	201.4			nu star (bias corrected)	81.89		
386					Mean (detects)	0.38						
387												
388	**Gamma ROS Statistics using Imputed Non-Detects**											
389	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
390	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
391	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
392	This is especially true when the sample size is small.											
393	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
394					Minimum	0.179			Mean	0.333		
395					Maximum	0.5			Median	0.29		
396					SD	0.101			CV	0.302		
397					k hat (MLE)	11.85			k star (bias corrected MLE)	7.975		
398					Theta hat (MLE)	0.0281			Theta star (bias corrected MLE)	0.0418		
399					nu hat (MLE)	213.3			nu star (bias corrected)	143.6		
400					Adjusted Level of Significance (β)	0.0231						
401					Approximate Chi Square Value (143.55, α)	116.9			Adjusted Chi Square Value (143.55, β)	111.8		
402					95% Gamma Approximate UCL (use when n>=50)	0.409			95% Gamma Adjusted UCL (use when n<50)	0.428		
403												
404	**Estimates of Gamma Parameters using KM Estimates**											
405					Mean (KM)	0.346			SD (KM)	0.0891		
406					Variance (KM)	0.00794			SE of Mean (KM)	0.0378		
407					k hat (KM)	15.1			k star (KM)	10.14		
408					nu hat (KM)	271.8			nu star (KM)	182.5		
409					theta hat (KM)	0.0229			theta star (KM)	0.0341		
410					80% gamma percentile (KM)	0.433			90% gamma percentile (KM)	0.491		
411					95% gamma percentile (KM)	0.542			99% gamma percentile (KM)	0.648		
412												
413	**Gamma Kaplan-Meier (KM) Statistics**											
414					Approximate Chi Square Value (182.51, α)	152.3			Adjusted Chi Square Value (182.51, β)	146.4		
415					95% Gamma Approximate KM-UCL (use when n>=50)	0.415			95% Gamma Adjusted KM-UCL (use when n<50)	0.431		
416												

	A	B	C	D	E	F	G	H	I	J	K	L
417	**Lognormal GOF Test on Detected Observations Only**											
418					Shapiro Wilk Test Statistic	0.886	**Shapiro Wilk GOF Test**					
419					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level					
420					Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**					
421					5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level					
422	**Detected Data appear Lognormal at 5% Significance Level**											
423												
424	**Lognormal ROS Statistics Using Imputed Non-Detects**											
425					Mean in Original Scale	0.336	Mean in Log Scale	-1.127				
426					SD in Original Scale	0.0952	SD in Log Scale	0.285				
427					95% t UCL (assumes normality of ROS data)	0.395	95% Percentile Bootstrap UCL	0.386				
428					95% BCA Bootstrap UCL	0.389	95% Bootstrap t UCL	0.399				
429					95% H-UCL (Log ROS)	0.413						
430												
431	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
432					KM Mean (logged)	-1.093	KM Geo Mean	0.335				
433					KM SD (logged)	0.25	95% Critical H Value (KM-Log)	1.957				
434					KM Standard Error of Mean (logged)	0.106	95% H-UCL (KM -Log)	0.411				
435					KM SD (logged)	0.25	95% Critical H Value (KM-Log)	1.957				
436					KM Standard Error of Mean (logged)	0.106						
437												
438	**DL/2 Statistics**											
439	**DL/2 Normal**						**DL/2 Log-Transformed**					
440					Mean in Original Scale	0.411	Mean in Log Scale	-1.043				
441					SD in Original Scale	0.226	SD in Log Scale	0.614				
442					95% t UCL (Assumes normality)	0.551	95% H-Stat UCL	0.726				
443	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
444												
445	**Nonparametric Distribution Free UCL Statistics**											
446	**Detected Data appear Normal Distributed at 5% Significance Level**											
447												
448	**Suggested UCL to Use**											
449					95% KM (t) UCL	0.416						
450												
451	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
452	Recommendations are based upon data size, data distribution, and skewness.											
453	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
454	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
455												
456												
457	**Antimony (nfmw1s)**											
458												
459	**General Statistics**											
460					Total Number of Observations	7	Number of Distinct Observations	7				
461							Number of Missing Observations	0				
462					Minimum	0.49	Mean	4.399				
463					Maximum	7.7	Median	4.1				
464					SD	2.516	Std. Error of Mean	0.951				
465					Coefficient of Variation	0.572	Skewness	-0.207				
466												
467	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
468	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											

469	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
470	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
471												
472	Normal GOF Test											
473					Shapiro Wilk Test Statistic	0.978	Shapiro Wilk GOF Test					
474					5% Shapiro Wilk Critical Value	0.803	Data appear Normal at 5% Significance Level					
475					Lilliefors Test Statistic	0.126	Lilliefors GOF Test					
476					5% Lilliefors Critical Value	0.304	Data appear Normal at 5% Significance Level					
477	Data appear Normal at 5% Significance Level											
478												
479	Assuming Normal Distribution											
480				95% Normal UCL			95% UCLs (Adjusted for Skewness)					
481					95% Student's-t UCL	6.246	95% Adjusted-CLT UCL (Chen-1995)					5.883
482							95% Modified-t UCL (Johnson-1978)					6.234
483												
484	Gamma GOF Test											
485					A-D Test Statistic	0.379	Anderson-Darling Gamma GOF Test					
486					5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level					
487					K-S Test Statistic	0.196	Kolmogorov-Smirnov Gamma GOF Test					
488					5% K-S Critical Value	0.315	Detected data appear Gamma Distributed at 5% Significance Level					
489	Detected data appear Gamma Distributed at 5% Significance Level											
490												
491	Gamma Statistics											
492					k hat (MLE)	2.1	k star (bias corrected MLE)					1.295
493					Theta hat (MLE)	2.095	Theta star (bias corrected MLE)					3.397
494					nu hat (MLE)	29.39	nu star (bias corrected)					18.13
495					MLE Mean (bias corrected)	4.399	MLE Sd (bias corrected)					3.865
496							Approximate Chi Square Value (0.05)					9.485
497					Adjusted Level of Significance	0.0158	Adjusted Chi Square Value					7.672
498												
499	Assuming Gamma Distribution											
500				95% Approximate Gamma UCL (use when n>=50))		8.408	95% Adjusted Gamma UCL (use when n<50)					10.39
501												
502	Lognormal GOF Test											
503					Shapiro Wilk Test Statistic	0.822	Shapiro Wilk Lognormal GOF Test					
504					5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level					
505					Lilliefors Test Statistic	0.238	Lilliefors Lognormal GOF Test					
506					5% Lilliefors Critical Value	0.304	Data appear Lognormal at 5% Significance Level					
507	Data appear Lognormal at 5% Significance Level											
508												
509	Lognormal Statistics											
510					Minimum of Logged Data	-0.713	Mean of logged Data					1.225
511					Maximum of Logged Data	2.041	SD of logged Data					0.939
512												
513	Assuming Lognormal Distribution											
514					95% H-UCL	20.41	90% Chebyshev (MVUE) UCL					10.11
515					95% Chebyshev (MVUE) UCL	12.48	97.5% Chebyshev (MVUE) UCL					15.76
516					99% Chebyshev (MVUE) UCL	22.21						
517												
518	Nonparametric Distribution Free UCL Statistics											
519	Data appear to follow a Discernible Distribution at 5% Significance Level											
520												

521	**Nonparametric Distribution Free UCLs**											
522					95% CLT UCL	5.963				95% Jackknife UCL	6.246	
523					95% Standard Bootstrap UCL	5.854				95% Bootstrap-t UCL	6.215	
524					95% Hall's Bootstrap UCL	5.863				95% Percentile Bootstrap UCL	5.856	
525					95% BCA Bootstrap UCL	5.786						
526					90% Chebyshev(Mean, Sd) UCL	7.251				95% Chebyshev(Mean, Sd) UCL	8.544	
527					97.5% Chebyshev(Mean, Sd) UCL	10.34				99% Chebyshev(Mean, Sd) UCL	13.86	
528												
529	**Suggested UCL to Use**											
530					95% Student's-t UCL	6.246						
531												
532	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
533	Recommendations are based upon data size, data distribution, and skewness.											
534	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
535	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
536												
537	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
538	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
539												
540	**Antimony (nfmw2)**											
541												
542	**General Statistics**											
543					Total Number of Observations	9				Number of Distinct Observations	7	
544					Number of Detects	2				Number of Non-Detects	7	
545					Number of Distinct Detects	2				Number of Distinct Non-Detects	5	
546					Minimum Detect	0.081				Minimum Non-Detect	0.077	
547					Maximum Detect	0.17				Maximum Non-Detect	1.5	
548					Variance Detects	0.00396				Percent Non-Detects	77.78%	
549					Mean Detects	0.126				SD Detects	0.0629	
550					Median Detects	0.126				CV Detects	0.501	
551					Skewness Detects	N/A				Kurtosis Detects	N/A	
552					Mean of Logged Detects	-2.143				SD of Logged Detects	0.524	
553												
554	**Warning: Data set has only 2 Detected Values.**											
555	**This is not enough to compute meaningful or reliable statistics and estimates.**											
556												
557												
558	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
559	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
560	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
561	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
562												
563	**Normal GOF Test on Detects Only**											
564	**Not Enough Data to Perform GOF Test**											
565												
566	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
567					KM Mean	0.0967				KM Standard Error of Mean	0.0232	
568					KM SD	0.0367				95% KM (BCA) UCL	N/A	
569					95% KM (t) UCL	0.14				95% KM (Percentile Bootstrap) UCL	N/A	
570					95% KM (z) UCL	0.135				95% KM Bootstrap t UCL	N/A	
571					90% KM Chebyshev UCL	0.166				95% KM Chebyshev UCL	0.198	
572					97.5% KM Chebyshev UCL	0.242				99% KM Chebyshev UCL	0.328	

573												
574	**Gamma GOF Tests on Detected Observations Only**											
575	**Not Enough Data to Perform GOF Test**											
576												
577	**Gamma Statistics on Detected Data Only**											
578						k hat (MLE)	7.605			k star (bias corrected MLE)	N/A	
579						Theta hat (MLE)	0.0165			Theta star (bias corrected MLE)	N/A	
580						nu hat (MLE)	30.42			nu star (bias corrected)	N/A	
581						Mean (detects)	0.126					
582												
583	**Estimates of Gamma Parameters using KM Estimates**											
584						Mean (KM)	0.0967			SD (KM)	0.0367	
585						Variance (KM)	0.00135			SE of Mean (KM)	0.0232	
586						k hat (KM)	6.936			k star (KM)	4.698	
587						nu hat (KM)	124.8			nu star (KM)	84.56	
588						theta hat (KM)	0.0139			theta star (KM)	0.0206	
589						80% gamma percentile (KM)	0.131			90% gamma percentile (KM)	0.156	
590						95% gamma percentile (KM)	0.18			99% gamma percentile (KM)	0.229	
591												
592	**Gamma Kaplan-Meier (KM) Statistics**											
593										Adjusted Level of Significance (β)	0.0231	
594						Approximate Chi Square Value (84.56, α)	64.37			Adjusted Chi Square Value (84.56, β)	60.66	
595						95% Gamma Approximate KM-UCL (use when n>=50)	0.127			95% Gamma Adjusted KM-UCL (use when n<50)	0.135	
596												
597	**Lognormal GOF Test on Detected Observations Only**											
598	**Not Enough Data to Perform GOF Test**											
599												
600	**Lognormal ROS Statistics Using Imputed Non-Detects**											
601						Mean in Original Scale	0.0657			Mean in Log Scale	-2.873	
602						SD in Original Scale	0.0434			SD in Log Scale	0.555	
603						95% t UCL (assumes normality of ROS data)	0.0926			95% Percentile Bootstrap UCL	0.0897	
604						95% BCA Bootstrap UCL	0.1			95% Bootstrap t UCL	0.117	
605						95% H-UCL (Log ROS)	0.104					
606												
607	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
608						KM Mean (logged)	-2.392			KM Geo Mean	0.0914	
609						KM SD (logged)	0.311			95% Critical H Value (KM-Log)	2.023	
610						KM Standard Error of Mean (logged)	0.197			95% H-UCL (KM -Log)	0.12	
611						KM SD (logged)	0.311			95% Critical H Value (KM-Log)	2.023	
612						KM Standard Error of Mean (logged)	0.197					
613												
614	**DL/2 Statistics**											
615	**DL/2 Normal**									**DL/2 Log-Transformed**		
616						Mean in Original Scale	0.251			Mean in Log Scale	-1.962	
617						SD in Original Scale	0.291			SD in Log Scale	1.139	
618						95% t UCL (Assumes normality)	0.432			95% H-Stat UCL	1.125	
619	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
620												
621	**Nonparametric Distribution Free UCL Statistics**											
622	**Data do not follow a Discernible Distribution at 5% Significance Level**											
623												
624	**Suggested UCL to Use**											

625				95% KM (Chebyshev) UCL	0.198							
626	**Warning: Recommended UCL exceeds the maximum observation**											
627												
628	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
629	Recommendations are based upon data size, data distribution, and skewness.											
630	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
631	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
632												
633	**Antimony (nfmw20)**											
634												
635	**General Statistics**											
636				Total Number of Observations	8			Number of Distinct Observations	6			
637				Number of Detects	3			Number of Non-Detects	5			
638				Number of Distinct Detects	3			Number of Distinct Non-Detects	3			
639				Minimum Detect	0.15			Minimum Non-Detect	0.14			
640				Maximum Detect	0.23			Maximum Non-Detect	1.5			
641				Variance Detects	0.00173			Percent Non-Detects	62.5%			
642				Mean Detects	0.197			SD Detects	0.0416			
643				Median Detects	0.21			CV Detects	0.212			
644				Skewness Detects	-1.293			Kurtosis Detects	N/A			
645				Mean of Logged Detects	-1.642			SD of Logged Detects	0.225			
646												
647	**Warning: Data set has only 3 Detected Values.**											
648	**This is not enough to compute meaningful or reliable statistics and estimates.**											
649												
650												
651	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
652	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
653	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
654	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
655												
656	**Normal GOF Test on Detects Only**											
657				Shapiro Wilk Test Statistic	0.923			**Shapiro Wilk GOF Test**				
658				5% Shapiro Wilk Critical Value	0.767			Detected Data appear Normal at 5% Significance Level				
659				Lilliefors Test Statistic	0.292			**Lilliefors GOF Test**				
660				5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level				
661	**Detected Data appear Normal at 5% Significance Level**											
662												
663	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
664				KM Mean	0.183			KM Standard Error of Mean	0.0235			
665				KM SD	0.0383			95% KM (BCA) UCL	N/A			
666				95% KM (t) UCL	0.227			95% KM (Percentile Bootstrap) UCL	N/A			
667				95% KM (z) UCL	0.221			95% KM Bootstrap t UCL	N/A			
668				90% KM Chebyshev UCL	0.253			95% KM Chebyshev UCL	0.285			
669				97.5% KM Chebyshev UCL	0.329			99% KM Chebyshev UCL	0.416			
670												
671	**Gamma GOF Tests on Detected Observations Only**											
672	**Not Enough Data to Perform GOF Test**											
673												
674	**Gamma Statistics on Detected Data Only**											
675				k hat (MLE)	30.96			k star (bias corrected MLE)	N/A			
676				Theta hat (MLE)	0.00635			Theta star (bias corrected MLE)	N/A			

677					nu hat (MLE)	185.8				nu star (bias corrected)		N/A
678					Mean (detects)	0.197						
679												
680					**Gamma ROS Statistics using Imputed Non-Detects**							
681					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
682					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
683					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
684					This is especially true when the sample size is small.							
685					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
686					Minimum	0.0936				Mean		0.171
687					Maximum	0.23				Median		0.17
688					SD	0.0479				CV		0.28
689					k hat (MLE)	13.02				k star (bias corrected MLE)		8.224
690					Theta hat (MLE)	0.0131				Theta star (bias corrected MLE)		0.0208
691					nu hat (MLE)	208.4				nu star (bias corrected)		131.6
692					Adjusted Level of Significance (β)	0.0195						
693					Approximate Chi Square Value (131.58, α)	106.1				Adjusted Chi Square Value (131.58, β)		100.3
694					95% Gamma Approximate UCL (use when n>=50)	0.212				95% Gamma Adjusted UCL (use when n<50)		N/A
695												
696					**Estimates of Gamma Parameters using KM Estimates**							
697					Mean (KM)	0.183				SD (KM)		0.0383
698					Variance (KM)	0.00147				SE of Mean (KM)		0.0235
699					k hat (KM)	22.68				k star (KM)		14.26
700					nu hat (KM)	362.8				nu star (KM)		228.1
701					theta hat (KM)	0.00805				theta star (KM)		0.0128
702					80% gamma percentile (KM)	0.221				90% gamma percentile (KM)		0.247
703					95% gamma percentile (KM)	0.269				99% gamma percentile (KM)		0.313
704												
705					**Gamma Kaplan-Meier (KM) Statistics**							
706					Approximate Chi Square Value (228.10, α)	194.1				Adjusted Chi Square Value (228.10, β)		186.2
707					95% Gamma Approximate KM-UCL (use when n>=50)	0.214				95% Gamma Adjusted KM-UCL (use when n<50)		0.224
708												
709					**Lognormal GOF Test on Detected Observations Only**							
710					Shapiro Wilk Test Statistic	0.901				**Shapiro Wilk GOF Test**		
711					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
712					Lilliefors Test Statistic	0.309				**Lilliefors GOF Test**		
713					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
714					**Detected Data appear Lognormal at 5% Significance Level**							
715												
716					**Lognormal ROS Statistics Using Imputed Non-Detects**							
717					Mean in Original Scale	0.173				Mean in Log Scale		-1.788
718					SD in Original Scale	0.0446				SD in Log Scale		0.272
719					95% t UCL (assumes normality of ROS data)	0.203				95% Percentile Bootstrap UCL		0.197
720					95% BCA Bootstrap UCL	0.198				95% Bootstrap t UCL		0.201
721					95% H-UCL (Log ROS)	0.214						
722												
723					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
724					KM Mean (logged)	-1.723				KM Geo Mean		0.178
725					KM SD (logged)	0.212				95% Critical H Value (KM-Log)		1.956
726					KM Standard Error of Mean (logged)	0.13				95% H-UCL (KM -Log)		0.214
727					KM SD (logged)	0.212				95% Critical H Value (KM-Log)		1.956
728					KM Standard Error of Mean (logged)	0.13						

729												
730	**DL/2 Statistics**											
731	**DL/2 Normal**						**DL/2 Log-Transformed**					
732					Mean in Original Scale	0.248				Mean in Log Scale	-1.607	
733					SD in Original Scale	0.209				SD in Log Scale	0.65	
734					95% t UCL (Assumes normality)	0.387				95% H-Stat UCL	0.473	
735	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
736												
737	**Nonparametric Distribution Free UCL Statistics**											
738	**Detected Data appear Normal Distributed at 5% Significance Level**											
739												
740	**Suggested UCL to Use**											
741					95% KM (t) UCL	0.227						
742												
743	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
744	Recommendations are based upon data size, data distribution, and skewness.											
745	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
746	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
747												
748												
749	**Antimony (nfmw22)**											
750												
751	**General Statistics**											
752					Total Number of Observations	4				Number of Distinct Observations	4	
753										Number of Missing Observations	0	
754					Minimum	0.54				Mean	0.61	
755					Maximum	0.68				Median	0.61	
756					SD	0.0577				Std. Error of Mean	0.0289	
757					Coefficient of Variation	0.0946				Skewness	5.559E-15	
758												
759	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
760	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
761	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
762	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
763												
764	**Normal GOF Test**											
765					Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk GOF Test**					
766					5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level					
767					Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**					
768					5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level					
769	**Data appear Normal at 5% Significance Level**											
770												
771	**Assuming Normal Distribution**											
772	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
773					95% Student's-t UCL	0.678				95% Adjusted-CLT UCL (Chen-1995)	0.657	
774										95% Modified-t UCL (Johnson-1978)	0.678	
775												
776	**Gamma GOF Test**											
777					A-D Test Statistic	0.218	**Anderson-Darling Gamma GOF Test**					
778					5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level					
779					K-S Test Statistic	0.181	**Kolmogorov-Smirnov Gamma GOF Test**					
780					5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level					

781	**Detected data appear Gamma Distributed at 5% Significance Level**											
782												
783	**Gamma Statistics**											
784						k hat (MLE)	148			k star (bias corrected MLE)	37.18	
785						Theta hat (MLE)	0.00412			Theta star (bias corrected MLE)	0.0164	
786						nu hat (MLE)	1184			nu star (bias corrected)	297.4	
787						MLE Mean (bias corrected)	0.61			MLE Sd (bias corrected)	0.1	
788										Approximate Chi Square Value (0.05)	258.5	
789						Adjusted Level of Significance	N/A			Adjusted Chi Square Value	N/A	
790												
791	**Assuming Gamma Distribution**											
792					95% Approximate Gamma UCL (use when n>=50))		0.702			95% Adjusted Gamma UCL (use when n<50)	N/A	
793												
794	**Lognormal GOF Test**											
795						Shapiro Wilk Test Statistic	0.99			**Shapiro Wilk Lognormal GOF Test**		
796						5% Shapiro Wilk Critical Value	0.748			Data appear Lognormal at 5% Significance Level		
797						Lilliefors Test Statistic	0.195			**Lilliefors Lognormal GOF Test**		
798						5% Lilliefors Critical Value	0.375			Data appear Lognormal at 5% Significance Level		
799	**Data appear Lognormal at 5% Significance Level**											
800												
801	**Lognormal Statistics**											
802						Minimum of Logged Data	-0.616			Mean of logged Data	-0.498	
803						Maximum of Logged Data	-0.386			SD of logged Data	0.0951	
804												
805	**Assuming Lognormal Distribution**											
806						95% H-UCL	N/A			90% Chebyshev (MVUE) UCL	0.697	
807						95% Chebyshev (MVUE) UCL	0.736			97.5% Chebyshev (MVUE) UCL	0.791	
808						99% Chebyshev (MVUE) UCL	0.899					
809												
810	**Nonparametric Distribution Free UCL Statistics**											
811	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
812												
813	**Nonparametric Distribution Free UCLs**											
814						95% CLT UCL	0.657			95% Jackknife UCL	0.678	
815						95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL	N/A	
816						95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL	N/A	
817						95% BCA Bootstrap UCL	N/A					
818						90% Chebyshev(Mean, Sd) UCL	0.697			95% Chebyshev(Mean, Sd) UCL	0.736	
819						97.5% Chebyshev(Mean, Sd) UCL	0.79			99% Chebyshev(Mean, Sd) UCL	0.897	
820												
821	**Suggested UCL to Use**											
822						95% Student's-t UCL	0.678					
823												
824	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
825	Recommendations are based upon data size, data distribution, and skewness.											
826	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
827	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
828												
829												
830	**Antimony (nfmw23)**											
831												
832	**General Statistics**											

833	Total Number of Observations				4	Number of Distinct Observations						4
834						Number of Missing Observations						0
835	Minimum				0.94	Mean						0.988
836	Maximum				1.1	Median						0.955
837	SD				0.0754	Std. Error of Mean						0.0377
838	Coefficient of Variation				0.0764	Skewness						1.93
839												
840	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
841	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
842	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
843	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
844												
845	**Normal GOF Test**											
846	Shapiro Wilk Test Statistic				0.73	**Shapiro Wilk GOF Test**						
847	5% Shapiro Wilk Critical Value				0.748	Data Not Normal at 5% Significance Level						
848	Lilliefors Test Statistic				0.392	**Lilliefors GOF Test**						
849	5% Lilliefors Critical Value				0.375	Data Not Normal at 5% Significance Level						
850	**Data Not Normal at 5% Significance Level**											
851												
852	**Assuming Normal Distribution**											
853	**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**						
854	95% Student's-t UCL				1.076	95% Adjusted-CLT UCL (Chen-1995)						1.088
855						95% Modified-t UCL (Johnson-1978)						1.082
856												
857	**Gamma GOF Test**											
858	A-D Test Statistic				0.715	**Anderson-Darling Gamma GOF Test**						
859	5% A-D Critical Value				0.657	Data Not Gamma Distributed at 5% Significance Level						
860	K-S Test Statistic				0.41	**Kolmogorov-Smirnov Gamma GOF Test**						
861	5% K-S Critical Value				0.394	Data Not Gamma Distributed at 5% Significance Level						
862	**Data Not Gamma Distributed at 5% Significance Level**											
863												
864	**Gamma Statistics**											
865	k hat (MLE)				239.2	k star (bias corrected MLE)						59.98
866	Theta hat (MLE)				0.00413	Theta star (bias corrected MLE)						0.0165
867	nu hat (MLE)				1914	nu star (bias corrected)						479.8
868	MLE Mean (bias corrected)				0.988	MLE Sd (bias corrected)						0.128
869						Approximate Chi Square Value (0.05)						430
870	Adjusted Level of Significance				N/A	Adjusted Chi Square Value						N/A
871												
872	**Assuming Gamma Distribution**											
873	95% Approximate Gamma UCL (use when n>=50))				1.102	95% Adjusted Gamma UCL (use when n<50)						N/A
874												
875	**Lognormal GOF Test**											
876	Shapiro Wilk Test Statistic				0.737	**Shapiro Wilk Lognormal GOF Test**						
877	5% Shapiro Wilk Critical Value				0.748	Data Not Lognormal at 5% Significance Level						
878	Lilliefors Test Statistic				0.388	**Lilliefors Lognormal GOF Test**						
879	5% Lilliefors Critical Value				0.375	Data Not Lognormal at 5% Significance Level						
880	**Data Not Lognormal at 5% Significance Level**											
881												
882	**Lognormal Statistics**											
883	Minimum of Logged Data				-0.0619	Mean of logged Data						-0.0147
884	Maximum of Logged Data				0.0953	SD of logged Data						0.0738

885												
886	**Assuming Lognormal Distribution**											
887					95% H-UCL	N/A			90% Chebyshev (MVUE) UCL	1.097		
888					95% Chebyshev (MVUE) UCL	1.146			97.5% Chebyshev (MVUE) UCL	1.215		
889					99% Chebyshev (MVUE) UCL	1.35						
890												
891	**Nonparametric Distribution Free UCL Statistics**											
892	**Data do not follow a Discernible Distribution (0.05)**											
893												
894	**Nonparametric Distribution Free UCLs**											
895					95% CLT UCL	1.05			95% Jackknife UCL	1.076		
896					95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL	N/A		
897					95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL	N/A		
898					95% BCA Bootstrap UCL	N/A						
899					90% Chebyshev(Mean, Sd) UCL	1.101			95% Chebyshev(Mean, Sd) UCL	1.152		
900					97.5% Chebyshev(Mean, Sd) UCL	1.223			99% Chebyshev(Mean, Sd) UCL	1.363		
901												
902	**Suggested UCL to Use**											
903					95% Student's-t UCL	1.076			or 95% Modified-t UCL	1.082		
904												
905	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
906	Recommendations are based upon data size, data distribution, and skewness.											
907	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
908	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
909												
910	**Antimony (nfmw3)**											
911												
912	**General Statistics**											
913					Total Number of Observations	9			Number of Distinct Observations	9		
914					Number of Detects	4			Number of Non-Detects	5		
915					Number of Distinct Detects	4			Number of Distinct Non-Detects	5		
916					Minimum Detect	0.11			Minimum Non-Detect	0.25		
917					Maximum Detect	0.18			Maximum Non-Detect	1.5		
918					Variance Detects	0.00109			Percent Non-Detects	55.56%		
919					Mean Detects	0.143			SD Detects	0.033		
920					Median Detects	0.14			CV Detects	0.232		
921					Skewness Detects	0.229			Kurtosis Detects	-3.869		
922					Mean of Logged Detects	-1.969			SD of Logged Detects	0.233		
923												
924	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
925	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
926	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
927	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
928												
929	**Normal GOF Test on Detects Only**											
930					Shapiro Wilk Test Statistic	0.917			**Shapiro Wilk GOF Test**			
931					5% Shapiro Wilk Critical Value	0.748			Detected Data appear Normal at 5% Significance Level			
932					Lilliefors Test Statistic	0.252			**Lilliefors GOF Test**			
933					5% Lilliefors Critical Value	0.375			Detected Data appear Normal at 5% Significance Level			
934	**Detected Data appear Normal at 5% Significance Level**											
935												
936	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											

	A	B	C	D	E	F	G	H	I	J	K	L
937					KM Mean	0.143				KM Standard Error of Mean		0.0165
938					KM SD	0.0286				95% KM (BCA) UCL		N/A
939					95% KM (t) UCL	0.173				95% KM (Percentile Bootstrap) UCL		N/A
940					95% KM (z) UCL	0.17				95% KM Bootstrap t UCL		N/A
941					90% KM Chebyshev UCL	0.192				95% KM Chebyshev UCL		0.215
942					97.5% KM Chebyshev UCL	0.246				99% KM Chebyshev UCL		0.307
943												
944					**Gamma GOF Tests on Detected Observations Only**							
945					A-D Test Statistic	0.346	**Anderson-Darling GOF Test**					
946					5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level					
947					K-S Test Statistic	0.277	**Kolmogorov-Smirnov GOF**					
948					5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level					
949					**Detected data appear Gamma Distributed at 5% Significance Level**							
950												
951					**Gamma Statistics on Detected Data Only**							
952					k hat (MLE)	24.78	k star (bias corrected MLE)					6.361
953					Theta hat (MLE)	0.00575	Theta star (bias corrected MLE)					0.0224
954					nu hat (MLE)	198.2	nu star (bias corrected)					50.89
955					Mean (detects)	0.143						
956												
957					**Gamma ROS Statistics using Imputed Non-Detects**							
958					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
959					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
960					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
961					This is especially true when the sample size is small.							
962					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
963					Minimum	0.11	Mean					0.142
964					Maximum	0.18	Median					0.141
965					SD	0.0202	CV					0.143
966					k hat (MLE)	55.49	k star (bias corrected MLE)					37.07
967					Theta hat (MLE)	0.00256	Theta star (bias corrected MLE)					0.00383
968					nu hat (MLE)	998.8	nu star (bias corrected)					667.2
969					Adjusted Level of Significance (β)	0.0231						
970					Approximate Chi Square Value (667.21, α)	608.3	Adjusted Chi Square Value (667.21, β)					596.4
971					95% Gamma Approximate UCL (use when n>=50)	0.156	95% Gamma Adjusted UCL (use when n<50)					N/A
972												
973					**Estimates of Gamma Parameters using KM Estimates**							
974					Mean (KM)	0.143	SD (KM)					0.0286
975					Variance (KM)	8.1875E-4	SE of Mean (KM)					0.0165
976					k hat (KM)	24.8	k star (KM)					16.61
977					nu hat (KM)	446.4	nu star (KM)					299
978					theta hat (KM)	0.00575	theta star (KM)					0.00858
979					80% gamma percentile (KM)	0.171	90% gamma percentile (KM)					0.189
980					95% gamma percentile (KM)	0.204	99% gamma percentile (KM)					0.236
981												
982					**Gamma Kaplan-Meier (KM) Statistics**							
983					Approximate Chi Square Value (298.95, α)	259.9	Adjusted Chi Square Value (298.95, β)					252.2
984					95% Gamma Approximate KM-UCL (use when n>=50)	0.164	95% Gamma Adjusted KM-UCL (use when n<50)					0.169
985												
986					**Lognormal GOF Test on Detected Observations Only**							
987					Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk GOF Test**					
988					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level					

989					Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**					
990					5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level					
991	**Detected Data appear Lognormal at 5% Significance Level**											
992												
993	**Lognormal ROS Statistics Using Imputed Non-Detects**											
994					Mean in Original Scale	0.141	Mean in Log Scale	-1.969				
995					SD in Original Scale	0.0203	SD in Log Scale	0.143				
996					95% t UCL (assumes normality of ROS data)	0.153	95% Percentile Bootstrap UCL	0.151				
997					95% BCA Bootstrap UCL	0.152	95% Bootstrap t UCL	0.155				
998					95% H-UCL (Log ROS)	0.155						
999												
1000	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1001					KM Mean (logged)	-1.969	KM Geo Mean	0.14				
1002					KM SD (logged)	0.202	95% Critical H Value (KM-Log)	1.91				
1003					KM Standard Error of Mean (logged)	0.117	95% H-UCL (KM -Log)	0.163				
1004					KM SD (logged)	0.202	95% Critical H Value (KM-Log)	1.91				
1005					KM Standard Error of Mean (logged)	0.117						
1006												
1007	**DL/2 Statistics**											
1008	**DL/2 Normal**						**DL/2 Log-Transformed**					
1009					Mean in Original Scale	0.242	Mean in Log Scale	-1.614				
1010					SD in Original Scale	0.2	SD in Log Scale	0.596				
1011					95% t UCL (Assumes normality)	0.366	95% H-Stat UCL	0.396				
1012	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1013												
1014	**Nonparametric Distribution Free UCL Statistics**											
1015	**Detected Data appear Normal Distributed at 5% Significance Level**											
1016												
1017	**Suggested UCL to Use**											
1018					95% KM (t) UCL	0.173						
1019												
1020	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1021	Recommendations are based upon data size, data distribution, and skewness.											
1022	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1023	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1024												
1025	**Antimony (nfmw4)**											
1026												
1027	**General Statistics**											
1028					Total Number of Observations	9	Number of Distinct Observations	8				
1029					Number of Detects	6	Number of Non-Detects	3				
1030					Number of Distinct Detects	5	Number of Distinct Non-Detects	3				
1031					Minimum Detect	0.13	Minimum Non-Detect	0.25				
1032					Maximum Detect	0.23	Maximum Non-Detect	1.5				
1033					Variance Detects	0.00219	Percent Non-Detects	33.33%				
1034					Mean Detects	0.175	SD Detects	0.0468				
1035					Median Detects	0.17	CV Detects	0.267				
1036					Skewness Detects	0.141	Kurtosis Detects	-2.843				
1037					Mean of Logged Detects	-1.773	SD of Logged Detects	0.271				
1038												
1039	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1040	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											

1041	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1042	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1043												
1044	Normal GOF Test on Detects Only											
1045					Shapiro Wilk Test Statistic	0.821	Shapiro Wilk GOF Test					
1046					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
1047					Lilliefors Test Statistic	0.273	Lilliefors GOF Test					
1048					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
1049	Detected Data appear Normal at 5% Significance Level											
1050												
1051	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
1052					KM Mean	0.175	KM Standard Error of Mean	0.0191				
1053					KM SD	0.0427	95% KM (BCA) UCL	0.203				
1054					95% KM (t) UCL	0.211	95% KM (Percentile Bootstrap) UCL	0.205				
1055					95% KM (z) UCL	0.206	95% KM Bootstrap t UCL	0.215				
1056					90% KM Chebyshev UCL	0.232	95% KM Chebyshev UCL	0.258				
1057					97.5% KM Chebyshev UCL	0.294	99% KM Chebyshev UCL	0.365				
1058												
1059	Gamma GOF Tests on Detected Observations Only											
1060					A-D Test Statistic	0.627	Anderson-Darling GOF Test					
1061					5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level					
1062					K-S Test Statistic	0.287	Kolmogorov-Smirnov GOF					
1063					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
1064	Detected data appear Gamma Distributed at 5% Significance Level											
1065												
1066	Gamma Statistics on Detected Data Only											
1067					k hat (MLE)	16.65	k star (bias corrected MLE)	8.436				
1068					Theta hat (MLE)	0.0105	Theta star (bias corrected MLE)	0.0207				
1069					nu hat (MLE)	199.8	nu star (bias corrected)	101.2				
1070					Mean (detects)	0.175						
1071												
1072	Gamma ROS Statistics using Imputed Non-Detects											
1073	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1074	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1075	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1076	This is especially true when the sample size is small.											
1077	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1078					Minimum	0.13	Mean	0.174				
1079					Maximum	0.23	Median	0.173				
1080					SD	0.037	CV	0.212				
1081					k hat (MLE)	24.87	k star (bias corrected MLE)	16.65				
1082					Theta hat (MLE)	0.00701	Theta star (bias corrected MLE)	0.0105				
1083					nu hat (MLE)	447.6	nu star (bias corrected)	299.8				
1084					Adjusted Level of Significance (β)	0.0231						
1085					Approximate Chi Square Value (299.77, α)	260.7	Adjusted Chi Square Value (299.77, β)	253				
1086					95% Gamma Approximate UCL (use when n>=50)	0.2	95% Gamma Adjusted UCL (use when n<50)	0.206				
1087												
1088	Estimates of Gamma Parameters using KM Estimates											
1089					Mean (KM)	0.175	SD (KM)	0.0427				
1090					Variance (KM)	0.00183	SE of Mean (KM)	0.0191				
1091					k hat (KM)	16.78	k star (KM)	11.26				
1092					nu hat (KM)	302.1	nu star (KM)	202.7				

	A	B	C	D	E	F	G	H	I	J	K	L
1093					theta hat (KM)	0.0104				theta star (KM)		0.0155
1094					80% gamma percentile (KM)	0.217				90% gamma percentile (KM)		0.244
1095					95% gamma percentile (KM)	0.269				99% gamma percentile (KM)		0.319
1096												
1097					**Gamma Kaplan-Meier (KM) Statistics**							
1098					Approximate Chi Square Value (202.70, α)	170.8				Adjusted Chi Square Value (202.70, β)		164.6
1099					95% Gamma Approximate KM-UCL (use when n>=50)	0.208				95% Gamma Adjusted KM-UCL (use when n<50)		0.216
1100												
1101					**Lognormal GOF Test on Detected Observations Only**							
1102					Shapiro Wilk Test Statistic	0.814				**Shapiro Wilk GOF Test**		
1103					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
1104					Lilliefors Test Statistic	0.262				**Lilliefors GOF Test**		
1105					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
1106					**Detected Data appear Lognormal at 5% Significance Level**							
1107												
1108					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1109					Mean in Original Scale	0.173				Mean in Log Scale		-1.773
1110					SD in Original Scale	0.0371				SD in Log Scale		0.214
1111					95% t UCL (assumes normality of ROS data)	0.196				95% Percentile Bootstrap UCL		0.193
1112					95% BCA Bootstrap UCL	0.193				95% Bootstrap t UCL		0.199
1113					95% H-UCL (Log ROS)	0.201						
1114												
1115					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1116					KM Mean (logged)	-1.773				KM Geo Mean		0.17
1117					KM SD (logged)	0.247				95% Critical H Value (KM-Log)		1.954
1118					KM Standard Error of Mean (logged)	0.11				95% H-UCL (KM -Log)		0.208
1119					KM SD (logged)	0.247				95% Critical H Value (KM-Log)		1.954
1120					KM Standard Error of Mean (logged)	0.11						
1121												
1122					**DL/2 Statistics**							
1123					**DL/2 Normal**					**DL/2 Log-Transformed**		
1124					Mean in Original Scale	0.242				Mean in Log Scale		-1.599
1125					SD in Original Scale	0.197				SD in Log Scale		0.564
1126					95% t UCL (Assumes normality)	0.364				95% H-Stat UCL		0.378
1127					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1128												
1129					**Nonparametric Distribution Free UCL Statistics**							
1130					**Detected Data appear Normal Distributed at 5% Significance Level**							
1131												
1132					**Suggested UCL to Use**							
1133					95% KM (t) UCL	0.211						
1134												
1135					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1136					Recommendations are based upon data size, data distribution, and skewness.							
1137					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1138					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1139												
1140												
1141	**Antimony (nfmw7)**											
1142												
1143					**General Statistics**							
1144					Total Number of Observations	9				Number of Distinct Observations		6

1145											Number of Missing Observations	0
1146					Minimum	0.84					Mean	1.19
1147					Maximum	2.5					Median	0.98
1148					SD	0.539					Std. Error of Mean	0.18
1149					Coefficient of Variation	0.453					Skewness	2.164
1150												
1151	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1152	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1153	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1154	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1155												
1156	**Normal GOF Test**											
1157					Shapiro Wilk Test Statistic	0.692	**Shapiro Wilk GOF Test**					
1158					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
1159					Lilliefors Test Statistic	0.318	**Lilliefors GOF Test**					
1160					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
1161	**Data Not Normal at 5% Significance Level**											
1162												
1163	**Assuming Normal Distribution**											
1164	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1165					95% Student's-t UCL	1.524					95% Adjusted-CLT UCL (Chen-1995)	1.624
1166											95% Modified-t UCL (Johnson-1978)	1.546
1167												
1168	**Gamma GOF Test**											
1169					A-D Test Statistic	0.991	**Anderson-Darling Gamma GOF Test**					
1170					5% A-D Critical Value	0.722	Data Not Gamma Distributed at 5% Significance Level					
1171					K-S Test Statistic	0.32	**Kolmogorov-Smirnov Gamma GOF Test**					
1172					5% K-S Critical Value	0.28	Data Not Gamma Distributed at 5% Significance Level					
1173	**Data Not Gamma Distributed at 5% Significance Level**											
1174												
1175	**Gamma Statistics**											
1176					k hat (MLE)	7.548					k star (bias corrected MLE)	5.106
1177					Theta hat (MLE)	0.158					Theta star (bias corrected MLE)	0.233
1178					nu hat (MLE)	135.9					nu star (bias corrected)	91.91
1179					MLE Mean (bias corrected)	1.19					MLE Sd (bias corrected)	0.527
1180											Approximate Chi Square Value (0.05)	70.81
1181					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	66.91
1182												
1183	**Assuming Gamma Distribution**											
1184					95% Approximate Gamma UCL (use when n>=50))	1.545					95% Adjusted Gamma UCL (use when n<50)	1.635
1185												
1186	**Lognormal GOF Test**											
1187					Shapiro Wilk Test Statistic	0.778	**Shapiro Wilk Lognormal GOF Test**					
1188					5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level					
1189					Lilliefors Test Statistic	0.303	**Lilliefors Lognormal GOF Test**					
1190					5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level					
1191	**Data Not Lognormal at 5% Significance Level**											
1192												
1193	**Lognormal Statistics**											
1194					Minimum of Logged Data	-0.174					Mean of logged Data	0.106
1195					Maximum of Logged Data	0.916					SD of logged Data	0.363
1196												

1197	**Assuming Lognormal Distribution**											
1198					95% H-UCL	1.553			90% Chebyshev (MVUE) UCL	1.61		
1199					95% Chebyshev (MVUE) UCL	1.806			97.5% Chebyshev (MVUE) UCL	2.077		
1200					99% Chebyshev (MVUE) UCL	2.61						
1201												
1202	**Nonparametric Distribution Free UCL Statistics**											
1203	**Data do not follow a Discernible Distribution (0.05)**											
1204												
1205	**Nonparametric Distribution Free UCLs**											
1206					95% CLT UCL	1.485			95% Jackknife UCL	1.524		
1207					95% Standard Bootstrap UCL	1.476			95% Bootstrap-t UCL	1.921		
1208					95% Hall's Bootstrap UCL	2.37			95% Percentile Bootstrap UCL	1.489		
1209					95% BCA Bootstrap UCL	1.659						
1210					90% Chebyshev(Mean, Sd) UCL	1.729			95% Chebyshev(Mean, Sd) UCL	1.973		
1211					97.5% Chebyshev(Mean, Sd) UCL	2.312			99% Chebyshev(Mean, Sd) UCL	2.977		
1212												
1213	**Suggested UCL to Use**											
1214					95% Student's-t UCL	1.524			or 95% Modified-t UCL	1.546		
1215												
1216	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1217	Recommendations are based upon data size, data distribution, and skewness.											
1218	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1219	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1220												
1221	**Antimony (nfmw8)**											
1222												
1223	**General Statistics**											
1224					Total Number of Observations	8			Number of Distinct Observations	7		
1225					Number of Detects	2			Number of Non-Detects	6		
1226					Number of Distinct Detects	2			Number of Distinct Non-Detects	5		
1227					Minimum Detect	0.073			Minimum Non-Detect	0.077		
1228					Maximum Detect	0.089			Maximum Non-Detect	1.5		
1229					Variance Detects	1.2800E-4			Percent Non-Detects	75%		
1230					Mean Detects	0.081			SD Detects	0.0113		
1231					Median Detects	0.081			CV Detects	0.14		
1232					Skewness Detects	N/A			Kurtosis Detects	N/A		
1233					Mean of Logged Detects	-2.518			SD of Logged Detects	0.14		
1234												
1235	**Warning: Data set has only 2 Detected Values.**											
1236	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1237												
1238												
1239	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1240	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1241	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1242	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1243												
1244	**Normal GOF Test on Detects Only**											
1245	**Not Enough Data to Perform GOF Test**											
1246												
1247	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1248					KM Mean	0.077			KM Standard Error of Mean	0.0049		

1249					KM SD	0.00693				95% KM (BCA) UCL		N/A
1250					95% KM (t) UCL	0.0863				95% KM (Percentile Bootstrap) UCL		N/A
1251					95% KM (z) UCL	0.0851				95% KM Bootstrap t UCL		N/A
1252					90% KM Chebyshev UCL	0.0917				95% KM Chebyshev UCL		0.0984
1253					97.5% KM Chebyshev UCL	0.108				99% KM Chebyshev UCL		0.126
1254												
1255					**Gamma GOF Tests on Detected Observations Only**							
1256					**Not Enough Data to Perform GOF Test**							
1257												
1258					**Gamma Statistics on Detected Data Only**							
1259					k hat (MLE)	102.2				k star (bias corrected MLE)		N/A
1260					Theta hat (MLE)	7.9271E-4				Theta star (bias corrected MLE)		N/A
1261					nu hat (MLE)	408.7				nu star (bias corrected)		N/A
1262					Mean (detects)	0.081						
1263												
1264					**Estimates of Gamma Parameters using KM Estimates**							
1265					Mean (KM)	0.077				SD (KM)		0.00693
1266					Variance (KM)	4.8000E-5				SE of Mean (KM)		0.0049
1267					k hat (KM)	123.5				k star (KM)		77.28
1268					nu hat (KM)	1976				nu star (KM)		1237
1269					theta hat (KM)	6.2338E-4				theta star (KM)		9.9633E-4
1270					80% gamma percentile (KM)	0.0843				90% gamma percentile (KM)		0.0884
1271					95% gamma percentile (KM)	0.092				99% gamma percentile (KM)		0.0988
1272												
1273					**Gamma Kaplan-Meier (KM) Statistics**							
1274										Adjusted Level of Significance (β)		0.0195
1275					Approximate Chi Square Value (N/A, α)	1156				Adjusted Chi Square Value (N/A, β)		1136
1276					95% Gamma Approximate KM-UCL (use when n>=50)	0.0824				95% Gamma Adjusted KM-UCL (use when n<50)		0.0838
1277												
1278					**Lognormal GOF Test on Detected Observations Only**							
1279					**Not Enough Data to Perform GOF Test**							
1280												
1281					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1282					Mean in Original Scale	0.0766				Mean in Log Scale		-2.571
1283					SD in Original Scale	0.00576				SD in Log Scale		0.072
1284					95% t UCL (assumes normality of ROS data)	0.0805				95% Percentile Bootstrap UCL		0.0802
1285					95% BCA Bootstrap UCL	0.0812				95% Bootstrap t UCL		0.087
1286					95% H-UCL (Log ROS)	N/A						
1287												
1288					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1289					KM Mean (logged)	-2.568				KM Geo Mean		0.0767
1290					KM SD (logged)	0.0858				95% Critical H Value (KM-Log)		N/A
1291					KM Standard Error of Mean (logged)	0.0607				95% H-UCL (KM -Log)		N/A
1292					KM SD (logged)	0.0858				95% Critical H Value (KM-Log)		N/A
1293					KM Standard Error of Mean (logged)	0.0607						
1294												
1295					**DL/2 Statistics**							
1296					**DL/2 Normal**					**DL/2 Log-Transformed**		
1297					Mean in Original Scale	0.257				Mean in Log Scale		-2.024
1298					SD in Original Scale	0.312				SD in Log Scale		1.213
1299					95% t UCL (Assumes normality)	0.466				95% H-Stat UCL		1.701
1300					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							

1301												
1302	**Nonparametric Distribution Free UCL Statistics**											
1303	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1304												
1305	**Suggested UCL to Use**											
1306					95% KM (t) UCL	0.0863			KM H-UCL	N/A		
1307					95% KM (BCA) UCL	N/A						
1308	**Warning: One or more Recommended UCL(s) not available!**											
1309												
1310	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1311	Recommendations are based upon data size, data distribution, and skewness.											
1312	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1313	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1314												
1315	**Antimony (nfmw9)**											
1316												
1317	**General Statistics**											
1318					Total Number of Observations	8			Number of Distinct Observations	8		
1319					Number of Detects	5			Number of Non-Detects	3		
1320					Number of Distinct Detects	5			Number of Distinct Non-Detects	3		
1321					Minimum Detect	0.48			Minimum Non-Detect	0.33		
1322					Maximum Detect	1.1			Maximum Non-Detect	1.5		
1323					Variance Detects	0.0599			Percent Non-Detects	37.5%		
1324					Mean Detects	0.686			SD Detects	0.245		
1325					Median Detects	0.65			CV Detects	0.357		
1326					Skewness Detects	1.658			Kurtosis Detects	3.058		
1327					Mean of Logged Detects	-0.421			SD of Logged Detects	0.32		
1328												
1329	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1330	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1331	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1332	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1333												
1334	**Normal GOF Test on Detects Only**											
1335					Shapiro Wilk Test Statistic	0.829			**Shapiro Wilk GOF Test**			
1336					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
1337					Lilliefors Test Statistic	0.326			**Lilliefors GOF Test**			
1338					5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			
1339	**Detected Data appear Normal at 5% Significance Level**											
1340												
1341	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1342					KM Mean	0.601			KM Standard Error of Mean	0.0997		
1343					KM SD	0.233			95% KM (BCA) UCL	0.76		
1344					95% KM (t) UCL	0.79			95% KM (Percentile Bootstrap) UCL	0.773		
1345					95% KM (z) UCL	0.765			95% KM Bootstrap t UCL	0.833		
1346					90% KM Chebyshev UCL	0.9			95% KM Chebyshev UCL	1.036		
1347					97.5% KM Chebyshev UCL	1.224			99% KM Chebyshev UCL	1.593		
1348												
1349	**Gamma GOF Tests on Detected Observations Only**											
1350					A-D Test Statistic	0.425			**Anderson-Darling GOF Test**			
1351					5% A-D Critical Value	0.679			Detected data appear Gamma Distributed at 5% Significance Level			
1352					K-S Test Statistic	0.292			**Kolmogorov-Smirnov GOF**			

	A	B	C	D	E	F	G	H	I	J	K	L
1353					5% K-S Critical Value	0.358	Detected data appear Gamma Distributed at 5% Significance Level					
1354	**Detected data appear Gamma Distributed at 5% Significance Level**											
1355												
1356	**Gamma Statistics on Detected Data Only**											
1357					k hat (MLE)	11.51				k star (bias corrected MLE)		4.736
1358					Theta hat (MLE)	0.0596				Theta star (bias corrected MLE)		0.145
1359					nu hat (MLE)	115.1				nu star (bias corrected)		47.36
1360					Mean (detects)	0.686						
1361												
1362	**Gamma ROS Statistics using Imputed Non-Detects**											
1363	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1364	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1365	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1366	This is especially true when the sample size is small.											
1367	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1368					Minimum	0.217				Mean		0.575
1369					Maximum	1.1				Median		0.544
1370					SD	0.257				CV		0.446
1371					k hat (MLE)	5.758				k star (bias corrected MLE)		3.682
1372					Theta hat (MLE)	0.0999				Theta star (bias corrected MLE)		0.156
1373					nu hat (MLE)	92.12				nu star (bias corrected)		58.91
1374					Adjusted Level of Significance (β)	0.0195						
1375					Approximate Chi Square Value (58.91, α)	42.26				Adjusted Chi Square Value (58.91, β)		38.72
1376					95% Gamma Approximate UCL (use when n>=50)	0.802				95% Gamma Adjusted UCL (use when n<50)		0.875
1377												
1378	**Estimates of Gamma Parameters using KM Estimates**											
1379					Mean (KM)	0.601				SD (KM)		0.233
1380					Variance (KM)	0.0543				SE of Mean (KM)		0.0997
1381					k hat (KM)	6.647				k star (KM)		4.238
1382					nu hat (KM)	106.4				nu star (KM)		67.8
1383					theta hat (KM)	0.0904				theta star (KM)		0.142
1384					80% gamma percentile (KM)	0.823				90% gamma percentile (KM)		0.992
1385					95% gamma percentile (KM)	1.147				99% gamma percentile (KM)		1.478
1386												
1387	**Gamma Kaplan-Meier (KM) Statistics**											
1388					Approximate Chi Square Value (67.80, α)	49.85				Adjusted Chi Square Value (67.80, β)		45.98
1389					95% Gamma Approximate KM-UCL (use when n>=50)	0.817				95% Gamma Adjusted KM-UCL (use when n<50)		0.886
1390												
1391	**Lognormal GOF Test on Detected Observations Only**											
1392					Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**					
1393					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level					
1394					Lilliefors Test Statistic	0.275	**Lilliefors GOF Test**					
1395					5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level					
1396	**Detected Data appear Lognormal at 5% Significance Level**											
1397												
1398	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1399					Mean in Original Scale	0.593				Mean in Log Scale		-0.584
1400					SD in Original Scale	0.235				SD in Log Scale		0.364
1401					95% t UCL (assumes normality of ROS data)	0.75				95% Percentile Bootstrap UCL		0.729
1402					95% BCA Bootstrap UCL	0.771				95% Bootstrap t UCL		0.83
1403					95% H-UCL (Log ROS)	0.8						
1404												

	A	B	C	D	E	F	G	H	I	J	K	L
1405	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1406					KM Mean (logged)	-0.577				KM Geo Mean		0.562
1407					KM SD (logged)	0.362				95% Critical H Value (KM-Log)		2.141
1408					KM Standard Error of Mean (logged)	0.158				95% H-UCL (KM -Log)		0.804
1409					KM SD (logged)	0.362				95% Critical H Value (KM-Log)		2.141
1410					KM Standard Error of Mean (logged)	0.158						
1411												
1412	**DL/2 Statistics**											
1413	**DL/2 Normal**						**DL/2 Log-Transformed**					
1414					Mean in Original Scale	0.579				Mean in Log Scale		-0.679
1415					SD in Original Scale	0.288				SD in Log Scale		0.594
1416					95% t UCL (Assumes normality)	0.772				95% H-Stat UCL		1.066
1417	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1418												
1419	**Nonparametric Distribution Free UCL Statistics**											
1420	**Detected Data appear Normal Distributed at 5% Significance Level**											
1421												
1422	**Suggested UCL to Use**											
1423					95% KM (t) UCL	0.79						
1424												
1425	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1426	Recommendations are based upon data size, data distribution, and skewness.											
1427	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1428	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1429												
1430	**Antimony (smw10)**											
1431												
1432	**General Statistics**											
1433					Total Number of Observations	8				Number of Distinct Observations		7
1434					Number of Detects	3				Number of Non-Detects		5
1435					Number of Distinct Detects	2				Number of Distinct Non-Detects		5
1436					Minimum Detect	0.56				Minimum Non-Detect		0.35
1437					Maximum Detect	0.57				Maximum Non-Detect		1.5
1438					Variance Detects	3.3333E-5				Percent Non-Detects		62.5%
1439					Mean Detects	0.563				SD Detects		0.00577
1440					Median Detects	0.56				CV Detects		0.0102
1441					Skewness Detects	1.732				Kurtosis Detects		N/A
1442					Mean of Logged Detects	-0.574				SD of Logged Detects		0.0102
1443												
1444	**Warning: Data set has only 3 Detected Values.**											
1445	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1446												
1447												
1448	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1449	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1450	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1451	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1452												
1453	**Normal GOF Test on Detects Only**											
1454					Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**					
1455					5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level					
1456					Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
1457				5% Lilliefors Critical Value		0.425	Detected Data appear Normal at 5% Significance Level					
1458	**Detected Data appear Approximate Normal at 5% Significance Level**											
1459												
1460	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1461				KM Mean		0.441	KM Standard Error of Mean					0.0489
1462				KM SD		0.106	95% KM (BCA) UCL					N/A
1463				95% KM (t) UCL		0.534	95% KM (Percentile Bootstrap) UCL					N/A
1464				95% KM (z) UCL		0.522	95% KM Bootstrap t UCL					N/A
1465				90% KM Chebyshev UCL		0.588	95% KM Chebyshev UCL					0.655
1466				97.5% KM Chebyshev UCL		0.747	99% KM Chebyshev UCL					0.928
1467												
1468	**Gamma GOF Tests on Detected Observations Only**											
1469	**Not Enough Data to Perform GOF Test**											
1470												
1471	**Gamma Statistics on Detected Data Only**											
1472				k hat (MLE)		14336	k star (bias corrected MLE)					N/A
1473				Theta hat (MLE)		3.9294E-5	Theta star (bias corrected MLE)					N/A
1474				nu hat (MLE)		86019	nu star (bias corrected)					N/A
1475				Mean (detects)		0.563						
1476												
1477	**Gamma ROS Statistics using Imputed Non-Detects**											
1478	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1479	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1480	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1481	This is especially true when the sample size is small.											
1482	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1483				Minimum		0.545	Mean					0.553
1484				Maximum		0.57	Median					0.548
1485				SD		0.00975	CV					0.0176
1486				k hat (MLE)		3696	k star (bias corrected MLE)					2310
1487				Theta hat (MLE)		1.4951E-4	Theta star (bias corrected MLE)					2.3920E-4
1488				nu hat (MLE)		59139	nu star (bias corrected)					36963
1489				Adjusted Level of Significance (β)		0.0195						
1490				Approximate Chi Square Value (N/A, α)		36517	Adjusted Chi Square Value (N/A, β)					36404
1491				95% Gamma Approximate UCL (use when n>=50)		0.559	95% Gamma Adjusted UCL (use when n<50)					N/A
1492												
1493	**Estimates of Gamma Parameters using KM Estimates**											
1494				Mean (KM)		0.441	SD (KM)					0.106
1495				Variance (KM)		0.0112	SE of Mean (KM)					0.0489
1496				k hat (KM)		17.47	k star (KM)					11
1497				nu hat (KM)		279.5	nu star (KM)					176
1498				theta hat (KM)		0.0253	theta star (KM)					0.0401
1499				80% gamma percentile (KM)		0.548	90% gamma percentile (KM)					0.618
1500				95% gamma percentile (KM)		0.681	99% gamma percentile (KM)					0.808
1501												
1502	**Gamma Kaplan-Meier (KM) Statistics**											
1503				Approximate Chi Square Value (176.02, α)		146.3	Adjusted Chi Square Value (176.02, β)					139.5
1504				95% Gamma Approximate KM-UCL (use when n>=50)		0.531	95% Gamma Adjusted KM-UCL (use when n<50)					0.557
1505												
1506	**Lognormal GOF Test on Detected Observations Only**											
1507				Shapiro Wilk Test Statistic		0.75	**Shapiro Wilk GOF Test**					
1508				5% Shapiro Wilk Critical Value		0.767	Detected Data Not Lognormal at 5% Significance Level					

1509					Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**					
1510					5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level					
1511	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
1512												
1513	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1514					Mean in Original Scale	0.553	Mean in Log Scale	-0.593				
1515					SD in Original Scale	0.00962	SD in Log Scale	0.0173				
1516					95% t UCL (assumes normality of ROS data)	0.559	95% Percentile Bootstrap UCL	N/A				
1517					95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A				
1518					95% H-UCL (Log ROS)	N/A						
1519												
1520	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1521					KM Mean (logged)	-0.846	KM Geo Mean	0.429				
1522					KM SD (logged)	0.236	95% Critical H Value (KM-Log)	1.982				
1523					KM Standard Error of Mean (logged)	0.109	95% H-UCL (KM -Log)	0.526				
1524					KM SD (logged)	0.236	95% Critical H Value (KM-Log)	1.982				
1525					KM Standard Error of Mean (logged)	0.109						
1526												
1527	**DL/2 Statistics**											
1528	**DL/2 Normal**						**DL/2 Log-Transformed**					
1529					Mean in Original Scale	0.403	Mean in Log Scale	-1.07				
1530					SD in Original Scale	0.23	SD in Log Scale	0.617				
1531					95% t UCL (Assumes normality)	0.557	95% H-Stat UCL	0.755				
1532	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1533												
1534	**Nonparametric Distribution Free UCL Statistics**											
1535	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
1536												
1537	**Suggested UCL to Use**											
1538					95% KM (t) UCL	0.534						
1539												
1540	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
1541	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
1542												
1543	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1544	Recommendations are based upon data size, data distribution, and skewness.											
1545	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1546	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1547												
1548	**Antimony (smw11)**											
1549												
1550	**General Statistics**											
1551					Total Number of Observations	9	Number of Distinct Observations	8				
1552					Number of Detects	7	Number of Non-Detects	2				
1553					Number of Distinct Detects	6	Number of Distinct Non-Detects	2				
1554					Minimum Detect	0.55	Minimum Non-Detect	0.42				
1555					Maximum Detect	0.87	Maximum Non-Detect	1.5				
1556					Variance Detects	0.0103	Percent Non-Detects	22.22%				
1557					Mean Detects	0.727	SD Detects	0.102				
1558					Median Detects	0.74	CV Detects	0.14				
1559					Skewness Detects	-0.488	Kurtosis Detects	0.966				
1560					Mean of Logged Detects	-0.327	SD of Logged Detects	0.146				

	A	B	C	D	E	F	G	H	I	J	K	L
1561												
1562	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1563	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1564	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1565	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1566												
1567	**Normal GOF Test on Detects Only**											
1568					Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**					
1569					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level					
1570					Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**					
1571					5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level					
1572	**Detected Data appear Normal at 5% Significance Level**											
1573												
1574	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1575					KM Mean	0.689	KM Standard Error of Mean	0.0513				
1576					KM SD	0.134	95% KM (BCA) UCL	0.76				
1577					95% KM (t) UCL	0.784	95% KM (Percentile Bootstrap) UCL	0.763				
1578					95% KM (z) UCL	0.773	95% KM Bootstrap t UCL	0.764				
1579					90% KM Chebyshev UCL	0.843	95% KM Chebyshev UCL	0.912				
1580					97.5% KM Chebyshev UCL	1.009	99% KM Chebyshev UCL	1.199				
1581												
1582	**Gamma GOF Tests on Detected Observations Only**											
1583					A-D Test Statistic	0.276	**Anderson-Darling GOF Test**					
1584					5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level					
1585					K-S Test Statistic	0.182	**Kolmogorov-Smirnov GOF**					
1586					5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level					
1587	**Detected data appear Gamma Distributed at 5% Significance Level**											
1588												
1589	**Gamma Statistics on Detected Data Only**											
1590					k hat (MLE)	56.67	k star (bias corrected MLE)	32.48				
1591					Theta hat (MLE)	0.0128	Theta star (bias corrected MLE)	0.0224				
1592					nu hat (MLE)	793.4	nu star (bias corrected)	454.7				
1593					Mean (detects)	0.727						
1594												
1595	**Gamma ROS Statistics using Imputed Non-Detects**											
1596	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1597	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1598	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1599	This is especially true when the sample size is small.											
1600	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1601					Minimum	0.497	Mean	0.698				
1602					Maximum	0.87	Median	0.7				
1603					SD	0.116	CV	0.167				
1604					k hat (MLE)	37.79	k star (bias corrected MLE)	25.27				
1605					Theta hat (MLE)	0.0185	Theta star (bias corrected MLE)	0.0276				
1606					nu hat (MLE)	680.3	nu star (bias corrected)	454.9				
1607					Adjusted Level of Significance (β)	0.0231						
1608					Approximate Chi Square Value (454.87, α)	406.4	Adjusted Chi Square Value (454.87, β)	396.7				
1609					95% Gamma Approximate UCL (use when n>=50)	0.781	95% Gamma Adjusted UCL (use when n<50)	0.801				
1610												
1611	**Estimates of Gamma Parameters using KM Estimates**											
1612					Mean (KM)	0.689	SD (KM)	0.134				

	A	B	C	D	E	F	G	H	I	J	K	L
1613					Variance (KM)	0.0181					SE of Mean (KM)	0.0513
1614					k hat (KM)	26.27					k star (KM)	17.58
1615					nu hat (KM)	472.8					nu star (KM)	316.5
1616					theta hat (KM)	0.0262					theta star (KM)	0.0392
1617					80% gamma percentile (KM)	0.822					90% gamma percentile (KM)	0.906
1618					95% gamma percentile (KM)	0.979					99% gamma percentile (KM)	1.127
1619												
1620					**Gamma Kaplan-Meier (KM) Statistics**							
1621					Approximate Chi Square Value (316.52, α)	276.3					Adjusted Chi Square Value (316.52, β)	268.4
1622					95% Gamma Approximate KM-UCL (use when n>=50)	0.789					95% Gamma Adjusted KM-UCL (use when n<50)	0.812
1623												
1624					**Lognormal GOF Test on Detected Observations Only**							
1625					Shapiro Wilk Test Statistic	0.94			**Shapiro Wilk GOF Test**			
1626					5% Shapiro Wilk Critical Value	0.803			Detected Data appear Lognormal at 5% Significance Level			
1627					Lilliefors Test Statistic	0.202			**Lilliefors GOF Test**			
1628					5% Lilliefors Critical Value	0.304			Detected Data appear Lognormal at 5% Significance Level			
1629					**Detected Data appear Lognormal at 5% Significance Level**							
1630												
1631					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1632					Mean in Original Scale	0.699					Mean in Log Scale	-0.371
1633					SD in Original Scale	0.114					SD in Log Scale	0.171
1634					95% t UCL (assumes normality of ROS data)	0.77					95% Percentile Bootstrap UCL	0.758
1635					95% BCA Bootstrap UCL	0.756					95% Bootstrap t UCL	0.766
1636					95% H-UCL (Log ROS)	0.785						
1637												
1638					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1639					KM Mean (logged)	-0.395					KM Geo Mean	0.674
1640					KM SD (logged)	0.219					95% Critical H Value (KM-Log)	1.926
1641					KM Standard Error of Mean (logged)	0.0836					95% H-UCL (KM -Log)	0.801
1642					KM SD (logged)	0.219					95% Critical H Value (KM-Log)	1.926
1643					KM Standard Error of Mean (logged)	0.0836						
1644												
1645					**DL/2 Statistics**							
1646					**DL/2 Normal**				**DL/2 Log-Transformed**			
1647					Mean in Original Scale	0.672					Mean in Log Scale	-0.46
1648					SD in Original Scale	0.195					SD in Log Scale	0.432
1649					95% t UCL (Assumes normality)	0.793					95% H-Stat UCL	0.965
1650					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1651												
1652					**Nonparametric Distribution Free UCL Statistics**							
1653					**Detected Data appear Normal Distributed at 5% Significance Level**							
1654												
1655					**Suggested UCL to Use**							
1656					95% KM (t) UCL	0.784						
1657												
1658					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1659					Recommendations are based upon data size, data distribution, and skewness.							
1660					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1661					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1662												
1663	**Antimony (smw12)**											
1664												

	A	B	C	D	E	F	G	H	I	J	K	L
1665	**General Statistics**											
1666	Total Number of Observations					8	Number of Distinct Observations					8
1667	Number of Detects					3	Number of Non-Detects					5
1668	Number of Distinct Detects					3	Number of Distinct Non-Detects					5
1669	Minimum Detect					0.39	Minimum Non-Detect					0.18
1670	Maximum Detect					0.53	Maximum Non-Detect					1.5
1671	Variance Detects					0.0052	Percent Non-Detects					62.5%
1672	Mean Detects					0.47	SD Detects					0.0721
1673	Median Detects					0.49	CV Detects					0.153
1674	Skewness Detects					-1.152	Kurtosis Detects					N/A
1675	Mean of Logged Detects					-0.763	SD of Logged Detects					0.159
1676												
1677	**Warning: Data set has only 3 Detected Values.**											
1678	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1679												
1680												
1681	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1682	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1683	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1684	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1685												
1686	**Normal GOF Test on Detects Only**											
1687	Shapiro Wilk Test Statistic					0.942	**Shapiro Wilk GOF Test**					
1688	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Normal at 5% Significance Level					
1689	Lilliefors Test Statistic					0.276	**Lilliefors GOF Test**					
1690	5% Lilliefors Critical Value					0.425	Detected Data appear Normal at 5% Significance Level					
1691	**Detected Data appear Normal at 5% Significance Level**											
1692												
1693	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1694	KM Mean					0.325	KM Standard Error of Mean					0.0754
1695	KM SD					0.151	95% KM (BCA) UCL					N/A
1696	95% KM (t) UCL					0.468	95% KM (Percentile Bootstrap) UCL					N/A
1697	95% KM (z) UCL					0.449	95% KM Bootstrap t UCL					N/A
1698	90% KM Chebyshev UCL					0.551	95% KM Chebyshev UCL					0.654
1699	97.5% KM Chebyshev UCL					0.796	99% KM Chebyshev UCL					1.076
1700												
1701	**Gamma GOF Tests on Detected Observations Only**											
1702	**Not Enough Data to Perform GOF Test**											
1703												
1704	**Gamma Statistics on Detected Data Only**											
1705	k hat (MLE)					60.73	k star (bias corrected MLE)					N/A
1706	Theta hat (MLE)					0.00774	Theta star (bias corrected MLE)					N/A
1707	nu hat (MLE)					364.4	nu star (bias corrected)					N/A
1708	Mean (detects)					0.47						
1709												
1710	**Gamma ROS Statistics using Imputed Non-Detects**											
1711	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1712	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1713	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1714	This is especially true when the sample size is small.											
1715	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1716	Minimum					0.256	Mean					0.361

1717					Maximum	0.53					Median	0.356
1718					SD	0.106					CV	0.294
1719					k hat (MLE)	13.59					k star (bias corrected MLE)	8.577
1720					Theta hat (MLE)	0.0266					Theta star (bias corrected MLE)	0.0421
1721					nu hat (MLE)	217.4					nu star (bias corrected)	137.2
1722					Adjusted Level of Significance (β)	0.0195						
1723					Approximate Chi Square Value (137.22, α)	111.2					Adjusted Chi Square Value (137.22, β)	105.2
1724					95% Gamma Approximate UCL (use when n>=50)	0.446					95% Gamma Adjusted UCL (use when n<50)	N/A
1725												
1726					**Estimates of Gamma Parameters using KM Estimates**							
1727					Mean (KM)	0.325					SD (KM)	0.151
1728					Variance (KM)	0.0228					SE of Mean (KM)	0.0754
1729					k hat (KM)	4.641					k star (KM)	2.984
1730					nu hat (KM)	74.26					nu star (KM)	47.74
1731					theta hat (KM)	0.07					theta star (KM)	0.109
1732					80% gamma percentile (KM)	0.464					90% gamma percentile (KM)	0.577
1733					95% gamma percentile (KM)	0.683					99% gamma percentile (KM)	0.913
1734												
1735					**Gamma Kaplan-Meier (KM) Statistics**							
1736					Approximate Chi Square Value (47.74, α)	32.89					Adjusted Chi Square Value (47.74, β)	29.8
1737					95% Gamma Approximate KM-UCL (use when n>=50)	0.472					95% Gamma Adjusted KM-UCL (use when n<50)	0.521
1738												
1739					**Lognormal GOF Test on Detected Observations Only**							
1740					Shapiro Wilk Test Statistic	0.926					**Shapiro Wilk GOF Test**	
1741					5% Shapiro Wilk Critical Value	0.767					Detected Data appear Lognormal at 5% Significance Level	
1742					Lilliefors Test Statistic	0.29					**Lilliefors GOF Test**	
1743					5% Lilliefors Critical Value	0.425					Detected Data appear Lognormal at 5% Significance Level	
1744					**Detected Data appear Lognormal at 5% Significance Level**							
1745												
1746					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1747					Mean in Original Scale	0.373					Mean in Log Scale	-1.013
1748					SD in Original Scale	0.0948					SD in Log Scale	0.245
1749					95% t UCL (assumes normality of ROS data)	0.436					95% Percentile Bootstrap UCL	0.428
1750					95% BCA Bootstrap UCL	0.433					95% Bootstrap t UCL	0.469
1751					95% H-UCL (Log ROS)	0.45						
1752												
1753					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1754					KM Mean (logged)	-1.239					KM Geo Mean	0.29
1755					KM SD (logged)	0.485					95% Critical H Value (KM-Log)	2.328
1756					KM Standard Error of Mean (logged)	0.242					95% H-UCL (KM -Log)	0.499
1757					KM SD (logged)	0.485					95% Critical H Value (KM-Log)	2.328
1758					KM Standard Error of Mean (logged)	0.242						
1759												
1760					**DL/2 Statistics**							
1761					**DL/2 Normal**						**DL/2 Log-Transformed**	
1762					Mean in Original Scale	0.353					Mean in Log Scale	-1.266
1763					SD in Original Scale	0.23					SD in Log Scale	0.759
1764					95% t UCL (Assumes normality)	0.507					95% H-Stat UCL	0.854
1765					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1766												
1767					**Nonparametric Distribution Free UCL Statistics**							
1768					**Detected Data appear Normal Distributed at 5% Significance Level**							

1769											
1770	**Suggested UCL to Use**										
1771				95% KM (t) UCL	0.468						
1772											
1773	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
1774	Recommendations are based upon data size, data distribution, and skewness.										
1775	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).										
1776	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.										
1777											
1778	**Antimony (smw13)**										
1779											
1780	**General Statistics**										
1781				Total Number of Observations	8			Number of Distinct Observations	6		
1782				Number of Detects	3			Number of Non-Detects	5		
1783				Number of Distinct Detects	2			Number of Distinct Non-Detects	4		
1784				Minimum Detect	0.4			Minimum Non-Detect	0.31		
1785				Maximum Detect	0.42			Maximum Non-Detect	1.5		
1786				Variance Detects	1.3333E-4			Percent Non-Detects	62.5%		
1787				Mean Detects	0.407			SD Detects	0.0115		
1788				Median Detects	0.4			CV Detects	0.0284		
1789				Skewness Detects	1.732			Kurtosis Detects	N/A		
1790				Mean of Logged Detects	-0.9			SD of Logged Detects	0.0282		
1791											
1792	**Warning: Data set has only 3 Detected Values.**										
1793	**This is not enough to compute meaningful or reliable statistics and estimates.**										
1794											
1795											
1796	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**										
1797	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**										
1798	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**										
1799	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**										
1800											
1801	**Normal GOF Test on Detects Only**										
1802				Shapiro Wilk Test Statistic	0.75			**Shapiro Wilk GOF Test**			
1803				5% Shapiro Wilk Critical Value	0.767			Detected Data Not Normal at 5% Significance Level			
1804				Lilliefors Test Statistic	0.385			**Lilliefors GOF Test**			
1805				5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level			
1806	**Detected Data appear Approximate Normal at 5% Significance Level**										
1807											
1808	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**										
1809				KM Mean	0.358			KM Standard Error of Mean	0.0244		
1810				KM SD	0.0488			95% KM (BCA) UCL	N/A		
1811				95% KM (t) UCL	0.405			95% KM (Percentile Bootstrap) UCL	N/A		
1812				95% KM (z) UCL	0.398			95% KM Bootstrap t UCL	N/A		
1813				90% KM Chebyshev UCL	0.432			95% KM Chebyshev UCL	0.465		
1814				97.5% KM Chebyshev UCL	0.511			99% KM Chebyshev UCL	0.601		
1815											
1816	**Gamma GOF Tests on Detected Observations Only**										
1817	**Not Enough Data to Perform GOF Test**										
1818											
1819	**Gamma Statistics on Detected Data Only**										
1820				k hat (MLE)	1880			k star (bias corrected MLE)	N/A		

1821					Theta hat (MLE)	2.1626E-4				Theta star (bias corrected MLE)		N/A
1822					nu hat (MLE)	11283				nu star (bias corrected)		N/A
1823					Mean (detects)	0.407						
1824												
1825	**Gamma ROS Statistics using Imputed Non-Detects**											
1826	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1827	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1828	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1829	This is especially true when the sample size is small.											
1830	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1831					Minimum	0.365				Mean		0.389
1832					Maximum	0.42				Median		0.389
1833					SD	0.0176				CV		0.0453
1834					k hat (MLE)	561.8				k star (bias corrected MLE)		351.2
1835					Theta hat (MLE)	6.9267E-4				Theta star (bias corrected MLE)		0.00111
1836					nu hat (MLE)	8989				nu star (bias corrected)		5619
1837					Adjusted Level of Significance (β)	0.0195						
1838					Approximate Chi Square Value (N/A, α)	5446				Adjusted Chi Square Value (N/A, β)		5403
1839					95% Gamma Approximate UCL (use when n>=50)	0.402				95% Gamma Adjusted UCL (use when n<50)		N/A
1840												
1841	**Estimates of Gamma Parameters using KM Estimates**											
1842					Mean (KM)	0.358				SD (KM)		0.0488
1843					Variance (KM)	0.00238				SE of Mean (KM)		0.0244
1844					k hat (KM)	53.94				k star (KM)		33.79
1845					nu hat (KM)	863				nu star (KM)		540.7
1846					theta hat (KM)	0.00664				theta star (KM)		0.0106
1847					80% gamma percentile (KM)	0.409				90% gamma percentile (KM)		0.439
1848					95% gamma percentile (KM)	0.465				99% gamma percentile (KM)		0.517
1849												
1850	**Gamma Kaplan-Meier (KM) Statistics**											
1851					Approximate Chi Square Value (540.71, α)	487.8				Adjusted Chi Square Value (540.71, β)		475
1852					95% Gamma Approximate KM-UCL (use when n>=50)	0.397				95% Gamma Adjusted KM-UCL (use when n<50)		0.408
1853												
1854	**Lognormal GOF Test on Detected Observations Only**											
1855					Shapiro Wilk Test Statistic	0.75				**Shapiro Wilk GOF Test**		
1856					5% Shapiro Wilk Critical Value	0.767				Detected Data Not Lognormal at 5% Significance Level		
1857					Lilliefors Test Statistic	0.385				**Lilliefors GOF Test**		
1858					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
1859	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
1860												
1861	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1862					Mean in Original Scale	0.39				Mean in Log Scale		-0.943
1863					SD in Original Scale	0.017				SD in Log Scale		0.0434
1864					95% t UCL (assumes normality of ROS data)	0.401				95% Percentile Bootstrap UCL		0.399
1865					95% BCA Bootstrap UCL	0.4				95% Bootstrap t UCL		0.402
1866					95% H-UCL (Log ROS)	N/A						
1867												
1868	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1869					KM Mean (logged)	-1.036				KM Geo Mean		0.355
1870					KM SD (logged)	0.137				95% Critical H Value (KM-Log)		1.881
1871					KM Standard Error of Mean (logged)	0.0683				95% H-UCL (KM -Log)		0.395
1872					KM SD (logged)	0.137				95% Critical H Value (KM-Log)		1.881

1873			KM Standard Error of Mean (logged)			0.0683						
1874												
1875						DL/2 Statistics						
1876			DL/2 Normal					DL/2 Log-Transformed				
1877					Mean in Original Scale	0.346				Mean in Log Scale		-1.197
1878					SD in Original Scale	0.197				SD in Log Scale		0.552
1879					95% t UCL (Assumes normality)	0.478				95% H-Stat UCL		0.586
1880			DL/2 is not a recommended method, provided for comparisons and historical reasons									
1881												
1882						Nonparametric Distribution Free UCL Statistics						
1883						Detected Data appear Approximate Normal Distributed at 5% Significance Level						
1884												
1885						Suggested UCL to Use						
1886					95% KM (t) UCL	0.405						
1887												
1888						When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test						
1889						When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL						
1890												
1891						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1892						Recommendations are based upon data size, data distribution, and skewness.						
1893						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1894						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1895												
1896	Antimony (smw14)											
1897												
1898						General Statistics						
1899					Total Number of Observations	8				Number of Distinct Observations		8
1900					Number of Detects	6				Number of Non-Detects		2
1901					Number of Distinct Detects	6				Number of Distinct Non-Detects		2
1902					Minimum Detect	0.46				Minimum Non-Detect		0.49
1903					Maximum Detect	0.82				Maximum Non-Detect		1.5
1904					Variance Detects	0.0184				Percent Non-Detects		25%
1905					Mean Detects	0.627				SD Detects		0.136
1906					Median Detects	0.625				CV Detects		0.216
1907					Skewness Detects	0.201				Kurtosis Detects		-0.99
1908					Mean of Logged Detects	-0.487				SD of Logged Detects		0.219
1909												
1910						Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use						
1911						guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.						
1912						For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).						
1913						Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1						
1914												
1915						Normal GOF Test on Detects Only						
1916					Shapiro Wilk Test Statistic	0.959				Shapiro Wilk GOF Test		
1917					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Normal at 5% Significance Level		
1918					Lilliefors Test Statistic	0.158				Lilliefors GOF Test		
1919					5% Lilliefors Critical Value	0.325				Detected Data appear Normal at 5% Significance Level		
1920						Detected Data appear Normal at 5% Significance Level						
1921												
1922						Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs						
1923					KM Mean	0.603				KM Standard Error of Mean		0.0532
1924					KM SD	0.129				95% KM (BCA) UCL		0.689

1925					95% KM (t) UCL	0.704				95% KM (Percentile Bootstrap) UCL		0.687
1926					95% KM (z) UCL	0.69				95% KM Bootstrap t UCL		0.726
1927					90% KM Chebyshev UCL	0.763				95% KM Chebyshev UCL		0.835
1928					97.5% KM Chebyshev UCL	0.935				99% KM Chebyshev UCL		1.133
1929												
1930					**Gamma GOF Tests on Detected Observations Only**							
1931					A-D Test Statistic	0.239				**Anderson-Darling GOF Test**		
1932					5% A-D Critical Value	0.697				Detected data appear Gamma Distributed at 5% Significance Level		
1933					K-S Test Statistic	0.182				**Kolmogorov-Smirnov GOF**		
1934					5% K-S Critical Value	0.332				Detected data appear Gamma Distributed at 5% Significance Level		
1935					**Detected data appear Gamma Distributed at 5% Significance Level**							
1936												
1937					**Gamma Statistics on Detected Data Only**							
1938					k hat (MLE)	25.4				k star (bias corrected MLE)		12.81
1939					Theta hat (MLE)	0.0247				Theta star (bias corrected MLE)		0.0489
1940					nu hat (MLE)	304.8				nu star (bias corrected)		153.8
1941					Mean (detects)	0.627						
1942												
1943					**Gamma ROS Statistics using Imputed Non-Detects**							
1944					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1945					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1946					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1947					This is especially true when the sample size is small.							
1948					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1949					Minimum	0.427				Mean		0.597
1950					Maximum	0.82				Median		0.606
1951					SD	0.134				CV		0.225
1952					k hat (MLE)	22.83				k star (bias corrected MLE)		14.35
1953					Theta hat (MLE)	0.0262				Theta star (bias corrected MLE)		0.0416
1954					nu hat (MLE)	365.4				nu star (bias corrected)		229.7
1955					Adjusted Level of Significance (β)	0.0195						
1956					Approximate Chi Square Value (229.68, α)	195.6				Adjusted Chi Square Value (229.68, β)		187.6
1957					95% Gamma Approximate UCL (use when n>=50)	0.702				95% Gamma Adjusted UCL (use when n<50)		0.731
1958												
1959					**Estimates of Gamma Parameters using KM Estimates**							
1960					Mean (KM)	0.603				SD (KM)		0.129
1961					Variance (KM)	0.0165				SE of Mean (KM)		0.0532
1962					k hat (KM)	21.98				k star (KM)		13.82
1963					nu hat (KM)	351.7				nu star (KM)		221.1
1964					theta hat (KM)	0.0274				theta star (KM)		0.0436
1965					80% gamma percentile (KM)	0.733				90% gamma percentile (KM)		0.818
1966					95% gamma percentile (KM)	0.892				99% gamma percentile (KM)		1.043
1967												
1968					**Gamma Kaplan-Meier (KM) Statistics**							
1969					Approximate Chi Square Value (221.14, α)	187.7				Adjusted Chi Square Value (221.14, β)		179.9
1970					95% Gamma Approximate KM-UCL (use when n>=50)	0.71				95% Gamma Adjusted KM-UCL (use when n<50)		0.741
1971												
1972					**Lognormal GOF Test on Detected Observations Only**							
1973					Shapiro Wilk Test Statistic	0.958				**Shapiro Wilk GOF Test**		
1974					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
1975					Lilliefors Test Statistic	0.183				**Lilliefors GOF Test**		
1976					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		

	A	B	C	D	E	F	G	H	I	J	K	L
1977	**Detected Data appear Lognormal at 5% Significance Level**											
1978												
1979	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1980					Mean in Original Scale	0.598			Mean in Log Scale	-0.535		
1981					SD in Original Scale	0.132			SD in Log Scale	0.219		
1982				95% t UCL (assumes normality of ROS data)		0.687			95% Percentile Bootstrap UCL	0.671		
1983					95% BCA Bootstrap UCL	0.675			95% Bootstrap t UCL	0.697		
1984					95% H-UCL (Log ROS)	0.706						
1985												
1986	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1987					KM Mean (logged)	-0.528			KM Geo Mean	0.589		
1988					KM SD (logged)	0.211			95% Critical H Value (KM-Log)	1.955		
1989					KM Standard Error of Mean (logged)	0.0874			95% H-UCL (KM -Log)	0.704		
1990					KM SD (logged)	0.211			95% Critical H Value (KM-Log)	1.955		
1991					KM Standard Error of Mean (logged)	0.0874						
1992												
1993	**DL/2 Statistics**											
1994	**DL/2 Normal**						**DL/2 Log-Transformed**					
1995					Mean in Original Scale	0.594			Mean in Log Scale	-0.577		
1996					SD in Original Scale	0.187			SD in Log Scale	0.389		
1997					95% t UCL (Assumes normality)	0.72			95% H-Stat UCL	0.835		
1998	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1999												
2000	**Nonparametric Distribution Free UCL Statistics**											
2001	**Detected Data appear Normal Distributed at 5% Significance Level**											
2002												
2003	**Suggested UCL to Use**											
2004					95% KM (t) UCL	0.704						
2005												
2006	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2007	Recommendations are based upon data size, data distribution, and skewness.											
2008	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2009	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2010												
2011	**Antimony (smw15)**											
2012												
2013	**General Statistics**											
2014					Total Number of Observations	9			Number of Distinct Observations	9		
2015					Number of Detects	5			Number of Non-Detects	4		
2016					Number of Distinct Detects	5			Number of Distinct Non-Detects	4		
2017					Minimum Detect	0.18			Minimum Non-Detect	0.15		
2018					Maximum Detect	0.67			Maximum Non-Detect	0.38		
2019					Variance Detects	0.0475			Percent Non-Detects	44.44%		
2020					Mean Detects	0.446			SD Detects	0.218		
2021					Median Detects	0.47			CV Detects	0.489		
2022					Skewness Detects	-0.23			Kurtosis Detects	-2.522		
2023					Mean of Logged Detects	-0.925			SD of Logged Detects	0.571		
2024												
2025	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2026	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2027	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2028	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											

	A	B	C	D	E	F	G	H	I	J	K	L
2029												
2030	**Normal GOF Test on Detects Only**											
2031					Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk GOF Test**					
2032					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level					
2033					Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**					
2034					5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level					
2035	**Detected Data appear Normal at 5% Significance Level**											
2036												
2037	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2038					KM Mean	0.322	KM Standard Error of Mean	0.0756				
2039					KM SD	0.202	95% KM (BCA) UCL	0.446				
2040					95% KM (t) UCL	0.462	95% KM (Percentile Bootstrap) UCL	0.442				
2041					95% KM (z) UCL	0.446	95% KM Bootstrap t UCL	0.434				
2042					90% KM Chebyshev UCL	0.549	95% KM Chebyshev UCL	0.651				
2043					97.5% KM Chebyshev UCL	0.794	99% KM Chebyshev UCL	1.074				
2044												
2045	**Gamma GOF Tests on Detected Observations Only**											
2046					A-D Test Statistic	0.357	**Anderson-Darling GOF Test**					
2047					5% A-D Critical Value	0.681	Detected data appear Gamma Distributed at 5% Significance Level					
2048					K-S Test Statistic	0.232	**Kolmogorov-Smirnov GOF**					
2049					5% K-S Critical Value	0.358	Detected data appear Gamma Distributed at 5% Significance Level					
2050	**Detected data appear Gamma Distributed at 5% Significance Level**											
2051												
2052	**Gamma Statistics on Detected Data Only**											
2053					k hat (MLE)	4.406	k star (bias corrected MLE)	1.896				
2054					Theta hat (MLE)	0.101	Theta star (bias corrected MLE)	0.235				
2055					nu hat (MLE)	44.06	nu star (bias corrected)	18.96				
2056					Mean (detects)	0.446						
2057												
2058	**Gamma ROS Statistics using Imputed Non-Detects**											
2059	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2060	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2061	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2062	This is especially true when the sample size is small.											
2063	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2064					Minimum	0.01	Mean	0.283				
2065					Maximum	0.67	Median	0.18				
2066					SD	0.249	CV	0.879				
2067					k hat (MLE)	1.083	k star (bias corrected MLE)	0.796				
2068					Theta hat (MLE)	0.262	Theta star (bias corrected MLE)	0.356				
2069					nu hat (MLE)	19.49	nu star (bias corrected)	14.33				
2070					Adjusted Level of Significance (β)	0.0231						
2071					Approximate Chi Square Value (14.33, α)	6.796	Adjusted Chi Square Value (14.33, β)	5.738				
2072					95% Gamma Approximate UCL (use when n>=50)	0.597	95% Gamma Adjusted UCL (use when n<50)	0.707				
2073												
2074	**Estimates of Gamma Parameters using KM Estimates**											
2075					Mean (KM)	0.322	SD (KM)	0.202				
2076					Variance (KM)	0.0408	SE of Mean (KM)	0.0756				
2077					k hat (KM)	2.541	k star (KM)	1.768				
2078					nu hat (KM)	45.73	nu star (KM)	31.82				
2079					theta hat (KM)	0.127	theta star (KM)	0.182				
2080					80% gamma percentile (KM)	0.489	90% gamma percentile (KM)	0.644				

2081	95% gamma percentile (KM)					0.794	99% gamma percentile (KM)					1.128
2082												
2083	**Gamma Kaplan-Meier (KM) Statistics**											
2084	Approximate Chi Square Value (31.82, α)					19.93	Adjusted Chi Square Value (31.82, β)					17.97
2085	95% Gamma Approximate KM-UCL (use when n>=50)					0.514	95% Gamma Adjusted KM-UCL (use when n<50)					0.57
2086												
2087	**Lognormal GOF Test on Detected Observations Only**											
2088	Shapiro Wilk Test Statistic					0.897	**Shapiro Wilk GOF Test**					
2089	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Lognormal at 5% Significance Level					
2090	Lilliefors Test Statistic					0.217	**Lilliefors GOF Test**					
2091	5% Lilliefors Critical Value					0.343	Detected Data appear Lognormal at 5% Significance Level					
2092	**Detected Data appear Lognormal at 5% Significance Level**											
2093												
2094	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2095	Mean in Original Scale					0.305	Mean in Log Scale					-1.433
2096	SD in Original Scale					0.228	SD in Log Scale					0.742
2097	95% t UCL (assumes normality of ROS data)					0.447	95% Percentile Bootstrap UCL					0.429
2098	95% BCA Bootstrap UCL					0.44	95% Bootstrap t UCL					0.513
2099	95% H-UCL (Log ROS)					0.637						
2100												
2101	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2102	KM Mean (logged)					-1.316	KM Geo Mean					0.268
2103	KM SD (logged)					0.587	95% Critical H Value (KM-Log)					2.405
2104	KM Standard Error of Mean (logged)					0.222	95% H-UCL (KM -Log)					0.525
2105	KM SD (logged)					0.587	95% Critical H Value (KM-Log)					2.405
2106	KM Standard Error of Mean (logged)					0.222						
2107												
2108	**DL/2 Statistics**											
2109	**DL/2 Normal**						**DL/2 Log-Transformed**					
2110	Mean in Original Scale					0.302	Mean in Log Scale					-1.478
2111	SD in Original Scale					0.232	SD in Log Scale					0.806
2112	95% t UCL (Assumes normality)					0.446	95% H-Stat UCL					0.706
2113	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2114												
2115	**Nonparametric Distribution Free UCL Statistics**											
2116	**Detected Data appear Normal Distributed at 5% Significance Level**											
2117												
2118	**Suggested UCL to Use**											
2119	95% KM (t) UCL					0.462						
2120												
2121	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2122	Recommendations are based upon data size, data distribution, and skewness.											
2123	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2124	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2125												
2126	**Antimony (smw16)**											
2127												
2128	**General Statistics**											
2129	Total Number of Observations					9	Number of Distinct Observations					9
2130	Number of Detects					7	Number of Non-Detects					2
2131	Number of Distinct Detects					7	Number of Distinct Non-Detects					2
2132	Minimum Detect					0.75	Minimum Non-Detect					0.25

2133				Maximum Detect	1.4					Maximum Non-Detect	1.5	
2134				Variance Detects	0.0637					Percent Non-Detects	22.22%	
2135				Mean Detects	1.023					SD Detects	0.252	
2136				Median Detects	0.93					CV Detects	0.247	
2137				Skewness Detects	0.553					Kurtosis Detects	-1.317	
2138				Mean of Logged Detects	-0.00285					SD of Logged Detects	0.242	
2139												
2140	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2141	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2142	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2143	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2144												
2145	**Normal GOF Test on Detects Only**											
2146				Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk GOF Test**						
2147				5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level						
2148				Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**						
2149				5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level						
2150	**Detected Data appear Normal at 5% Significance Level**											
2151												
2152	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2153				KM Mean	0.926	KM Standard Error of Mean	0.128					
2154				KM SD	0.336	95% KM (BCA) UCL	1.129					
2155				95% KM (t) UCL	1.165	95% KM (Percentile Bootstrap) UCL	1.121					
2156				95% KM (z) UCL	1.137	95% KM Bootstrap t UCL	1.133					
2157				90% KM Chebyshev UCL	1.312	95% KM Chebyshev UCL	1.486					
2158				97.5% KM Chebyshev UCL	1.728	99% KM Chebyshev UCL	2.204					
2159												
2160	**Gamma GOF Tests on Detected Observations Only**											
2161				A-D Test Statistic	0.315	**Anderson-Darling GOF Test**						
2162				5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level						
2163				K-S Test Statistic	0.205	**Kolmogorov-Smirnov GOF**						
2164				5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level						
2165	**Detected data appear Gamma Distributed at 5% Significance Level**											
2166												
2167	**Gamma Statistics on Detected Data Only**											
2168				k hat (MLE)	19.81	k star (bias corrected MLE)	11.42					
2169				Theta hat (MLE)	0.0516	Theta star (bias corrected MLE)	0.0896					
2170				nu hat (MLE)	277.4	nu star (bias corrected)	159.8					
2171				Mean (detects)	1.023							
2172												
2173	**Gamma ROS Statistics using Imputed Non-Detects**											
2174	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2175	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2176	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2177	This is especially true when the sample size is small.											
2178	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2179				Minimum	0.465	Mean	0.952					
2180				Maximum	1.4	Median	0.93					
2181				SD	0.286	CV	0.301					
2182				k hat (MLE)	11.36	k star (bias corrected MLE)	7.649					
2183				Theta hat (MLE)	0.0838	Theta star (bias corrected MLE)	0.124					
2184				nu hat (MLE)	204.5	nu star (bias corrected)	137.7					

2185	Adjusted Level of Significance (β)					0.0231						
2186	Approximate Chi Square Value (137.68, α)					111.6	Adjusted Chi Square Value (137.68, β)					106.6
2187	95% Gamma Approximate UCL (use when n>=50)					1.175	95% Gamma Adjusted UCL (use when n<50)					1.229
2188												
2189	**Estimates of Gamma Parameters using KM Estimates**											
2190	Mean (KM)					0.926	SD (KM)					0.336
2191	Variance (KM)					0.113	SE of Mean (KM)					0.128
2192	k hat (KM)					7.586	k star (KM)					5.131
2193	nu hat (KM)					136.5	nu star (KM)					92.36
2194	theta hat (KM)					0.122	theta star (KM)					0.181
2195	80% gamma percentile (KM)					1.241	90% gamma percentile (KM)					1.474
2196	95% gamma percentile (KM)					1.685	99% gamma percentile (KM)					2.131
2197												
2198	**Gamma Kaplan-Meier (KM) Statistics**											
2199	Approximate Chi Square Value (92.36, α)					71.2	Adjusted Chi Square Value (92.36, β)					67.29
2200	95% Gamma Approximate KM-UCL (use when n>=50)					1.202	95% Gamma Adjusted KM-UCL (use when n<50)					1.271
2201												
2202	**Lognormal GOF Test on Detected Observations Only**											
2203	Shapiro Wilk Test Statistic					0.93	**Shapiro Wilk GOF Test**					
2204	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Lognormal at 5% Significance Level					
2205	Lilliefors Test Statistic					0.185	**Lilliefors GOF Test**					
2206	5% Lilliefors Critical Value					0.304	Detected Data appear Lognormal at 5% Significance Level					
2207	**Detected Data appear Lognormal at 5% Significance Level**											
2208												
2209	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2210	Mean in Original Scale					0.959	Mean in Log Scale					-0.0779
2211	SD in Original Scale					0.27	SD in Log Scale					0.29
2212	95% t UCL (assumes normality of ROS data)					1.127	95% Percentile Bootstrap UCL					1.103
2213	95% BCA Bootstrap UCL					1.104	95% Bootstrap t UCL					1.164
2214	95% H-UCL (Log ROS)					1.185						
2215												
2216	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2217	KM Mean (logged)					-0.176	KM Geo Mean					0.839
2218	KM SD (logged)					0.503	95% Critical H Value (KM-Log)					2.232
2219	KM Standard Error of Mean (logged)					0.192	95% H-UCL (KM -Log)					1.416
2220	KM SD (logged)					0.503	95% Critical H Value (KM-Log)					2.232
2221	KM Standard Error of Mean (logged)					0.192						
2222												
2223	**DL/2 Statistics**											
2224	**DL/2 Normal**						**DL/2 Log-Transformed**					
2225	Mean in Original Scale					0.893	Mean in Log Scale					-0.265
2226	SD in Original Scale					0.373	SD in Log Scale					0.718
2227	95% t UCL (Assumes normality)					1.124	95% H-Stat UCL					1.946
2228	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2229												
2230	**Nonparametric Distribution Free UCL Statistics**											
2231	**Detected Data appear Normal Distributed at 5% Significance Level**											
2232												
2233	**Suggested UCL to Use**											
2234	95% KM (t) UCL					1.165						
2235												
2236	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
2237	Recommendations are based upon data size, data distribution, and skewness.											
2238	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2239	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2240												
2241	**Antimony (smw16d)**											
2242												
2243	**General Statistics**											
2244						Total Number of Observations	8			Number of Distinct Observations	6	
2245						Number of Detects	5			Number of Non-Detects	3	
2246						Number of Distinct Detects	5			Number of Distinct Non-Detects	3	
2247						Minimum Detect	0.19			Minimum Non-Detect	0.2	
2248						Maximum Detect	0.29			Maximum Non-Detect	1.5	
2249						Variance Detects	0.00202			Percent Non-Detects	37.5%	
2250						Mean Detects	0.232			SD Detects	0.0449	
2251						Median Detects	0.21			CV Detects	0.194	
2252						Skewness Detects	0.608			Kurtosis Detects	-2.548	
2253						Mean of Logged Detects	-1.476			SD of Logged Detects	0.189	
2254												
2255	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2256	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2257	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2258	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2259												
2260	**Normal GOF Test on Detects Only**											
2261						Shapiro Wilk Test Statistic	0.86			**Shapiro Wilk GOF Test**		
2262						5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level		
2263						Lilliefors Test Statistic	0.288			**Lilliefors GOF Test**		
2264						5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level		
2265	**Detected Data appear Normal at 5% Significance Level**											
2266												
2267	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2268						KM Mean	0.223			KM Standard Error of Mean	0.0173	
2269						KM SD	0.0389			95% KM (BCA) UCL	0.254	
2270						95% KM (t) UCL	0.256			95% KM (Percentile Bootstrap) UCL	0.251	
2271						95% KM (z) UCL	0.252			95% KM Bootstrap t UCL	0.344	
2272						90% KM Chebyshev UCL	0.275			95% KM Chebyshev UCL	0.298	
2273						97.5% KM Chebyshev UCL	0.331			99% KM Chebyshev UCL	0.395	
2274												
2275	**Gamma GOF Tests on Detected Observations Only**											
2276						A-D Test Statistic	0.471			**Anderson-Darling GOF Test**		
2277						5% A-D Critical Value	0.678			Detected data appear Gamma Distributed at 5% Significance Level		
2278						K-S Test Statistic	0.298			**Kolmogorov-Smirnov GOF**		
2279						5% K-S Critical Value	0.357			Detected data appear Gamma Distributed at 5% Significance Level		
2280	**Detected data appear Gamma Distributed at 5% Significance Level**											
2281												
2282	**Gamma Statistics on Detected Data Only**											
2283						k hat (MLE)	34.44			k star (bias corrected MLE)	13.91	
2284						Theta hat (MLE)	0.00674			Theta star (bias corrected MLE)	0.0167	
2285						nu hat (MLE)	344.4			nu star (bias corrected)	139.1	
2286						Mean (detects)	0.232					
2287												
2288	**Gamma ROS Statistics using Imputed Non-Detects**											

	A	B	C	D	E	F	G	H	I	J	K	L
2289	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2290	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2291	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2292	This is especially true when the sample size is small.											
2293	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2294					Minimum	0.178				Mean	0.221	
2295					Maximum	0.29				Median	0.21	
2296					SD	0.039				CV	0.177	
2297					k hat (MLE)	39.42				k star (bias corrected MLE)	24.72	
2298					Theta hat (MLE)	0.0056				Theta star (bias corrected MLE)	0.00893	
2299					nu hat (MLE)	630.7				nu star (bias corrected)	395.6	
2300					Adjusted Level of Significance (β)	0.0195						
2301					Approximate Chi Square Value (395.55, α)	350.5				Adjusted Chi Square Value (395.55, β)	339.7	
2302					95% Gamma Approximate UCL (use when n>=50)	0.249				95% Gamma Adjusted UCL (use when n<50)	0.257	
2303												
2304	**Estimates of Gamma Parameters using KM Estimates**											
2305					Mean (KM)	0.223				SD (KM)	0.0389	
2306					Variance (KM)	0.00151				SE of Mean (KM)	0.0173	
2307					k hat (KM)	32.91				k star (KM)	20.65	
2308					nu hat (KM)	526.6				nu star (KM)	330.4	
2309					theta hat (KM)	0.00678				theta star (KM)	0.0108	
2310					80% gamma percentile (KM)	0.263				90% gamma percentile (KM)	0.288	
2311					95% gamma percentile (KM)	0.31				99% gamma percentile (KM)	0.353	
2312												
2313	**Gamma Kaplan-Meier (KM) Statistics**											
2314					Approximate Chi Square Value (330.44, α)	289.3				Adjusted Chi Square Value (330.44, β)	279.5	
2315					95% Gamma Approximate KM-UCL (use when n>=50)	0.255				95% Gamma Adjusted KM-UCL (use when n<50)	0.264	
2316												
2317	**Lognormal GOF Test on Detected Observations Only**											
2318					Shapiro Wilk Test Statistic	0.87				**Shapiro Wilk GOF Test**		
2319					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
2320					Lilliefors Test Statistic	0.273				**Lilliefors GOF Test**		
2321					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
2322	**Detected Data appear Lognormal at 5% Significance Level**											
2323												
2324	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2325					Mean in Original Scale	0.221				Mean in Log Scale	-1.522	
2326					SD in Original Scale	0.0387				SD in Log Scale	0.166	
2327					95% t UCL (assumes normality of ROS data)	0.247				95% Percentile Bootstrap UCL	0.242	
2328					95% BCA Bootstrap UCL	0.246				95% Bootstrap t UCL	0.283	
2329					95% H-UCL (Log ROS)	0.249						
2330												
2331	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2332					KM Mean (logged)	-1.514				KM Geo Mean	0.22	
2333					KM SD (logged)	0.165				95% Critical H Value (KM-Log)	1.908	
2334					KM Standard Error of Mean (logged)	0.0736				95% H-UCL (KM -Log)	0.251	
2335					KM SD (logged)	0.165				95% Critical H Value (KM-Log)	1.908	
2336					KM Standard Error of Mean (logged)	0.0736						
2337												
2338	**DL/2 Statistics**											
2339	**DL/2 Normal**									**DL/2 Log-Transformed**		
2340					Mean in Original Scale	0.269				Mean in Log Scale	-1.487	

2341				SD in Original Scale	0.204					SD in Log Scale	0.591	
2342				95% t UCL (Assumes normality)	0.406					95% H-Stat UCL	0.472	
2343	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2344												
2345	**Nonparametric Distribution Free UCL Statistics**											
2346	**Detected Data appear Normal Distributed at 5% Significance Level**											
2347												
2348	**Suggested UCL to Use**											
2349				95% KM (t) UCL	0.256							
2350												
2351	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2352	Recommendations are based upon data size, data distribution, and skewness.											
2353	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2354	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2355												
2356	**Antimony (smw17)**											
2357												
2358	**General Statistics**											
2359				Total Number of Observations	8					Number of Distinct Observations	5	
2360				Number of Detects	5					Number of Non-Detects	3	
2361				Number of Distinct Detects	4					Number of Distinct Non-Detects	2	
2362				Minimum Detect	0.85					Minimum Non-Detect	0.38	
2363				Maximum Detect	1.5					Maximum Non-Detect	1.5	
2364				Variance Detects	0.068					Percent Non-Detects	37.5%	
2365				Mean Detects	1.19					SD Detects	0.261	
2366				Median Detects	1.3					CV Detects	0.219	
2367				Skewness Detects	-0.322					Kurtosis Detects	-1.46	
2368				Mean of Logged Detects	0.154					SD of Logged Detects	0.229	
2369												
2370	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2371	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2372	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2373	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2374												
2375	**Normal GOF Test on Detects Only**											
2376				Shapiro Wilk Test Statistic	0.935					**Shapiro Wilk GOF Test**		
2377				5% Shapiro Wilk Critical Value	0.762					Detected Data appear Normal at 5% Significance Level		
2378				Lilliefors Test Statistic	0.263					**Lilliefors GOF Test**		
2379				5% Lilliefors Critical Value	0.343					Detected Data appear Normal at 5% Significance Level		
2380	**Detected Data appear Normal at 5% Significance Level**											
2381												
2382	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2383				KM Mean	1.033					KM Standard Error of Mean	0.165	
2384				KM SD	0.365					95% KM (BCA) UCL	N/A	
2385				95% KM (t) UCL	1.345					95% KM (Percentile Bootstrap) UCL	N/A	
2386				95% KM (z) UCL	1.304					95% KM Bootstrap t UCL	N/A	
2387				90% KM Chebyshev UCL	1.527					95% KM Chebyshev UCL	1.751	
2388				97.5% KM Chebyshev UCL	2.061					99% KM Chebyshev UCL	2.671	
2389												
2390	**Gamma GOF Tests on Detected Observations Only**											
2391				A-D Test Statistic	0.348					**Anderson-Darling GOF Test**		
2392				5% A-D Critical Value	0.679					Detected data appear Gamma Distributed at 5% Significance Level		

	A	B	C	D	E	F	G	H	I	J	K	L
2393					K-S Test Statistic	0.296	**Kolmogorov-Smirnov GOF**					
2394					5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level					
2395	**Detected data appear Gamma Distributed at 5% Significance Level**											
2396												
2397	**Gamma Statistics on Detected Data Only**											
2398					k hat (MLE)	24.65				k star (bias corrected MLE)		9.995
2399					Theta hat (MLE)	0.0483				Theta star (bias corrected MLE)		0.119
2400					nu hat (MLE)	246.5				nu star (bias corrected)		99.95
2401					Mean (detects)	1.19						
2402												
2403	**Gamma ROS Statistics using Imputed Non-Detects**											
2404	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2405	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2406	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2407	This is especially true when the sample size is small.											
2408	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2409					Minimum	0.716				Mean		1.09
2410					Maximum	1.5				Median		1.068
2411					SD	0.265				CV		0.243
2412					k hat (MLE)	18.93				k star (bias corrected MLE)		11.91
2413					Theta hat (MLE)	0.0576				Theta star (bias corrected MLE)		0.0915
2414					nu hat (MLE)	302.8				nu star (bias corrected)		190.6
2415					Adjusted Level of Significance (β)	0.0195						
2416					Approximate Chi Square Value (190.59, α)	159.7				Adjusted Chi Square Value (190.59, β)		152.5
2417					95% Gamma Approximate UCL (use when n>=50)	1.302				95% Gamma Adjusted UCL (use when n<50)		1.363
2418												
2419	**Estimates of Gamma Parameters using KM Estimates**											
2420					Mean (KM)	1.033				SD (KM)		0.365
2421					Variance (KM)	0.133				SE of Mean (KM)		0.165
2422					k hat (KM)	8.026				k star (KM)		5.1
2423					nu hat (KM)	128.4				nu star (KM)		81.6
2424					theta hat (KM)	0.129				theta star (KM)		0.203
2425					80% gamma percentile (KM)	1.385				90% gamma percentile (KM)		1.645
2426					95% gamma percentile (KM)	1.881				99% gamma percentile (KM)		2.381
2427												
2428	**Gamma Kaplan-Meier (KM) Statistics**											
2429					Approximate Chi Square Value (81.60, α)	61.78				Adjusted Chi Square Value (81.60, β)		57.44
2430					95% Gamma Approximate KM-UCL (use when n>=50)	1.364				95% Gamma Adjusted KM-UCL (use when n<50)		1.467
2431												
2432	**Lognormal GOF Test on Detected Observations Only**											
2433					Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**					
2434					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level					
2435					Lilliefors Test Statistic	0.282	**Lilliefors GOF Test**					
2436					5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level					
2437	**Detected Data appear Lognormal at 5% Significance Level**											
2438												
2439	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2440					Mean in Original Scale	1.089				Mean in Log Scale		0.0592
2441					SD in Original Scale	0.263				SD in Log Scale		0.245
2442					95% t UCL (assumes normality of ROS data)	1.265				95% Percentile Bootstrap UCL		1.231
2443					95% BCA Bootstrap UCL	1.248				95% Bootstrap t UCL		1.277
2444					95% H-UCL (Log ROS)	1.315						

	A	B	C	D	E	F	G	H	I	J	K	L
2445												
2446	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2447					KM Mean (logged)	-0.0553			KM Geo Mean			0.946
2448					KM SD (logged)	0.458			95% Critical H Value (KM-Log)			2.285
2449					KM Standard Error of Mean (logged)	0.21			95% H-UCL (KM -Log)			1.561
2450					KM SD (logged)	0.458			95% Critical H Value (KM-Log)			2.285
2451					KM Standard Error of Mean (logged)	0.21						
2452												
2453	**DL/2 Statistics**											
2454	**DL/2 Normal**						**DL/2 Log-Transformed**					
2455					Mean in Original Scale	0.955			Mean in Log Scale			-0.184
2456					SD in Original Scale	0.417			SD in Log Scale			0.653
2457					95% t UCL (Assumes normality)	1.234			95% H-Stat UCL			1.974
2458	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2459												
2460	**Nonparametric Distribution Free UCL Statistics**											
2461	**Detected Data appear Normal Distributed at 5% Significance Level**											
2462												
2463	**Suggested UCL to Use**											
2464					95% KM (t) UCL	1.345						
2465												
2466	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2467	Recommendations are based upon data size, data distribution, and skewness.											
2468	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2469	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2470												
2471	**Antimony (smw17d)**											
2472												
2473	**General Statistics**											
2474					Total Number of Observations	8			Number of Distinct Observations			7
2475					Number of Detects	2			Number of Non-Detects			6
2476					Number of Distinct Detects	2			Number of Distinct Non-Detects			5
2477					Minimum Detect	0.074			Minimum Non-Detect			0.077
2478					Maximum Detect	0.091			Maximum Non-Detect			1.5
2479					Variance Detects	1.4450E-4			Percent Non-Detects			75%
2480					Mean Detects	0.0825			SD Detects			0.012
2481					Median Detects	0.0825			CV Detects			0.146
2482					Skewness Detects	N/A			Kurtosis Detects			N/A
2483					Mean of Logged Detects	-2.5			SD of Logged Detects			0.146
2484												
2485	**Warning: Data set has only 2 Detected Values.**											
2486	**This is not enough to compute meaningful or reliable statistics and estimates.**											
2487												
2488												
2489	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2490	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2491	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2492	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2493												
2494	**Normal GOF Test on Detects Only**											
2495	**Not Enough Data to Perform GOF Test**											
2496												

	A	B	C	D	E	F	G	H	I	J	K	L
2497	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2498					KM Mean	0.0774				KM Standard Error of Mean		0.0043
2499					KM SD	0.0068				95% KM (BCA) UCL		N/A
2500					95% KM (t) UCL	0.0855				95% KM (Percentile Bootstrap) UCL		N/A
2501					95% KM (z) UCL	0.0845				95% KM Bootstrap t UCL		N/A
2502					90% KM Chebyshev UCL	0.0903				95% KM Chebyshev UCL		0.0961
2503					97.5% KM Chebyshev UCL	0.104				99% KM Chebyshev UCL		0.12
2504												
2505	**Gamma GOF Tests on Detected Observations Only**											
2506	**Not Enough Data to Perform GOF Test**											
2507												
2508	**Gamma Statistics on Detected Data Only**											
2509					k hat (MLE)	93.87				k star (bias corrected MLE)		N/A
2510					Theta hat (MLE)	8.7888E-4				Theta star (bias corrected MLE)		N/A
2511					nu hat (MLE)	375.5				nu star (bias corrected)		N/A
2512					Mean (detects)	0.0825						
2513												
2514	**Estimates of Gamma Parameters using KM Estimates**											
2515					Mean (KM)	0.0774				SD (KM)		0.0068
2516					Variance (KM)	4.6240E-5				SE of Mean (KM)		0.0043
2517					k hat (KM)	129.6				k star (KM)		81.06
2518					nu hat (KM)	2073				nu star (KM)		1297
2519					theta hat (KM)	5.9742E-4				theta star (KM)		9.5488E-4
2520					80% gamma percentile (KM)	0.0845				90% gamma percentile (KM)		0.0886
2521					95% gamma percentile (KM)	0.0921				99% gamma percentile (KM)		0.0988
2522												
2523	**Gamma Kaplan-Meier (KM) Statistics**											
2524										Adjusted Level of Significance (β)		0.0195
2525					Approximate Chi Square Value (N/A, α)	1214				Adjusted Chi Square Value (N/A, β)		1194
2526					95% Gamma Approximate KM-UCL (use when n>=50)	0.0827				95% Gamma Adjusted KM-UCL (use when n<50)		0.0841
2527												
2528	**Lognormal GOF Test on Detected Observations Only**											
2529	**Not Enough Data to Perform GOF Test**											
2530												
2531	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2532					Mean in Original Scale	0.0771				Mean in Log Scale		-2.566
2533					SD in Original Scale	0.00607				SD in Log Scale		0.0748
2534					95% t UCL (assumes normality of ROS data)	0.0811				95% Percentile Bootstrap UCL		0.081
2535					95% BCA Bootstrap UCL	0.0817				95% Bootstrap t UCL		0.0842
2536					95% H-UCL (Log ROS)	N/A						
2537												
2538	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2539					KM Mean (logged)	-2.562				KM Geo Mean		0.0771
2540					KM SD (logged)	0.0827				95% Critical H Value (KM-Log)		N/A
2541					KM Standard Error of Mean (logged)	0.0523				95% H-UCL (KM -Log)		N/A
2542					KM SD (logged)	0.0827				95% Critical H Value (KM-Log)		N/A
2543					KM Standard Error of Mean (logged)	0.0523						
2544												
2545	**DL/2 Statistics**											
2546	**DL/2 Normal**						**DL/2 Log-Transformed**					
2547					Mean in Original Scale	0.168				Mean in Log Scale		-2.403
2548					SD in Original Scale	0.245				SD in Log Scale		1.058

2549				95% t UCL (Assumes normality)		0.332					95% H-Stat UCL	0.661
2550	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2551												
2552	**Nonparametric Distribution Free UCL Statistics**											
2553	**Data do not follow a Discernible Distribution at 5% Significance Level**											
2554												
2555	**Suggested UCL to Use**											
2556				95% KM (t) UCL		0.0855					KM H-UCL	N/A
2557				95% KM (BCA) UCL		N/A						
2558	**Warning: One or more Recommended UCL(s) not available!**											
2559												
2560	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2561	Recommendations are based upon data size, data distribution, and skewness.											
2562	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2563	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2564												
2565	**Antimony (smw18)**											
2566												
2567	**General Statistics**											
2568				Total Number of Observations		8					Number of Distinct Observations	6
2569				Number of Detects		2					Number of Non-Detects	6
2570				Number of Distinct Detects		2					Number of Distinct Non-Detects	4
2571				Minimum Detect		0.66					Minimum Non-Detect	0.32
2572				Maximum Detect		0.69					Maximum Non-Detect	1.5
2573				Variance Detects		4.5000E-4					Percent Non-Detects	75%
2574				Mean Detects		0.675					SD Detects	0.0212
2575				Median Detects		0.675					CV Detects	0.0314
2576				Skewness Detects		N/A					Kurtosis Detects	N/A
2577				Mean of Logged Detects		-0.393					SD of Logged Detects	0.0314
2578												
2579	**Warning: Data set has only 2 Detected Values.**											
2580	**This is not enough to compute meaningful or reliable statistics and estimates.**											
2581												
2582												
2583	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2584	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2585	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2586	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2587												
2588	**Normal GOF Test on Detects Only**											
2589	**Not Enough Data to Perform GOF Test**											
2590												
2591	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2592				KM Mean		0.438					KM Standard Error of Mean	0.0967
2593				KM SD		0.168					95% KM (BCA) UCL	N/A
2594				95% KM (t) UCL		0.622					95% KM (Percentile Bootstrap) UCL	N/A
2595				95% KM (z) UCL		0.597					95% KM Bootstrap t UCL	N/A
2596				90% KM Chebyshev UCL		0.729					95% KM Chebyshev UCL	0.86
2597				97.5% KM Chebyshev UCL		1.043					99% KM Chebyshev UCL	1.401
2598												
2599	**Gamma GOF Tests on Detected Observations Only**											
2600	**Not Enough Data to Perform GOF Test**											

2601												
2602	**Gamma Statistics on Detected Data Only**											
2603					k hat (MLE)	2025		k star (bias corrected MLE)			N/A	
2604					Theta hat (MLE)	3.3339E-4		Theta star (bias corrected MLE)			N/A	
2605					nu hat (MLE)	8099		nu star (bias corrected)			N/A	
2606					Mean (detects)	0.675						
2607												
2608	**Estimates of Gamma Parameters using KM Estimates**											
2609					Mean (KM)	0.438		SD (KM)			0.168	
2610					Variance (KM)	0.0281		SE of Mean (KM)			0.0967	
2611					k hat (KM)	6.842		k star (KM)			4.36	
2612					nu hat (KM)	109.5		nu star (KM)			69.76	
2613					theta hat (KM)	0.0641		theta star (KM)			0.101	
2614					80% gamma percentile (KM)	0.598		90% gamma percentile (KM)			0.72	
2615					95% gamma percentile (KM)	0.831		99% gamma percentile (KM)			1.067	
2616												
2617	**Gamma Kaplan-Meier (KM) Statistics**											
2618								Adjusted Level of Significance (β)			0.0195	
2619					Approximate Chi Square Value (69.76, α)	51.53		Adjusted Chi Square Value (69.76, β)			47.59	
2620					95% Gamma Approximate KM-UCL (use when n>=50)	0.593		95% Gamma Adjusted KM-UCL (use when n<50)			0.643	
2621												
2622	**Lognormal GOF Test on Detected Observations Only**											
2623	**Not Enough Data to Perform GOF Test**											
2624												
2625	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2626					Mean in Original Scale	0.615		Mean in Log Scale			-0.487	
2627					SD in Original Scale	0.0427		SD in Log Scale			0.0681	
2628					95% t UCL (assumes normality of ROS data)	0.644		95% Percentile Bootstrap UCL			0.638	
2629					95% BCA Bootstrap UCL	0.643		95% Bootstrap t UCL			0.656	
2630					95% H-UCL (Log ROS)	N/A						
2631												
2632	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2633					KM Mean (logged)	-0.891		KM Geo Mean			0.41	
2634					KM SD (logged)	0.352		95% Critical H Value (KM-Log)			2.126	
2635					KM Standard Error of Mean (logged)	0.203		95% H-UCL (KM -Log)			0.579	
2636					KM SD (logged)	0.352		95% Critical H Value (KM-Log)			2.126	
2637					KM Standard Error of Mean (logged)	0.203						
2638												
2639	**DL/2 Statistics**											
2640	**DL/2 Normal**							**DL/2 Log-Transformed**				
2641					Mean in Original Scale	0.444		Mean in Log Scale			-1.043	
2642					SD in Original Scale	0.289		SD in Log Scale			0.753	
2643					95% t UCL (Assumes normality)	0.637		95% H-Stat UCL			1.053	
2644	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2645												
2646	**Nonparametric Distribution Free UCL Statistics**											
2647	**Data do not follow a Discernible Distribution at 5% Significance Level**											
2648												
2649	**Suggested UCL to Use**											
2650					95% KM (t) UCL	0.622		KM H-UCL			0.579	
2651					95% KM (BCA) UCL	N/A						
2652	**Warning: One or more Recommended UCL(s) not available!**											

	A	B	C	D	E	F	G	H	I	J	K	L
2653												
2654	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2655	Recommendations are based upon data size, data distribution, and skewness.											
2656	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2657	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2658												
2659	**Antimony (smw18d)**											
2660												
2661	**General Statistics**											
2662						Total Number of Observations	8				Number of Distinct Observations	5
2663						Number of Detects	5				Number of Non-Detects	3
2664						Number of Distinct Detects	4				Number of Distinct Non-Detects	3
2665						Minimum Detect	0.2				Minimum Non-Detect	0.2
2666						Maximum Detect	0.24				Maximum Non-Detect	1.5
2667						Variance Detects	2.3000E-4				Percent Non-Detects	37.5%
2668						Mean Detects	0.224				SD Detects	0.0152
2669						Median Detects	0.23				CV Detects	0.0677
2670						Skewness Detects	-1.118				Kurtosis Detects	1.456
2671						Mean of Logged Detects	-1.498				SD of Logged Detects	0.0695
2672												
2673	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2674	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2675	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2676	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2677												
2678	**Normal GOF Test on Detects Only**											
2679						Shapiro Wilk Test Statistic	0.914				**Shapiro Wilk GOF Test**	
2680						5% Shapiro Wilk Critical Value	0.762				Detected Data appear Normal at 5% Significance Level	
2681						Lilliefors Test Statistic	0.254				**Lilliefors GOF Test**	
2682						5% Lilliefors Critical Value	0.343				Detected Data appear Normal at 5% Significance Level	
2683	**Detected Data appear Normal at 5% Significance Level**											
2684												
2685	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2686						KM Mean	0.218				KM Standard Error of Mean	0.0067
2687						KM SD	0.0153				95% KM (BCA) UCL	N/A
2688						95% KM (t) UCL	0.231				95% KM (Percentile Bootstrap) UCL	N/A
2689						95% KM (z) UCL	0.229				95% KM Bootstrap t UCL	N/A
2690						90% KM Chebyshev UCL	0.238				95% KM Chebyshev UCL	0.247
2691						97.5% KM Chebyshev UCL	0.26				99% KM Chebyshev UCL	0.285
2692												
2693	**Gamma GOF Tests on Detected Observations Only**											
2694						A-D Test Statistic	0.383				**Anderson-Darling GOF Test**	
2695						5% A-D Critical Value	0.678				Detected data appear Gamma Distributed at 5% Significance Level	
2696						K-S Test Statistic	0.274				**Kolmogorov-Smirnov GOF**	
2697						5% K-S Critical Value	0.357				Detected data appear Gamma Distributed at 5% Significance Level	
2698	**Detected data appear Gamma Distributed at 5% Significance Level**											
2699												
2700	**Gamma Statistics on Detected Data Only**											
2701						k hat (MLE)	263.7				k star (bias corrected MLE)	105.6
2702						Theta hat (MLE)	8.4957E-4				Theta star (bias corrected MLE)	0.00212
2703						nu hat (MLE)	2637				nu star (bias corrected)	1056
2704						Mean (detects)	0.224					

2705												
2706	**Gamma ROS Statistics using Imputed Non-Detects**											
2707	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2708	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2709	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2710	This is especially true when the sample size is small.											
2711	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2712					Minimum	0.191			Mean	0.216		
2713					Maximum	0.24			Median	0.218		
2714					SD	0.0169			CV	0.0783		
2715					k hat (MLE)	184.3			k star (bias corrected MLE)	115.3		
2716					Theta hat (MLE)	0.00117			Theta star (bias corrected MLE)	0.00188		
2717					nu hat (MLE)	2949			nu star (bias corrected)	1844		
2718					Adjusted Level of Significance (β)	0.0195						
2719					Approximate Chi Square Value (N/A, α)	1745			Adjusted Chi Square Value (N/A, β)	1721		
2720					95% Gamma Approximate UCL (use when n>=50)	0.229			95% Gamma Adjusted UCL (use when n<50)	0.232		
2721												
2722	**Estimates of Gamma Parameters using KM Estimates**											
2723					Mean (KM)	0.218			SD (KM)	0.0153		
2724					Variance (KM)	2.3447E-4			SE of Mean (KM)	0.0067		
2725					k hat (KM)	202.9			k star (KM)	126.9		
2726					nu hat (KM)	3246			nu star (KM)	2030		
2727					theta hat (KM)	0.00108			theta star (KM)	0.00172		
2728					80% gamma percentile (KM)	0.234			90% gamma percentile (KM)	0.243		
2729					95% gamma percentile (KM)	0.251			99% gamma percentile (KM)	0.266		
2730												
2731	**Gamma Kaplan-Meier (KM) Statistics**											
2732					Approximate Chi Square Value (N/A, α)	1926			Adjusted Chi Square Value (N/A, β)	1901		
2733					95% Gamma Approximate KM-UCL (use when n>=50)	0.23			95% Gamma Adjusted KM-UCL (use when n<50)	0.233		
2734												
2735	**Lognormal GOF Test on Detected Observations Only**											
2736					Shapiro Wilk Test Statistic	0.901			**Shapiro Wilk GOF Test**			
2737					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Lognormal at 5% Significance Level			
2738					Lilliefors Test Statistic	0.258			**Lilliefors GOF Test**			
2739					5% Lilliefors Critical Value	0.343			Detected Data appear Lognormal at 5% Significance Level			
2740	**Detected Data appear Lognormal at 5% Significance Level**											
2741												
2742	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2743					Mean in Original Scale	0.216			Mean in Log Scale	-1.533		
2744					SD in Original Scale	0.0168			SD in Log Scale	0.0785		
2745					95% t UCL (assumes normality of ROS data)	0.228			95% Percentile Bootstrap UCL	0.226		
2746					95% BCA Bootstrap UCL	0.226			95% Bootstrap t UCL	0.227		
2747					95% H-UCL (Log ROS)	N/A						
2748												
2749	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2750					KM Mean (logged)	-1.525			KM Geo Mean	0.218		
2751					KM SD (logged)	0.0706			95% Critical H Value (KM-Log)	N/A		
2752					KM Standard Error of Mean (logged)	0.031			95% H-UCL (KM -Log)	N/A		
2753					KM SD (logged)	0.0706			95% Critical H Value (KM-Log)	N/A		
2754					KM Standard Error of Mean (logged)	0.031						
2755												
2756	**DL/2 Statistics**											

2757	**DL/2 Normal**						**DL/2 Log-Transformed**					
2758				Mean in Original Scale	0.261					Mean in Log Scale	-1.53	
2759				SD in Original Scale	0.205					SD in Log Scale	0.605	
2760				95% t UCL (Assumes normality)	0.398					95% H-Stat UCL	0.465	
2761	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2762												
2763	**Nonparametric Distribution Free UCL Statistics**											
2764	**Detected Data appear Normal Distributed at 5% Significance Level**											
2765												
2766	**Suggested UCL to Use**											
2767				95% KM (t) UCL	0.231							
2768												
2769	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2770	Recommendations are based upon data size, data distribution, and skewness.											
2771	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2772	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2773												
2774	**Antimony (smw19)**											
2775												
2776	**General Statistics**											
2777				Total Number of Observations	8					Number of Distinct Observations	7	
2778				Number of Detects	4					Number of Non-Detects	4	
2779				Number of Distinct Detects	4					Number of Distinct Non-Detects	3	
2780				Minimum Detect	0.092					Minimum Non-Detect	0.077	
2781				Maximum Detect	0.72					Maximum Non-Detect	1.5	
2782				Variance Detects	0.0843					Percent Non-Detects	50%	
2783				Mean Detects	0.291					SD Detects	0.29	
2784				Median Detects	0.175					CV Detects	1	
2785				Skewness Detects	1.837					Kurtosis Detects	3.436	
2786				Mean of Logged Detects	-1.56					SD of Logged Detects	0.888	
2787												
2788	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2789	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2790	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2791	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2792												
2793	**Normal GOF Test on Detects Only**											
2794				Shapiro Wilk Test Statistic	0.777		**Shapiro Wilk GOF Test**					
2795				5% Shapiro Wilk Critical Value	0.748		Detected Data appear Normal at 5% Significance Level					
2796				Lilliefors Test Statistic	0.359		**Lilliefors GOF Test**					
2797				5% Lilliefors Critical Value	0.375		Detected Data appear Normal at 5% Significance Level					
2798	**Detected Data appear Normal at 5% Significance Level**											
2799												
2800	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2801				KM Mean	0.214					KM Standard Error of Mean	0.0937	
2802				KM SD	0.212					95% KM (BCA) UCL	N/A	
2803				95% KM (t) UCL	0.392					95% KM (Percentile Bootstrap) UCL	N/A	
2804				95% KM (z) UCL	0.368					95% KM Bootstrap t UCL	N/A	
2805				90% KM Chebyshev UCL	0.495					95% KM Chebyshev UCL	0.623	
2806				97.5% KM Chebyshev UCL	0.799					99% KM Chebyshev UCL	1.147	
2807												
2808	**Gamma GOF Tests on Detected Observations Only**											

	A	B	C	D	E	F	G	H	I	J	K	L
2809					A-D Test Statistic	0.413	**Anderson-Darling GOF Test**					
2810					5% A-D Critical Value	0.662	Detected data appear Gamma Distributed at 5% Significance Level					
2811					K-S Test Statistic	0.304	**Kolmogorov-Smirnov GOF**					
2812					5% K-S Critical Value	0.399	Detected data appear Gamma Distributed at 5% Significance Level					
2813	**Detected data appear Gamma Distributed at 5% Significance Level**											
2814												
2815	**Gamma Statistics on Detected Data Only**											
2816					k hat (MLE)	1.69				k star (bias corrected MLE)	0.589	
2817					Theta hat (MLE)	0.172				Theta star (bias corrected MLE)	0.493	
2818					nu hat (MLE)	13.52				nu star (bias corrected)	4.713	
2819					Mean (detects)	0.291						
2820												
2821	**Gamma ROS Statistics using Imputed Non-Detects**											
2822	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2823	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2824	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2825	This is especially true when the sample size is small.											
2826	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2827					Minimum	0.01				Mean	0.184	
2828					Maximum	0.72				Median	0.13	
2829					SD	0.228				CV	1.236	
2830					k hat (MLE)	0.817				k star (bias corrected MLE)	0.594	
2831					Theta hat (MLE)	0.226				Theta star (bias corrected MLE)	0.31	
2832					nu hat (MLE)	13.07				nu star (bias corrected)	9.5	
2833					Adjusted Level of Significance (β)	0.0195						
2834					Approximate Chi Square Value (9.50, α)	3.632				Adjusted Chi Square Value (9.50, β)	2.775	
2835					95% Gamma Approximate UCL (use when n>=50)	0.482				95% Gamma Adjusted UCL (use when n<50)	N/A	
2836												
2837	**Estimates of Gamma Parameters using KM Estimates**											
2838					Mean (KM)	0.214				SD (KM)	0.212	
2839					Variance (KM)	0.045				SE of Mean (KM)	0.0937	
2840					k hat (KM)	1.019				k star (KM)	0.72	
2841					nu hat (KM)	16.31				nu star (KM)	11.52	
2842					theta hat (KM)	0.21				theta star (KM)	0.297	
2843					80% gamma percentile (KM)	0.352				90% gamma percentile (KM)	0.534	
2844					95% gamma percentile (KM)	0.721				99% gamma percentile (KM)	1.168	
2845												
2846	**Gamma Kaplan-Meier (KM) Statistics**											
2847					Approximate Chi Square Value (11.52, α)	4.916				Adjusted Chi Square Value (11.52, β)	3.882	
2848					95% Gamma Approximate KM-UCL (use when n>=50)	0.502				95% Gamma Adjusted KM-UCL (use when n<50)	0.636	
2849												
2850	**Lognormal GOF Test on Detected Observations Only**											
2851					Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk GOF Test**					
2852					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level					
2853					Lilliefors Test Statistic	0.25	**Lilliefors GOF Test**					
2854					5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level					
2855	**Detected Data appear Lognormal at 5% Significance Level**											
2856												
2857	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2858					Mean in Original Scale	0.193				Mean in Log Scale	-2.049	
2859					SD in Original Scale	0.22				SD in Log Scale	0.92	
2860					95% t UCL (assumes normality of ROS data)	0.34				95% Percentile Bootstrap UCL	0.333	

2861				95% BCA Bootstrap UCL	0.372					95% Bootstrap t UCL	0.634	
2862				95% H-UCL (Log ROS)	0.605							
2863												
2864	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2865				KM Mean (logged)	-1.863					KM Geo Mean	0.155	
2866				KM SD (logged)	0.723					95% Critical H Value (KM-Log)	2.783	
2867				KM Standard Error of Mean (logged)	0.334					95% H-UCL (KM -Log)	0.431	
2868				KM SD (logged)	0.723					95% Critical H Value (KM-Log)	2.783	
2869				KM Standard Error of Mean (logged)	0.334							
2870												
2871	**DL/2 Statistics**											
2872	**DL/2 Normal**						**DL/2 Log-Transformed**					
2873				Mean in Original Scale	0.291					Mean in Log Scale	-1.638	
2874				SD in Original Scale	0.28					SD in Log Scale	0.988	
2875				95% t UCL (Assumes normality)	0.479					95% H-Stat UCL	1.125	
2876	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2877												
2878	**Nonparametric Distribution Free UCL Statistics**											
2879	**Detected Data appear Normal Distributed at 5% Significance Level**											
2880												
2881	**Suggested UCL to Use**											
2882				95% KM (t) UCL	0.392							
2883												
2884	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2885	Recommendations are based upon data size, data distribution, and skewness.											
2886	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2887	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2888												
2889	**Antimony (smw7)**											
2890												
2891	**General Statistics**											
2892				Total Number of Observations	8					Number of Distinct Observations	7	
2893				Number of Detects	2					Number of Non-Detects	6	
2894				Number of Distinct Detects	1					Number of Distinct Non-Detects	6	
2895												
2896	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
2897	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
2898												
2899	**The data set for variable Antimony (smw7) was not processed!**											
2900												
2901												
2902	**Antimony (smw8)**											
2903												
2904	**General Statistics**											
2905				Total Number of Observations	8					Number of Distinct Observations	5	
2906				Number of Detects	1					Number of Non-Detects	7	
2907				Number of Distinct Detects	1					Number of Distinct Non-Detects	4	
2908												
2909	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
2910	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
2911												
2912	**The data set for variable Antimony (smw8) was not processed!**											

	A	B	C	D	E	F	G	H	I	J	K	L
2913												
2914												
2915	**Antimony (smw9)**											
2916												
2917	**General Statistics**											
2918					Total Number of Observations	9			Number of Distinct Observations	9		
2919					Number of Detects	3			Number of Non-Detects	6		
2920					Number of Distinct Detects	3			Number of Distinct Non-Detects	6		
2921					Minimum Detect	0.53			Minimum Non-Detect	0.3		
2922					Maximum Detect	0.64			Maximum Non-Detect	1.5		
2923					Variance Detects	0.00303			Percent Non-Detects	66.67%		
2924					Mean Detects	0.587			SD Detects	0.0551		
2925					Median Detects	0.59			CV Detects	0.0939		
2926					Skewness Detects	-0.271			Kurtosis Detects	N/A		
2927					Mean of Logged Detects	-0.536			SD of Logged Detects	0.0946		
2928												
2929	**Warning: Data set has only 3 Detected Values.**											
2930	**This is not enough to compute meaningful or reliable statistics and estimates.**											
2931												
2932												
2933	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2934	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2935	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2936	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2937												
2938	**Normal GOF Test on Detects Only**											
2939					Shapiro Wilk Test Statistic	0.997			**Shapiro Wilk GOF Test**			
2940					5% Shapiro Wilk Critical Value	0.767			Detected Data appear Normal at 5% Significance Level			
2941					Lilliefors Test Statistic	0.191			**Lilliefors GOF Test**			
2942					5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level			
2943	**Detected Data appear Normal at 5% Significance Level**											
2944												
2945	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2946					KM Mean	0.408			KM Standard Error of Mean	0.0613		
2947					KM SD	0.141			95% KM (BCA) UCL	N/A		
2948					95% KM (t) UCL	0.521			95% KM (Percentile Bootstrap) UCL	N/A		
2949					95% KM (z) UCL	0.508			95% KM Bootstrap t UCL	N/A		
2950					90% KM Chebyshev UCL	0.591			95% KM Chebyshev UCL	0.675		
2951					97.5% KM Chebyshev UCL	0.79			99% KM Chebyshev UCL	1.017		
2952												
2953	**Gamma GOF Tests on Detected Observations Only**											
2954	**Not Enough Data to Perform GOF Test**											
2955												
2956	**Gamma Statistics on Detected Data Only**											
2957					k hat (MLE)	168.7			k star (bias corrected MLE)	N/A		
2958					Theta hat (MLE)	0.00348			Theta star (bias corrected MLE)	N/A		
2959					nu hat (MLE)	1012			nu star (bias corrected)	N/A		
2960					Mean (detects)	0.587						
2961												
2962	**Gamma ROS Statistics using Imputed Non-Detects**											
2963	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2964	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											

	A	B	C	D	E	F	G	H	I	J	K	L
2965	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2966	This is especially true when the sample size is small.											
2967	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2968					Minimum	0.386				Mean		0.46
2969					Maximum	0.64				Median		0.386
2970					SD	0.101				CV		0.219
2971					k hat (MLE)	25.48				k star (bias corrected MLE)		17.06
2972					Theta hat (MLE)	0.0181				Theta star (bias corrected MLE)		0.027
2973					nu hat (MLE)	458.7				nu star (bias corrected)		307.2
2974					Adjusted Level of Significance (β)	0.0231						
2975					Approximate Chi Square Value (307.15, α)	267.6				Adjusted Chi Square Value (307.15, β)		259.7
2976					95% Gamma Approximate UCL (use when n>=50)	0.529				95% Gamma Adjusted UCL (use when n<50)		N/A
2977												
2978	**Estimates of Gamma Parameters using KM Estimates**											
2979					Mean (KM)	0.408				SD (KM)		0.141
2980					Variance (KM)	0.02				SE of Mean (KM)		0.0613
2981					k hat (KM)	8.295				k star (KM)		5.604
2982					nu hat (KM)	149.3				nu star (KM)		100.9
2983					theta hat (KM)	0.0491				theta star (KM)		0.0727
2984					80% gamma percentile (KM)	0.541				90% gamma percentile (KM)		0.638
2985					95% gamma percentile (KM)	0.726				99% gamma percentile (KM)		0.91
2986												
2987	**Gamma Kaplan-Meier (KM) Statistics**											
2988					Approximate Chi Square Value (100.87, α)	78.7				Adjusted Chi Square Value (100.87, β)		74.58
2989					95% Gamma Approximate KM-UCL (use when n>=50)	0.522				95% Gamma Adjusted KM-UCL (use when n<50)		0.551
2990												
2991	**Lognormal GOF Test on Detected Observations Only**											
2992					Shapiro Wilk Test Statistic	0.994				**Shapiro Wilk GOF Test**		
2993					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
2994					Lilliefors Test Statistic	0.203				**Lilliefors GOF Test**		
2995					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
2996	**Detected Data appear Lognormal at 5% Significance Level**											
2997												
2998	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2999					Mean in Original Scale	0.475				Mean in Log Scale		-0.76
3000					SD in Original Scale	0.09				SD in Log Scale		0.179
3001					95% t UCL (assumes normality of ROS data)	0.531				95% Percentile Bootstrap UCL		0.526
3002					95% BCA Bootstrap UCL	0.527				95% Bootstrap t UCL		0.559
3003					95% H-UCL (Log ROS)	0.535						
3004												
3005	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3006					KM Mean (logged)	-0.954				KM Geo Mean		0.385
3007					KM SD (logged)	0.327				95% Critical H Value (KM-Log)		2.042
3008					KM Standard Error of Mean (logged)	0.141				95% H-UCL (KM -Log)		0.515
3009					KM SD (logged)	0.327				95% Critical H Value (KM-Log)		2.042
3010					KM Standard Error of Mean (logged)	0.141						
3011												
3012	**DL/2 Statistics**											
3013	**DL/2 Normal**						**DL/2 Log-Transformed**					
3014					Mean in Original Scale	0.377				Mean in Log Scale		-1.175
3015					SD in Original Scale	0.245				SD in Log Scale		0.676
3016					95% t UCL (Assumes normality)	0.529				95% H-Stat UCL		0.718

	A	B	C	D	E	F	G	H	I	J	K	L
3017	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3018												
3019	**Nonparametric Distribution Free UCL Statistics**											
3020	**Detected Data appear Normal Distributed at 5% Significance Level**											
3021												
3022	**Suggested UCL to Use**											
3023					95% KM (t) UCL	0.521						
3024												
3025	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3026	Recommendations are based upon data size, data distribution, and skewness.											
3027	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3028	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3029												
3030	**Antimony (tw2r)**											
3031												
3032	**General Statistics**											
3033					Total Number of Observations	9			Number of Distinct Observations	7		
3034					Number of Detects	2			Number of Non-Detects	7		
3035					Number of Distinct Detects	2			Number of Distinct Non-Detects	5		
3036					Minimum Detect	0.13			Minimum Non-Detect	0.14		
3037					Maximum Detect	0.15			Maximum Non-Detect	0.5		
3038					Variance Detects	2.0000E-4			Percent Non-Detects	77.78%		
3039					Mean Detects	0.14			SD Detects	0.0141		
3040					Median Detects	0.14			CV Detects	0.101		
3041					Skewness Detects	N/A			Kurtosis Detects	N/A		
3042					Mean of Logged Detects	-1.969			SD of Logged Detects	0.101		
3043												
3044	**Warning: Data set has only 2 Detected Values.**											
3045	**This is not enough to compute meaningful or reliable statistics and estimates.**											
3046												
3047												
3048	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3049	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3050	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3051	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3052												
3053	**Normal GOF Test on Detects Only**											
3054	**Not Enough Data to Perform GOF Test**											
3055												
3056	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3057					KM Mean	0.137			KM Standard Error of Mean	0.0077		
3058					KM SD	0.00943			95% KM (BCA) UCL	N/A		
3059					95% KM (t) UCL	0.151			95% KM (Percentile Bootstrap) UCL	N/A		
3060					95% KM (z) UCL	0.149			95% KM Bootstrap t UCL	N/A		
3061					90% KM Chebyshev UCL	0.16			95% KM Chebyshev UCL	0.17		
3062					97.5% KM Chebyshev UCL	0.185			99% KM Chebyshev UCL	0.213		
3063												
3064	**Gamma GOF Tests on Detected Observations Only**											
3065	**Not Enough Data to Perform GOF Test**											
3066												
3067	**Gamma Statistics on Detected Data Only**											
3068					k hat (MLE)	195.7			k star (bias corrected MLE)	N/A		

3069					Theta hat (MLE)	7.1550E-4				Theta star (bias corrected MLE)		N/A
3070					nu hat (MLE)	782.7				nu star (bias corrected)		N/A
3071					Mean (detects)	0.14						
3072												
3073					**Estimates of Gamma Parameters using KM Estimates**							
3074					Mean (KM)	0.137				SD (KM)		0.00943
3075					Variance (KM)	8.8889E-5				SE of Mean (KM)		0.0077
3076					k hat (KM)	210.1				k star (KM)		140.2
3077					nu hat (KM)	3782				nu star (KM)		2523
3078					theta hat (KM)	6.5041E-4				theta star (KM)		9.7509E-4
3079					80% gamma percentile (KM)	0.146				90% gamma percentile (KM)		0.152
3080					95% gamma percentile (KM)	0.156				99% gamma percentile (KM)		0.165
3081												
3082					**Gamma Kaplan-Meier (KM) Statistics**							
3083										Adjusted Level of Significance (β)		0.0231
3084					Approximate Chi Square Value (N/A, α)	2407				Adjusted Chi Square Value (N/A, β)		2383
3085					95% Gamma Approximate KM-UCL (use when n>=50)	0.143				95% Gamma Adjusted KM-UCL (use when n<50)		0.145
3086												
3087					**Lognormal GOF Test on Detected Observations Only**							
3088					**Not Enough Data to Perform GOF Test**							
3089												
3090					**Lognormal ROS Statistics Using Imputed Non-Detects**							
3091					Mean in Original Scale	0.136				Mean in Log Scale		-1.995
3092					SD in Original Scale	0.00717				SD in Log Scale		0.0518
3093					95% t UCL (assumes normality of ROS data)	0.141				95% Percentile Bootstrap UCL		N/A
3094					95% BCA Bootstrap UCL	N/A				95% Bootstrap t UCL		N/A
3095					95% H-UCL (Log ROS)	N/A						
3096												
3097					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
3098					KM Mean (logged)	-1.993				KM Geo Mean		0.136
3099					KM SD (logged)	0.0675				95% Critical H Value (KM-Log)		N/A
3100					KM Standard Error of Mean (logged)	0.0551				95% H-UCL (KM -Log)		N/A
3101					KM SD (logged)	0.0675				95% Critical H Value (KM-Log)		N/A
3102					KM Standard Error of Mean (logged)	0.0551						
3103												
3104					**DL/2 Statistics**							
3105					**DL/2 Normal**					**DL/2 Log-Transformed**		
3106					Mean in Original Scale	0.164				Mean in Log Scale		-1.877
3107					SD in Original Scale	0.061				SD in Log Scale		0.405
3108					95% t UCL (Assumes normality)	0.202				95% H-Stat UCL		0.226
3109					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
3110												
3111					**Nonparametric Distribution Free UCL Statistics**							
3112					**Data do not follow a Discernible Distribution at 5% Significance Level**							
3113												
3114					**Suggested UCL to Use**							
3115					95% KM (t) UCL	0.151				KM H-UCL		N/A
3116					95% KM (BCA) UCL	N/A						
3117					**Warning: One or more Recommended UCL(s) not available!**							
3118					**Warning: Recommended UCL exceeds the maximum observation**							
3119												
3120					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony (tw5r)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
Number of Detects	2	Number of Non-Detects	6
Number of Distinct Detects	2	Number of Distinct Non-Detects	5
Minimum Detect	0.21	Minimum Non-Detect	0.18
Maximum Detect	0.39	Maximum Non-Detect	1.5
Variance Detects	0.0162	Percent Non-Detects	75%
Mean Detects	0.3	SD Detects	0.127
Median Detects	0.3	CV Detects	0.424
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.251	SD of Logged Detects	0.438

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use

guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.

For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).

Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.223	KM Standard Error of Mean	0.0387
KM SD	0.0696	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.296	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.286	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.339	95% KM Chebyshev UCL	0.391
97.5% KM Chebyshev UCL	0.464	99% KM Chebyshev UCL	0.608

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	10.77	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0279	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	43.07	nu star (bias corrected)	N/A
Mean (detects)	0.3		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.223	SD (KM)	0.0696
Variance (KM)	0.00485	SE of Mean (KM)	0.0387
k hat (KM)	10.24	k star (KM)	6.485
nu hat (KM)	163.9	nu star (KM)	103.8

3173					theta hat (KM)	0.0218					theta star (KM)	0.0344
3174					80% gamma percentile (KM)	0.291					90% gamma percentile (KM)	0.34
3175					95% gamma percentile (KM)	0.384					99% gamma percentile (KM)	0.475
3176												
3177					**Gamma Kaplan-Meier (KM) Statistics**							
3178											Adjusted Level of Significance (β)	0.0195
3179					Approximate Chi Square Value (103.76, α)	81.25					Adjusted Chi Square Value (103.76, β)	76.23
3180					95% Gamma Approximate KM-UCL (use when n>=50)	0.285					95% Gamma Adjusted KM-UCL (use when n<50)	0.303
3181												
3182					**Lognormal GOF Test on Detected Observations Only**							
3183					**Not Enough Data to Perform GOF Test**							
3184												
3185					**Lognormal ROS Statistics Using Imputed Non-Detects**							
3186					Mean in Original Scale	0.188					Mean in Log Scale	-1.746
3187					SD in Original Scale	0.0879					SD in Log Scale	0.388
3188					95% t UCL (assumes normality of ROS data)	0.247					95% Percentile Bootstrap UCL	0.245
3189					95% BCA Bootstrap UCL	0.258					95% Bootstrap t UCL	0.31
3190					95% H-UCL (Log ROS)	0.259						
3191												
3192					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
3193					KM Mean (logged)	-1.538					KM Geo Mean	0.215
3194					KM SD (logged)	0.254					95% Critical H Value (KM-Log)	2.002
3195					KM Standard Error of Mean (logged)	0.146					95% H-UCL (KM -Log)	0.269
3196					KM SD (logged)	0.254					95% Critical H Value (KM-Log)	2.002
3197					KM Standard Error of Mean (logged)	0.146						
3198												
3199					**DL/2 Statistics**							
3200					**DL/2 Normal**						**DL/2 Log-Transformed**	
3201					Mean in Original Scale	0.251					Mean in Log Scale	-1.637
3202					SD in Original Scale	0.223					SD in Log Scale	0.715
3203					95% t UCL (Assumes normality)	0.4					95% H-Stat UCL	0.53
3204					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
3205												
3206					**Nonparametric Distribution Free UCL Statistics**							
3207					**Data do not follow a Discernible Distribution at 5% Significance Level**							
3208												
3209					**Suggested UCL to Use**							
3210					95% KM (t) UCL	0.296					KM H-UCL	0.269
3211					95% KM (BCA) UCL	N/A						
3212					**Warning: One or more Recommended UCL(s) not available!**							
3213												
3214					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
3215					Recommendations are based upon data size, data distribution, and skewness.							
3216					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
3217					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
3218												
3219												
3220	**Antimony (waste water clarifier well)**											
3221												
3222					**General Statistics**							
3223					Total Number of Observations	1					Number of Distinct Observations	1
3224											Number of Missing Observations	0

	A	B	C	D	E	F	G	H	I	J	K	L
3225					Minimum	0.82					Mean	0.82
3226					Maximum	0.82					Median	0.82
3227												
3228	Warning: This data set only has 1 observations!											
3229	Data set is too small to compute reliable and meaningful statistics and estimates!											
3230	The data set for variable Antimony (waste water clarifier well) was not processed!											
3231												
3232	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
3233	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
3234												
3235												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 10:43:47 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	3.8	Mean	6.544
Maximum	11.1	Median	6.3
SD	2.635	Std. Error of Mean	0.878
Coefficient of Variation	0.403	Skewness	0.866

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.881	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.209	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8.178	95% Adjusted-CLT UCL (Chen-1995)	8.26
		95% Modified-t UCL (Johnson-1978)	8.22

Gamma GOF Test

A-D Test Statistic	0.367	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.162	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.518	k star (bias corrected MLE)	5.086
Theta hat (MLE)	0.871	Theta star (bias corrected MLE)	1.287
nu hat (MLE)	135.3	nu star (bias corrected)	91.55
MLE Mean (bias corrected)	6.544	MLE Sd (bias corrected)	2.902
		Approximate Chi Square Value (0.05)	70.49
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	66.6

53	**Assuming Gamma Distribution**											
54	95% Approximate Gamma UCL (use when n>=50))					8.5	95% Adjusted Gamma UCL (use when n<50)					8.996
55												
56	**Lognormal GOF Test**											
57	Shapiro Wilk Test Statistic					0.926	**Shapiro Wilk Lognormal GOF Test**					
58	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
59	Lilliefors Test Statistic					0.152	**Lilliefors Lognormal GOF Test**					
60	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64	Minimum of Logged Data					1.335	Mean of logged Data					1.811
65	Maximum of Logged Data					2.407	SD of logged Data					0.386
66												
67	**Assuming Lognormal Distribution**											
68	95% H-UCL					8.796	90% Chebyshev (MVUE) UCL					9.077
69	95% Chebyshev (MVUE) UCL					10.23	97.5% Chebyshev (MVUE) UCL					11.83
70	99% Chebyshev (MVUE) UCL					14.98						
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
74												
75	**Nonparametric Distribution Free UCLs**											
76	95% CLT UCL					7.989	95% Jackknife UCL					8.178
77	95% Standard Bootstrap UCL					7.916	95% Bootstrap-t UCL					8.834
78	95% Hall's Bootstrap UCL					9.614	95% Percentile Bootstrap UCL					8.011
79	95% BCA Bootstrap UCL					8.189						
80	90% Chebyshev(Mean, Sd) UCL					9.179	95% Chebyshev(Mean, Sd) UCL					10.37
81	97.5% Chebyshev(Mean, Sd) UCL					12.03	99% Chebyshev(Mean, Sd) UCL					15.28
82												
83	**Suggested UCL to Use**											
84	95% Student's-t UCL					8.178						
85												
86	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
87	Recommendations are based upon data size, data distribution, and skewness.											
88	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
89	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
90												
91												
92	**Arsenic (nfmw10)**											
93												
94	**General Statistics**											
95	Total Number of Observations					8	Number of Distinct Observations					8
96							Number of Missing Observations					0
97	Minimum					9.5	Mean					14.58
98	Maximum					21.5	Median					14.7
99	SD					4.116	Std. Error of Mean					1.455
100	Coefficient of Variation					0.282	Skewness					0.441
101												
102	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
103	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
104	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											

105	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
106												
107	**Normal GOF Test**											
108					Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk GOF Test**					
109					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
110					Lilliefors Test Statistic	0.171	**Lilliefors GOF Test**					
111					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
112	**Data appear Normal at 5% Significance Level**											
113												
114	**Assuming Normal Distribution**											
115	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
116					95% Student's-t UCL	17.33	95% Adjusted-CLT UCL (Chen-1995)	17.21				
117							95% Modified-t UCL (Johnson-1978)	17.37				
118												
119	**Gamma GOF Test**											
120					A-D Test Statistic	0.235	**Anderson-Darling Gamma GOF Test**					
121					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
122					K-S Test Statistic	0.152	**Kolmogorov-Smirnov Gamma GOF Test**					
123					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
124	**Detected data appear Gamma Distributed at 5% Significance Level**											
125												
126	**Gamma Statistics**											
127					k hat (MLE)	14.4	k star (bias corrected MLE)	9.085				
128					Theta hat (MLE)	1.012	Theta star (bias corrected MLE)	1.604				
129					nu hat (MLE)	230.5	nu star (bias corrected)	145.4				
130					MLE Mean (bias corrected)	14.58	MLE Sd (bias corrected)	4.835				
131							Approximate Chi Square Value (0.05)	118.5				
132					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	112.4				
133												
134	**Assuming Gamma Distribution**											
135					95% Approximate Gamma UCL (use when n>=50))	17.88	95% Adjusted Gamma UCL (use when n<50)	18.86				
136												
137	**Lognormal GOF Test**											
138					Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk Lognormal GOF Test**					
139					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
140					Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**					
141					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
142	**Data appear Lognormal at 5% Significance Level**											
143												
144	**Lognormal Statistics**											
145					Minimum of Logged Data	2.251	Mean of logged Data	2.644				
146					Maximum of Logged Data	3.068	SD of logged Data	0.285				
147												
148	**Assuming Lognormal Distribution**											
149					95% H-UCL	18.25	90% Chebyshev (MVUE) UCL	18.99				
150					95% Chebyshev (MVUE) UCL	20.99	97.5% Chebyshev (MVUE) UCL	23.77				
151					99% Chebyshev (MVUE) UCL	29.22						
152												
153	**Nonparametric Distribution Free UCL Statistics**											
154	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
155												
156	**Nonparametric Distribution Free UCLs**											

157					95% CLT UCL	16.97					95% Jackknife UCL	17.33
158					95% Standard Bootstrap UCL	16.74					95% Bootstrap-t UCL	17.67
159					95% Hall's Bootstrap UCL	18.16					95% Percentile Bootstrap UCL	16.79
160					95% BCA Bootstrap UCL	17.04						
161					90% Chebyshev(Mean, Sd) UCL	18.94					95% Chebyshev(Mean, Sd) UCL	20.92
162					97.5% Chebyshev(Mean, Sd) UCL	23.66					99% Chebyshev(Mean, Sd) UCL	29.05
163												
164					**Suggested UCL to Use**							
165					95% Student's-t UCL	17.33						
166												
167	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
168	Recommendations are based upon data size, data distribution, and skewness.											
169	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
170	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
171												
172												
173	**Arsenic (nfmw11)**											
174												
175					**General Statistics**							
176					Total Number of Observations	8					Number of Distinct Observations	7
177											Number of Missing Observations	0
178					Minimum	2.6					Mean	3.3
179					Maximum	4.2					Median	3.15
180					SD	0.607					Std. Error of Mean	0.215
181					Coefficient of Variation	0.184					Skewness	0.352
182												
183	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
184	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
185	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
186	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
187												
188					**Normal GOF Test**							
189					Shapiro Wilk Test Statistic	0.918					**Shapiro Wilk GOF Test**	
190					5% Shapiro Wilk Critical Value	0.818					Data appear Normal at 5% Significance Level	
191					Lilliefors Test Statistic	0.19					**Lilliefors GOF Test**	
192					5% Lilliefors Critical Value	0.283					Data appear Normal at 5% Significance Level	
193	**Data appear Normal at 5% Significance Level**											
194												
195					**Assuming Normal Distribution**							
196					**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**	
197					95% Student's-t UCL	3.707					95% Adjusted-CLT UCL (Chen-1995)	3.682
198											95% Modified-t UCL (Johnson-1978)	3.711
199												
200					**Gamma GOF Test**							
201					A-D Test Statistic	0.327					**Anderson-Darling Gamma GOF Test**	
202					5% A-D Critical Value	0.716					Detected data appear Gamma Distributed at 5% Significance Level	
203					K-S Test Statistic	0.174					**Kolmogorov-Smirnov Gamma GOF Test**	
204					5% K-S Critical Value	0.294					Detected data appear Gamma Distributed at 5% Significance Level	
205	**Detected data appear Gamma Distributed at 5% Significance Level**											
206												
207					**Gamma Statistics**							
208					k hat (MLE)	34.21					k star (bias corrected MLE)	21.47

209					Theta hat (MLE)	0.0965				Theta star (bias corrected MLE)		0.154
210					nu hat (MLE)	547.4				nu star (bias corrected)		343.5
211					MLE Mean (bias corrected)	3.3				MLE Sd (bias corrected)		0.712
212										Approximate Chi Square Value (0.05)		301.5
213					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		291.6
214												
215	**Assuming Gamma Distribution**											
216				95% Approximate Gamma UCL (use when n>=50))		3.759				95% Adjusted Gamma UCL (use when n<50)		3.888
217												
218	**Lognormal GOF Test**											
219					Shapiro Wilk Test Statistic	0.923				**Shapiro Wilk Lognormal GOF Test**		
220					5% Shapiro Wilk Critical Value	0.818				Data appear Lognormal at 5% Significance Level		
221					Lilliefors Test Statistic	0.16				**Lilliefors Lognormal GOF Test**		
222					5% Lilliefors Critical Value	0.283				Data appear Lognormal at 5% Significance Level		
223	**Data appear Lognormal at 5% Significance Level**											
224												
225	**Lognormal Statistics**											
226					Minimum of Logged Data	0.956				Mean of logged Data		1.179
227					Maximum of Logged Data	1.435				SD of logged Data		0.183
228												
229	**Assuming Lognormal Distribution**											
230					95% H-UCL	3.777				90% Chebyshev (MVUE) UCL		3.941
231					95% Chebyshev (MVUE) UCL	4.231				97.5% Chebyshev (MVUE) UCL		4.634
232					99% Chebyshev (MVUE) UCL	5.426						
233												
234	**Nonparametric Distribution Free UCL Statistics**											
235	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
236												
237	**Nonparametric Distribution Free UCLs**											
238					95% CLT UCL	3.653				95% Jackknife UCL		3.707
239					95% Standard Bootstrap UCL	3.633				95% Bootstrap-t UCL		3.787
240					95% Hall's Bootstrap UCL	3.669				95% Percentile Bootstrap UCL		3.625
241					95% BCA Bootstrap UCL	3.65						
242					90% Chebyshev(Mean, Sd) UCL	3.944				95% Chebyshev(Mean, Sd) UCL		4.236
243					97.5% Chebyshev(Mean, Sd) UCL	4.64				99% Chebyshev(Mean, Sd) UCL		5.436
244												
245	**Suggested UCL to Use**											
246					95% Student's-t UCL	3.707						
247												
248	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
249	Recommendations are based upon data size, data distribution, and skewness.											
250	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
251	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
252												
253												
254	**Arsenic (nfmw12)**											
255												
256	**General Statistics**											
257					Total Number of Observations	8				Number of Distinct Observations		8
258										Number of Missing Observations		0
259					Minimum	0.37				Mean		1.145
260					Maximum	3.1				Median		0.885

261					SD	0.903				Std. Error of Mean		0.319
262					Coefficient of Variation	0.789				Skewness		1.668
263												
264	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
265	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
266	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
267	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
268												
269	**Normal GOF Test**											
270					Shapiro Wilk Test Statistic	0.827	**Shapiro Wilk GOF Test**					
271					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
272					Lilliefors Test Statistic	0.201	**Lilliefors GOF Test**					
273					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
274	**Data appear Normal at 5% Significance Level**											
275												
276	**Assuming Normal Distribution**											
277	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
278					95% Student's-t UCL	1.75				95% Adjusted-CLT UCL (Chen-1995)		1.871
279										95% Modified-t UCL (Johnson-1978)		1.781
280												
281	**Gamma GOF Test**											
282					A-D Test Statistic	0.288	**Anderson-Darling Gamma GOF Test**					
283					5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level					
284					K-S Test Statistic	0.194	**Kolmogorov-Smirnov Gamma GOF Test**					
285					5% K-S Critical Value	0.297	Detected data appear Gamma Distributed at 5% Significance Level					
286	**Detected data appear Gamma Distributed at 5% Significance Level**											
287												
288	**Gamma Statistics**											
289					k hat (MLE)	2.253				k star (bias corrected MLE)		1.491
290					Theta hat (MLE)	0.508				Theta star (bias corrected MLE)		0.768
291					nu hat (MLE)	36.04				nu star (bias corrected)		23.86
292					MLE Mean (bias corrected)	1.145				MLE Sd (bias corrected)		0.938
293										Approximate Chi Square Value (0.05)		13.74
294					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		11.84
295												
296	**Assuming Gamma Distribution**											
297					95% Approximate Gamma UCL (use when n>=50))	1.988				95% Adjusted Gamma UCL (use when n<50)		2.306
298												
299	**Lognormal GOF Test**											
300					Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk Lognormal GOF Test**					
301					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
302					Lilliefors Test Statistic	0.159	**Lilliefors Lognormal GOF Test**					
303					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
304	**Data appear Lognormal at 5% Significance Level**											
305												
306	**Lognormal Statistics**											
307					Minimum of Logged Data	-0.994				Mean of logged Data		-0.103
308					Maximum of Logged Data	1.131				SD of logged Data		0.725
309												
310	**Assuming Lognormal Distribution**											
311					95% H-UCL	2.521				90% Chebyshev (MVUE) UCL		2.013
312					95% Chebyshev (MVUE) UCL	2.414				97.5% Chebyshev (MVUE) UCL		2.969

313				99% Chebyshev (MVUE) UCL		4.061						
314												
315	**Nonparametric Distribution Free UCL Statistics**											
316	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
317												
318	**Nonparametric Distribution Free UCLs**											
319				95% CLT UCL		1.67				95% Jackknife UCL		1.75
320				95% Standard Bootstrap UCL		1.637				95% Bootstrap-t UCL		2.308
321				95% Hall's Bootstrap UCL		3.923				95% Percentile Bootstrap UCL		1.649
322				95% BCA Bootstrap UCL		1.848						
323				90% Chebyshev(Mean, Sd) UCL		2.103				95% Chebyshev(Mean, Sd) UCL		2.537
324				97.5% Chebyshev(Mean, Sd) UCL		3.139				99% Chebyshev(Mean, Sd) UCL		4.322
325												
326	**Suggested UCL to Use**											
327				95% Student's-t UCL		1.75						
328												
329	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
330	Recommendations are based upon data size, data distribution, and skewness.											
331	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
332	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
333												
334												
335	**Arsenic (nfmw19)**											
336												
337	**General Statistics**											
338				Total Number of Observations		8				Number of Distinct Observations		7
339										Number of Missing Observations		0
340				Minimum		2.3				Mean		3.575
341				Maximum		6.7				Median		3.1
342				SD		1.515				Std. Error of Mean		0.536
343				Coefficient of Variation		0.424				Skewness		1.393
344												
345	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
346	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
347	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
348	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
349												
350	**Normal GOF Test**											
351				Shapiro Wilk Test Statistic		0.838				**Shapiro Wilk GOF Test**		
352				5% Shapiro Wilk Critical Value		0.818				Data appear Normal at 5% Significance Level		
353				Lilliefors Test Statistic		0.223				**Lilliefors GOF Test**		
354				5% Lilliefors Critical Value		0.283				Data appear Normal at 5% Significance Level		
355	**Data appear Normal at 5% Significance Level**											
356												
357	**Assuming Normal Distribution**											
358	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
359				95% Student's-t UCL		4.59				95% Adjusted-CLT UCL (Chen-1995)		4.738
360										95% Modified-t UCL (Johnson-1978)		4.634
361												
362	**Gamma GOF Test**											
363				A-D Test Statistic		0.453				**Anderson-Darling Gamma GOF Test**		
364				5% A-D Critical Value		0.717				Detected data appear Gamma Distributed at 5% Significance Level		

	A	B	C	D	E	F	G	H	I	J	K	L
365					K-S Test Statistic	0.194	**Kolmogorov-Smirnov Gamma GOF Test**					
366					5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level					
367	**Detected data appear Gamma Distributed at 5% Significance Level**											
368												
369	**Gamma Statistics**											
370					k hat (MLE)	7.484				k star (bias corrected MLE)		4.761
371					Theta hat (MLE)	0.478				Theta star (bias corrected MLE)		0.751
372					nu hat (MLE)	119.7				nu star (bias corrected)		76.17
373					MLE Mean (bias corrected)	3.575				MLE Sd (bias corrected)		1.638
374										Approximate Chi Square Value (0.05)		57.07
375					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		52.91
376												
377	**Assuming Gamma Distribution**											
378				95% Approximate Gamma UCL (use when n>=50))		4.772				95% Adjusted Gamma UCL (use when n<50)		5.147
379												
380	**Lognormal GOF Test**											
381					Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk Lognormal GOF Test**					
382					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
383					Lilliefors Test Statistic	0.181	**Lilliefors Lognormal GOF Test**					
384					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
385	**Data appear Lognormal at 5% Significance Level**											
386												
387	**Lognormal Statistics**											
388					Minimum of Logged Data	0.833				Mean of logged Data		1.206
389					Maximum of Logged Data	1.902				SD of logged Data		0.383
390												
391	**Assuming Lognormal Distribution**											
392					95% H-UCL	4.917				90% Chebyshev (MVUE) UCL		5.012
393					95% Chebyshev (MVUE) UCL	5.671				97.5% Chebyshev (MVUE) UCL		6.584
394					99% Chebyshev (MVUE) UCL	8.38						
395												
396	**Nonparametric Distribution Free UCL Statistics**											
397	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
398												
399	**Nonparametric Distribution Free UCLs**											
400					95% CLT UCL	4.456				95% Jackknife UCL		4.59
401					95% Standard Bootstrap UCL	4.405				95% Bootstrap-t UCL		5.262
402					95% Hall's Bootstrap UCL	5.044				95% Percentile Bootstrap UCL		4.45
403					95% BCA Bootstrap UCL	4.763						
404					90% Chebyshev(Mean, Sd) UCL	5.182				95% Chebyshev(Mean, Sd) UCL		5.91
405					97.5% Chebyshev(Mean, Sd) UCL	6.921				99% Chebyshev(Mean, Sd) UCL		8.906
406												
407	**Suggested UCL to Use**											
408					95% Student's-t UCL	4.59						
409												
410	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
411	Recommendations are based upon data size, data distribution, and skewness.											
412	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
413	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
414												
415												
416	**Arsenic (nfmw1d)**											

417												
418	**General Statistics**											
419					Total Number of Observations	9			Number of Distinct Observations	9		
420									Number of Missing Observations	0		
421					Minimum	12.7			Mean	18.71		
422					Maximum	22.6			Median	18.4		
423					SD	3.017			Std. Error of Mean	1.006		
424					Coefficient of Variation	0.161			Skewness	-0.769		
425												
426	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
427	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
428	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
429	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
430												
431	**Normal GOF Test**											
432					Shapiro Wilk Test Statistic	0.934			**Shapiro Wilk GOF Test**			
433					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
434					Lilliefors Test Statistic	0.179			**Lilliefors GOF Test**			
435					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
436	**Data appear Normal at 5% Significance Level**											
437												
438	**Assuming Normal Distribution**											
439					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
440					95% Student's-t UCL	20.58			95% Adjusted-CLT UCL (Chen-1995)	20.09		
441									95% Modified-t UCL (Johnson-1978)	20.54		
442												
443	**Gamma GOF Test**											
444					A-D Test Statistic	0.39			**Anderson-Darling Gamma GOF Test**			
445					5% A-D Critical Value	0.721			Detected data appear Gamma Distributed at 5% Significance Level			
446					K-S Test Statistic	0.192			**Kolmogorov-Smirnov Gamma GOF Test**			
447					5% K-S Critical Value	0.279			Detected data appear Gamma Distributed at 5% Significance Level			
448	**Detected data appear Gamma Distributed at 5% Significance Level**											
449												
450	**Gamma Statistics**											
451					k hat (MLE)	39.34			k star (bias corrected MLE)	26.3		
452					Theta hat (MLE)	0.476			Theta star (bias corrected MLE)	0.711		
453					nu hat (MLE)	708.2			nu star (bias corrected)	473.5		
454					MLE Mean (bias corrected)	18.71			MLE Sd (bias corrected)	3.648		
455									Approximate Chi Square Value (0.05)	424		
456					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	414.1		
457												
458	**Assuming Gamma Distribution**											
459					95% Approximate Gamma UCL (use when n>=50))	20.89			95% Adjusted Gamma UCL (use when n<50)	21.39		
460												
461	**Lognormal GOF Test**											
462					Shapiro Wilk Test Statistic	0.895			**Shapiro Wilk Lognormal GOF Test**			
463					5% Shapiro Wilk Critical Value	0.829			Data appear Lognormal at 5% Significance Level			
464					Lilliefors Test Statistic	0.205			**Lilliefors Lognormal GOF Test**			
465					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
466	**Data appear Lognormal at 5% Significance Level**											
467												
468	**Lognormal Statistics**											

469				Minimum of Logged Data		2.542				Mean of logged Data		2.916
470				Maximum of Logged Data		3.118				SD of logged Data		0.174
471												
472						**Assuming Lognormal Distribution**							
473					95% H-UCL	21.06				90% Chebyshev (MVUE) UCL		21.99
474				95% Chebyshev (MVUE) UCL		23.47				97.5% Chebyshev (MVUE) UCL		25.52
475				99% Chebyshev (MVUE) UCL		29.56						
476												
477						**Nonparametric Distribution Free UCL Statistics**							
478						**Data appear to follow a Discernible Distribution at 5% Significance Level**						
479												
480						**Nonparametric Distribution Free UCLs**							
481					95% CLT UCL	20.37				95% Jackknife UCL		20.58
482				95% Standard Bootstrap UCL		20.28				95% Bootstrap-t UCL		20.3
483				95% Hall's Bootstrap UCL		20.21				95% Percentile Bootstrap UCL		20.22
484				95% BCA Bootstrap UCL		20.04						
485				90% Chebyshev(Mean, Sd) UCL		21.73				95% Chebyshev(Mean, Sd) UCL		23.09
486				97.5% Chebyshev(Mean, Sd) UCL		24.99				99% Chebyshev(Mean, Sd) UCL		28.72
487												
488						**Suggested UCL to Use**							
489					95% Student's-t UCL	20.58						
490												
491						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
492						Recommendations are based upon data size, data distribution, and skewness.						
493						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
494						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
495												
496						**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**						
497						**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**						
498												
499												
500	**Arsenic (nfmw1s)**											
501												
502						**General Statistics**							
503					Total Number of Observations	7				Number of Distinct Observations		7
504										Number of Missing Observations		0
505					Minimum	5.3				Mean		11.14
506					Maximum	26.3				Median		9.7
507					SD	7.123				Std. Error of Mean		2.692
508					Coefficient of Variation	0.639				Skewness		2.009
509												
510						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
511						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
512						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
513						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
514												
515						**Normal GOF Test**						
516					Shapiro Wilk Test Statistic	0.769				**Shapiro Wilk GOF Test**		
517					5% Shapiro Wilk Critical Value	0.803				Data Not Normal at 5% Significance Level		
518					Lilliefors Test Statistic	0.32				**Lilliefors GOF Test**		
519					5% Lilliefors Critical Value	0.304				Data Not Normal at 5% Significance Level		
520						**Data Not Normal at 5% Significance Level**						

521												
522	**Assuming Normal Distribution**											
523	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
524				95% Student's-t UCL		16.37				95% Adjusted-CLT UCL (Chen-1995)		17.76
525										95% Modified-t UCL (Johnson-1978)		16.72
526												
527	**Gamma GOF Test**											
528				A-D Test Statistic		0.441	**Anderson-Darling Gamma GOF Test**					
529				5% A-D Critical Value		0.71	Detected data appear Gamma Distributed at 5% Significance Level					
530				K-S Test Statistic		0.246	**Kolmogorov-Smirnov Gamma GOF Test**					
531				5% K-S Critical Value		0.313	Detected data appear Gamma Distributed at 5% Significance Level					
532	**Detected data appear Gamma Distributed at 5% Significance Level**											
533												
534	**Gamma Statistics**											
535				k hat (MLE)		3.871	k star (bias corrected MLE)					2.307
536				Theta hat (MLE)		2.879	Theta star (bias corrected MLE)					4.83
537				nu hat (MLE)		54.19	nu star (bias corrected)					32.3
538				MLE Mean (bias corrected)		11.14	MLE Sd (bias corrected)					7.336
539							Approximate Chi Square Value (0.05)					20.31
540				Adjusted Level of Significance		0.0158	Adjusted Chi Square Value					17.5
541												
542	**Assuming Gamma Distribution**											
543				95% Approximate Gamma UCL (use when n>=50)		17.72	95% Adjusted Gamma UCL (use when n<50)					20.57
544												
545	**Lognormal GOF Test**											
546				Shapiro Wilk Test Statistic		0.924	**Shapiro Wilk Lognormal GOF Test**					
547				5% Shapiro Wilk Critical Value		0.803	Data appear Lognormal at 5% Significance Level					
548				Lilliefors Test Statistic		0.216	**Lilliefors Lognormal GOF Test**					
549				5% Lilliefors Critical Value		0.304	Data appear Lognormal at 5% Significance Level					
550	**Data appear Lognormal at 5% Significance Level**											
551												
552	**Lognormal Statistics**											
553				Minimum of Logged Data		1.668	Mean of logged Data					2.276
554				Maximum of Logged Data		3.27	SD of logged Data					0.53
555												
556	**Assuming Lognormal Distribution**											
557				95% H-UCL		19.34	90% Chebyshev (MVUE) UCL					17.58
558				95% Chebyshev (MVUE) UCL		20.58	97.5% Chebyshev (MVUE) UCL					24.74
559				99% Chebyshev (MVUE) UCL		32.92						
560												
561	**Nonparametric Distribution Free UCL Statistics**											
562	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
563												
564	**Nonparametric Distribution Free UCLs**											
565				95% CLT UCL		15.57	95% Jackknife UCL					16.37
566				95% Standard Bootstrap UCL		15.39	95% Bootstrap-t UCL					22.08
567				95% Hall's Bootstrap UCL		33.04	95% Percentile Bootstrap UCL					15.36
568				95% BCA Bootstrap UCL		17.73						
569				90% Chebyshev(Mean, Sd) UCL		19.22	95% Chebyshev(Mean, Sd) UCL					22.88
570				97.5% Chebyshev(Mean, Sd) UCL		27.96	99% Chebyshev(Mean, Sd) UCL					37.93
571												
572	**Suggested UCL to Use**											

573				95% Adjusted Gamma UCL		20.57						
574												
575	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
576	Recommendations are based upon data size, data distribution, and skewness.											
577	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
578	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
579												
580												
581	**Arsenic (nfmw2)**											
582												
583	**General Statistics**											
584				Total Number of Observations		9			Number of Distinct Observations			9
585									Number of Missing Observations			0
586				Minimum		2.2			Mean			8.644
587				Maximum		16.5			Median			7
588				SD		4.969			Std. Error of Mean			1.656
589				Coefficient of Variation		0.575			Skewness			0.409
590												
591	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
592	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
593	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
594	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
595												
596	**Normal GOF Test**											
597				Shapiro Wilk Test Statistic		0.932			**Shapiro Wilk GOF Test**			
598				5% Shapiro Wilk Critical Value		0.829			Data appear Normal at 5% Significance Level			
599				Lilliefors Test Statistic		0.185			**Lilliefors GOF Test**			
600				5% Lilliefors Critical Value		0.274			Data appear Normal at 5% Significance Level			
601	**Data appear Normal at 5% Significance Level**											
602												
603	**Assuming Normal Distribution**											
604	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
605				95% Student's-t UCL		11.72			95% Adjusted-CLT UCL (Chen-1995)			11.61
606									95% Modified-t UCL (Johnson-1978)			11.76
607												
608	**Gamma GOF Test**											
609				A-D Test Statistic		0.238			**Anderson-Darling Gamma GOF Test**			
610				5% A-D Critical Value		0.727			Detected data appear Gamma Distributed at 5% Significance Level			
611				K-S Test Statistic		0.184			**Kolmogorov-Smirnov Gamma GOF Test**			
612				5% K-S Critical Value		0.281			Detected data appear Gamma Distributed at 5% Significance Level			
613	**Detected data appear Gamma Distributed at 5% Significance Level**											
614												
615	**Gamma Statistics**											
616				k hat (MLE)		3.024			k star (bias corrected MLE)			2.09
617				Theta hat (MLE)		2.859			Theta star (bias corrected MLE)			4.136
618				nu hat (MLE)		54.43			nu star (bias corrected)			37.62
619				MLE Mean (bias corrected)		8.644			MLE Sd (bias corrected)			5.979
620									Approximate Chi Square Value (0.05)			24.58
621				Adjusted Level of Significance		0.0231			Adjusted Chi Square Value			22.38
622												
623	**Assuming Gamma Distribution**											
624				95% Approximate Gamma UCL (use when n>=50))		13.23			95% Adjusted Gamma UCL (use when n<50)			14.53

625												
626	**Lognormal GOF Test**											
627					Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**					
628					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
629					Lilliefors Test Statistic	0.161	**Lilliefors Lognormal GOF Test**					
630					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
631	**Data appear Lognormal at 5% Significance Level**											
632												
633	**Lognormal Statistics**											
634					Minimum of Logged Data	0.788	Mean of logged Data	1.983				
635					Maximum of Logged Data	2.803	SD of logged Data	0.664				
636												
637	**Assuming Lognormal Distribution**											
638					95% H-UCL	16.48	90% Chebyshev (MVUE) UCL	14.77				
639					95% Chebyshev (MVUE) UCL	17.47	97.5% Chebyshev (MVUE) UCL	21.22				
640					99% Chebyshev (MVUE) UCL	28.59						
641												
642	**Nonparametric Distribution Free UCL Statistics**											
643	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
644												
645	**Nonparametric Distribution Free UCLs**											
646					95% CLT UCL	11.37	95% Jackknife UCL	11.72				
647					95% Standard Bootstrap UCL	11.19	95% Bootstrap-t UCL	12.55				
648					95% Hall's Bootstrap UCL	11.23	95% Percentile Bootstrap UCL	11.31				
649					95% BCA Bootstrap UCL	11.32						
650					90% Chebyshev(Mean, Sd) UCL	13.61	95% Chebyshev(Mean, Sd) UCL	15.86				
651					97.5% Chebyshev(Mean, Sd) UCL	18.99	99% Chebyshev(Mean, Sd) UCL	25.12				
652												
653	**Suggested UCL to Use**											
654					95% Student's-t UCL	11.72						
655												
656	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
657	Recommendations are based upon data size, data distribution, and skewness.											
658	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
659	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
660												
661												
662	**Arsenic (nfmw20)**											
663												
664	**General Statistics**											
665					Total Number of Observations	8	Number of Distinct Observations	7				
666							Number of Missing Observations	0				
667					Minimum	3	Mean	3.963				
668					Maximum	6.1	Median	3.55				
669					SD	1.091	Std. Error of Mean	0.386				
670					Coefficient of Variation	0.275	Skewness	1.192				
671												
672	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
673	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
674	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
675	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
676												

	A	B	C	D	E	F	G	H	I	J	K	L
677	**Normal GOF Test**											
678					Shapiro Wilk Test Statistic	0.86	**Shapiro Wilk GOF Test**					
679					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
680					Lilliefors Test Statistic	0.255	**Lilliefors GOF Test**					
681					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
682	**Data appear Normal at 5% Significance Level**											
683												
684	**Assuming Normal Distribution**											
685	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
686					95% Student's-t UCL	4.694				95% Adjusted-CLT UCL (Chen-1995)	4.771	
687										95% Modified-t UCL (Johnson-1978)	4.721	
688												
689	**Gamma GOF Test**											
690					A-D Test Statistic	0.458	**Anderson-Darling Gamma GOF Test**					
691					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
692					K-S Test Statistic	0.245	**Kolmogorov-Smirnov Gamma GOF Test**					
693					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
694	**Detected data appear Gamma Distributed at 5% Significance Level**											
695												
696	**Gamma Statistics**											
697					k hat (MLE)	16.84				k star (bias corrected MLE)	10.61	
698					Theta hat (MLE)	0.235				Theta star (bias corrected MLE)	0.374	
699					nu hat (MLE)	269.4				nu star (bias corrected)	169.7	
700					MLE Mean (bias corrected)	3.963				MLE Sd (bias corrected)	1.217	
701										Approximate Chi Square Value (0.05)	140.6	
702					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	133.9	
703												
704	**Assuming Gamma Distribution**											
705					95% Approximate Gamma UCL (use when n>=50))	4.783				95% Adjusted Gamma UCL (use when n<50)	5.023	
706												
707	**Lognormal GOF Test**											
708					Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk Lognormal GOF Test**					
709					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
710					Lilliefors Test Statistic	0.227	**Lilliefors Lognormal GOF Test**					
711					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
712	**Data appear Lognormal at 5% Significance Level**											
713												
714	**Lognormal Statistics**											
715					Minimum of Logged Data	1.099				Mean of logged Data	1.347	
716					Maximum of Logged Data	1.808				SD of logged Data	0.256	
717												
718	**Assuming Lognormal Distribution**											
719					95% H-UCL	4.822				90% Chebyshev (MVUE) UCL	5.032	
720					95% Chebyshev (MVUE) UCL	5.519				97.5% Chebyshev (MVUE) UCL	6.195	
721					99% Chebyshev (MVUE) UCL	7.524						
722												
723	**Nonparametric Distribution Free UCL Statistics**											
724	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
725												
726	**Nonparametric Distribution Free UCLs**											
727					95% CLT UCL	4.597				95% Jackknife UCL	4.694	
728					95% Standard Bootstrap UCL	4.56				95% Bootstrap-t UCL	5.112	

729				95% Hall's Bootstrap UCL		4.747				95% Percentile Bootstrap UCL		4.625
730				95% BCA Bootstrap UCL		4.675						
731				90% Chebyshev(Mean, Sd) UCL		5.12				95% Chebyshev(Mean, Sd) UCL		5.645
732				97.5% Chebyshev(Mean, Sd) UCL		6.372				99% Chebyshev(Mean, Sd) UCL		7.802
733												
734					**Suggested UCL to Use**							
735				95% Student's-t UCL		4.694						
736												
737	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
738	Recommendations are based upon data size, data distribution, and skewness.											
739	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
740	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
741												
742												
743	**Arsenic (nfmw22)**											
744												
745					**General Statistics**							
746				Total Number of Observations		4				Number of Distinct Observations		4
747										Number of Missing Observations		0
748				Minimum		11.1				Mean		12.63
749				Maximum		14				Median		12.7
750				SD		1.441				Std. Error of Mean		0.72
751				Coefficient of Variation		0.114				Skewness		-0.111
752												
753	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
754	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
755	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
756	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
757												
758					**Normal GOF Test**							
759				Shapiro Wilk Test Statistic		0.87				**Shapiro Wilk GOF Test**		
760				5% Shapiro Wilk Critical Value		0.748				Data appear Normal at 5% Significance Level		
761				Lilliefors Test Statistic		0.272				**Lilliefors GOF Test**		
762				5% Lilliefors Critical Value		0.375				Data appear Normal at 5% Significance Level		
763	**Data appear Normal at 5% Significance Level**											
764												
765					**Assuming Normal Distribution**							
766				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
767				95% Student's-t UCL		14.32				95% Adjusted-CLT UCL (Chen-1995)		13.77
768										95% Modified-t UCL (Johnson-1978)		14.31
769												
770					**Gamma GOF Test**							
771				A-D Test Statistic		0.435				**Anderson-Darling Gamma GOF Test**		
772				5% A-D Critical Value		0.657				Detected data appear Gamma Distributed at 5% Significance Level		
773				K-S Test Statistic		0.307				**Kolmogorov-Smirnov Gamma GOF Test**		
774				5% K-S Critical Value		0.394				Detected data appear Gamma Distributed at 5% Significance Level		
775	**Detected data appear Gamma Distributed at 5% Significance Level**											
776												
777					**Gamma Statistics**							
778				k hat (MLE)		101.5				k star (bias corrected MLE)		25.55
779				Theta hat (MLE)		0.124				Theta star (bias corrected MLE)		0.494
780				nu hat (MLE)		812.3				nu star (bias corrected)		204.4

781				MLE Mean (bias corrected)		12.63				MLE Sd (bias corrected)		2.498
782										Approximate Chi Square Value (0.05)		172.3
783				Adjusted Level of Significance		N/A				Adjusted Chi Square Value		N/A
784												
785	**Assuming Gamma Distribution**											
786				95% Approximate Gamma UCL (use when n>=50))		14.98				95% Adjusted Gamma UCL (use when n<50)		N/A
787												
788	**Lognormal GOF Test**											
789				Shapiro Wilk Test Statistic		0.873				**Shapiro Wilk Lognormal GOF Test**		
790				5% Shapiro Wilk Critical Value		0.748				Data appear Lognormal at 5% Significance Level		
791				Lilliefors Test Statistic		0.275				**Lilliefors Lognormal GOF Test**		
792				5% Lilliefors Critical Value		0.375				Data appear Lognormal at 5% Significance Level		
793	**Data appear Lognormal at 5% Significance Level**											
794												
795	**Lognormal Statistics**											
796				Minimum of Logged Data		2.407				Mean of logged Data		2.531
797				Maximum of Logged Data		2.639				SD of logged Data		0.115
798												
799	**Assuming Lognormal Distribution**											
800				95% H-UCL		14.69				90% Chebyshev (MVUE) UCL		14.8
801				95% Chebyshev (MVUE) UCL		15.78				97.5% Chebyshev (MVUE) UCL		17.15
802				99% Chebyshev (MVUE) UCL		19.84						
803												
804	**Nonparametric Distribution Free UCL Statistics**											
805	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
806												
807	**Nonparametric Distribution Free UCLs**											
808				95% CLT UCL		13.81				95% Jackknife UCL		14.32
809				95% Standard Bootstrap UCL		N/A				95% Bootstrap-t UCL		N/A
810				95% Hall's Bootstrap UCL		N/A				95% Percentile Bootstrap UCL		N/A
811				95% BCA Bootstrap UCL		N/A						
812				90% Chebyshev(Mean, Sd) UCL		14.79				95% Chebyshev(Mean, Sd) UCL		15.77
813				97.5% Chebyshev(Mean, Sd) UCL		17.12				99% Chebyshev(Mean, Sd) UCL		19.79
814												
815	**Suggested UCL to Use**											
816				95% Student's-t UCL		14.32						
817												
818	**Recommended UCL exceeds the maximum observation**											
819												
820	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
821	Recommendations are based upon data size, data distribution, and skewness.											
822	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
823	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
824												
825	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
826	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
827												
828												
829	**Arsenic (nfmw23)**											
830												
831	**General Statistics**											
832				Total Number of Observations		4				Number of Distinct Observations		4

833										Number of Missing Observations		0
834					Minimum	50.8				Mean		60.78
835					Maximum	73.8				Median		59.25
836					SD	9.795				Std. Error of Mean		4.898
837					Coefficient of Variation	0.161				Skewness		0.813
838												
839	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
840	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
841	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
842	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
843												
844	**Normal GOF Test**											
845					Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**					
846					5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level					
847					Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**					
848					5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level					
849	**Data appear Normal at 5% Significance Level**											
850												
851	**Assuming Normal Distribution**											
852	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
853					95% Student's-t UCL	72.3				95% Adjusted-CLT UCL (Chen-1995)		70.96
854										95% Modified-t UCL (Johnson-1978)		72.63
855												
856	**Gamma GOF Test**											
857					A-D Test Statistic	0.225	**Anderson-Darling Gamma GOF Test**					
858					5% A-D Critical Value	0.656	Detected data appear Gamma Distributed at 5% Significance Level					
859					K-S Test Statistic	0.184	**Kolmogorov-Smirnov Gamma GOF Test**					
860					5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level					
861	**Detected data appear Gamma Distributed at 5% Significance Level**											
862												
863	**Gamma Statistics**											
864					k hat (MLE)	52.9				k star (bias corrected MLE)		13.39
865					Theta hat (MLE)	1.149				Theta star (bias corrected MLE)		4.539
866					nu hat (MLE)	423.2				nu star (bias corrected)		107.1
867					MLE Mean (bias corrected)	60.78				MLE Sd (bias corrected)		16.61
868										Approximate Chi Square Value (0.05)		84.24
869					Adjusted Level of Significance	N/A				Adjusted Chi Square Value		N/A
870												
871	**Assuming Gamma Distribution**											
872					95% Approximate Gamma UCL (use when n>=50))	77.29				95% Adjusted Gamma UCL (use when n<50)		N/A
873												
874	**Lognormal GOF Test**											
875					Shapiro Wilk Test Statistic	0.985	**Shapiro Wilk Lognormal GOF Test**					
876					5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level					
877					Lilliefors Test Statistic	0.18	**Lilliefors Lognormal GOF Test**					
878					5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level					
879	**Data appear Lognormal at 5% Significance Level**											
880												
881	**Lognormal Statistics**											
882					Minimum of Logged Data	3.928				Mean of logged Data		4.098
883					Maximum of Logged Data	4.301				SD of logged Data		0.158
884												

885	**Assuming Lognormal Distribution**											
886					95% H-UCL	75.55			90% Chebyshev (MVUE) UCL	75.14		
887					95% Chebyshev (MVUE) UCL	81.65			97.5% Chebyshev (MVUE) UCL	90.69		
888					99% Chebyshev (MVUE) UCL	108.4						
889												
890	**Nonparametric Distribution Free UCL Statistics**											
891	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
892												
893	**Nonparametric Distribution Free UCLs**											
894					95% CLT UCL	68.83			95% Jackknife UCL	72.3		
895					95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL	N/A		
896					95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL	N/A		
897					95% BCA Bootstrap UCL	N/A						
898					90% Chebyshev(Mean, Sd) UCL	75.47			95% Chebyshev(Mean, Sd) UCL	82.12		
899					97.5% Chebyshev(Mean, Sd) UCL	91.36			99% Chebyshev(Mean, Sd) UCL	109.5		
900												
901	**Suggested UCL to Use**											
902					95% Student's-t UCL	72.3						
903												
904	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
905	Recommendations are based upon data size, data distribution, and skewness.											
906	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
907	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
908												
909												
910	**Arsenic (nfmw3)**											
911												
912	**General Statistics**											
913					Total Number of Observations	9			Number of Distinct Observations	8		
914									Number of Missing Observations	0		
915					Minimum	2.4			Mean	4.6		
916					Maximum	9.4			Median	4.3		
917					SD	2.142			Std. Error of Mean	0.714		
918					Coefficient of Variation	0.466			Skewness	1.525		
919												
920	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
921	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
922	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
923	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
924												
925	**Normal GOF Test**											
926					Shapiro Wilk Test Statistic	0.86			**Shapiro Wilk GOF Test**			
927					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
928					Lilliefors Test Statistic	0.204			**Lilliefors GOF Test**			
929					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
930	**Data appear Normal at 5% Significance Level**											
931												
932	**Assuming Normal Distribution**											
933	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
934					95% Student's-t UCL	5.928			95% Adjusted-CLT UCL (Chen-1995)	6.163		
935									95% Modified-t UCL (Johnson-1978)	5.988		
936												

937	**Gamma GOF Test**											
938					A-D Test Statistic	0.316	**Anderson-Darling Gamma GOF Test**					
939					5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level					
940					K-S Test Statistic	0.185	**Kolmogorov-Smirnov Gamma GOF Test**					
941					5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level					
942	**Detected data appear Gamma Distributed at 5% Significance Level**											
943												
944	**Gamma Statistics**											
945					k hat (MLE)	6.203	k star (bias corrected MLE)	4.209				
946					Theta hat (MLE)	0.742	Theta star (bias corrected MLE)	1.093				
947					nu hat (MLE)	111.6	nu star (bias corrected)	75.77				
948					MLE Mean (bias corrected)	4.6	MLE Sd (bias corrected)	2.242				
949							Approximate Chi Square Value (0.05)	56.72				
950					Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	53.26				
951												
952	**Assuming Gamma Distribution**											
953					95% Approximate Gamma UCL (use when n>=50))	6.145	95% Adjusted Gamma UCL (use when n<50)	6.544				
954												
955	**Lognormal GOF Test**											
956					Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk Lognormal GOF Test**					
957					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
958					Lilliefors Test Statistic	0.169	**Lilliefors Lognormal GOF Test**					
959					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
960	**Data appear Lognormal at 5% Significance Level**											
961												
962	**Lognormal Statistics**											
963					Minimum of Logged Data	0.875	Mean of logged Data	1.443				
964					Maximum of Logged Data	2.241	SD of logged Data	0.419				
965												
966	**Assuming Lognormal Distribution**											
967					95% H-UCL	6.361	90% Chebyshev (MVUE) UCL	6.513				
968					95% Chebyshev (MVUE) UCL	7.391	97.5% Chebyshev (MVUE) UCL	8.609				
969					99% Chebyshev (MVUE) UCL	11						
970												
971	**Nonparametric Distribution Free UCL Statistics**											
972	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
973												
974	**Nonparametric Distribution Free UCLs**											
975					95% CLT UCL	5.775	95% Jackknife UCL	5.928				
976					95% Standard Bootstrap UCL	5.719	95% Bootstrap-t UCL	6.684				
977					95% Hall's Bootstrap UCL	10.53	95% Percentile Bootstrap UCL	5.811				
978					95% BCA Bootstrap UCL	6.089						
979					90% Chebyshev(Mean, Sd) UCL	6.742	95% Chebyshev(Mean, Sd) UCL	7.713				
980					97.5% Chebyshev(Mean, Sd) UCL	9.06	99% Chebyshev(Mean, Sd) UCL	11.71				
981												
982	**Suggested UCL to Use**											
983					95% Student's-t UCL	5.928						
984												
985	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
986	Recommendations are based upon data size, data distribution, and skewness.											
987	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
988	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

	A	B	C	D	E	F	G	H	I	J	K	L
989												
990	**Arsenic (nfmw4)**											
991												
992	**General Statistics**											
993	Total Number of Observations					9	Number of Distinct Observations					9
994	Number of Detects					8	Number of Non-Detects					1
995	Number of Distinct Detects					8	Number of Distinct Non-Detects					1
996	Minimum Detect					1.1	Minimum Non-Detect					2.3
997	Maximum Detect					5.1	Maximum Non-Detect					2.3
998	Variance Detects					2.271	Percent Non-Detects					11.11%
999	Mean Detects					2.95	SD Detects					1.507
1000	Median Detects					2.75	CV Detects					0.511
1001	Skewness Detects					0.21	Kurtosis Detects					-1.685
1002	Mean of Logged Detects					0.95	SD of Logged Detects					0.569
1003												
1004	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1005	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1006	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1007	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1008												
1009	**Normal GOF Test on Detects Only**											
1010	Shapiro Wilk Test Statistic					0.924	**Shapiro Wilk GOF Test**					
1011	5% Shapiro Wilk Critical Value					0.818	Detected Data appear Normal at 5% Significance Level					
1012	Lilliefors Test Statistic					0.19	**Lilliefors GOF Test**					
1013	5% Lilliefors Critical Value					0.283	Detected Data appear Normal at 5% Significance Level					
1014	**Detected Data appear Normal at 5% Significance Level**											
1015												
1016	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1017	KM Mean					2.781	KM Standard Error of Mean					0.506
1018	KM SD					1.415	95% KM (BCA) UCL					3.589
1019	95% KM (t) UCL					3.722	95% KM (Percentile Bootstrap) UCL					3.6
1020	95% KM (z) UCL					3.614	95% KM Bootstrap t UCL					3.867
1021	90% KM Chebyshev UCL					4.299	95% KM Chebyshev UCL					4.986
1022	97.5% KM Chebyshev UCL					5.941	99% KM Chebyshev UCL					7.815
1023												
1024	**Gamma GOF Tests on Detected Observations Only**											
1025	A-D Test Statistic					0.3	**Anderson-Darling GOF Test**					
1026	5% A-D Critical Value					0.719	Detected data appear Gamma Distributed at 5% Significance Level					
1027	K-S Test Statistic					0.207	**Kolmogorov-Smirnov GOF**					
1028	5% K-S Critical Value					0.295	Detected data appear Gamma Distributed at 5% Significance Level					
1029	**Detected data appear Gamma Distributed at 5% Significance Level**											
1030												
1031	**Gamma Statistics on Detected Data Only**											
1032	k hat (MLE)					3.967	k star (bias corrected MLE)					2.563
1033	Theta hat (MLE)					0.744	Theta star (bias corrected MLE)					1.151
1034	nu hat (MLE)					63.47	nu star (bias corrected)					41
1035	Mean (detects)					2.95						
1036												
1037	**Gamma ROS Statistics using Imputed Non-Detects**											
1038	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1039	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1040	For such situations, GROS method may yield incorrect values of UCLs and BTVs											

	A	B	C	D	E	F	G	H	I	J	K	L
1041	This is especially true when the sample size is small.											
1042	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1043					Minimum	1.1				Mean		2.786
1044					Maximum	5.1				Median		2.5
1045					SD	1.493				CV		0.536
1046					k hat (MLE)	3.823				k star (bias corrected MLE)		2.623
1047					Theta hat (MLE)	0.729				Theta star (bias corrected MLE)		1.062
1048					nu hat (MLE)	68.81				nu star (bias corrected)		47.21
1049					Adjusted Level of Significance (β)	0.0231						
1050					Approximate Chi Square Value (47.21, α)	32.44				Adjusted Chi Square Value (47.21, β)		29.88
1051					95% Gamma Approximate UCL (use when n>=50)	4.055				95% Gamma Adjusted UCL (use when n<50)		4.403
1052												
1053	**Estimates of Gamma Parameters using KM Estimates**											
1054					Mean (KM)	2.781				SD (KM)		1.415
1055					Variance (KM)	2.003				SE of Mean (KM)		0.506
1056					k hat (KM)	3.863				k star (KM)		2.649
1057					nu hat (KM)	69.53				nu star (KM)		47.68
1058					theta hat (KM)	0.72				theta star (KM)		1.05
1059					80% gamma percentile (KM)	4.027				90% gamma percentile (KM)		5.072
1060					95% gamma percentile (KM)	6.053				99% gamma percentile (KM)		8.194
1061												
1062	**Gamma Kaplan-Meier (KM) Statistics**											
1063					Approximate Chi Square Value (47.68, α)	32.84				Adjusted Chi Square Value (47.68, β)		30.26
1064					95% Gamma Approximate KM-UCL (use when n>=50)	4.039				95% Gamma Adjusted KM-UCL (use when n<50)		4.383
1065												
1066	**Lognormal GOF Test on Detected Observations Only**											
1067					Shapiro Wilk Test Statistic	0.932				**Shapiro Wilk GOF Test**		
1068					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Lognormal at 5% Significance Level		
1069					Lilliefors Test Statistic	0.189				**Lilliefors GOF Test**		
1070					5% Lilliefors Critical Value	0.283				Detected Data appear Lognormal at 5% Significance Level		
1071	**Detected Data appear Lognormal at 5% Significance Level**											
1072												
1073	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1074					Mean in Original Scale	2.786				Mean in Log Scale		0.888
1075					SD in Original Scale	1.494				SD in Log Scale		0.564
1076					95% t UCL (assumes normality of ROS data)	3.711				95% Percentile Bootstrap UCL		3.552
1077					95% BCA Bootstrap UCL	3.622				95% Bootstrap t UCL		3.857
1078					95% H-UCL (Log ROS)	4.553						
1079												
1080	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1081					KM Mean (logged)	0.883				KM Geo Mean		2.417
1082					KM SD (logged)	0.541				95% Critical H Value (KM-Log)		2.3
1083					KM Standard Error of Mean (logged)	0.195				95% H-UCL (KM -Log)		4.345
1084					KM SD (logged)	0.541				95% Critical H Value (KM-Log)		2.3
1085					KM Standard Error of Mean (logged)	0.195						
1086												
1087	**DL/2 Statistics**											
1088	**DL/2 Normal**						**DL/2 Log-Transformed**					
1089					Mean in Original Scale	2.75				Mean in Log Scale		0.86
1090					SD in Original Scale	1.532				SD in Log Scale		0.597
1091					95% t UCL (Assumes normality)	3.7				95% H-Stat UCL		4.717
1092	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											

	A	B	C	D	E	F	G	H	I	J	K	L
1093												
1094	**Nonparametric Distribution Free UCL Statistics**											
1095	**Detected Data appear Normal Distributed at 5% Significance Level**											
1096												
1097	**Suggested UCL to Use**											
1098	95% KM (t) UCL	3.722										
1099												
1100	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1101	Recommendations are based upon data size, data distribution, and skewness.											
1102	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1103	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1104												
1105												
1106	**Arsenic (nfmw7)**											
1107												
1108	**General Statistics**											
1109	Total Number of Observations	9				Number of Distinct Observations	9					
1110						Number of Missing Observations	0					
1111	Minimum	1.3				Mean	3.578					
1112	Maximum	10.8				Median	2.2					
1113	SD	3.175				Std. Error of Mean	1.058					
1114	Coefficient of Variation	0.887				Skewness	1.888					
1115												
1116	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1117	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1118	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1119	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1120												
1121	**Normal GOF Test**											
1122	Shapiro Wilk Test Statistic	0.725				**Shapiro Wilk GOF Test**						
1123	5% Shapiro Wilk Critical Value	0.829				Data Not Normal at 5% Significance Level						
1124	Lilliefors Test Statistic	0.338				**Lilliefors GOF Test**						
1125	5% Lilliefors Critical Value	0.274				Data Not Normal at 5% Significance Level						
1126	**Data Not Normal at 5% Significance Level**											
1127												
1128	**Assuming Normal Distribution**											
1129	**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**						
1130	95% Student's-t UCL	5.546				95% Adjusted-CLT UCL (Chen-1995)	6.031					
1131						95% Modified-t UCL (Johnson-1978)	5.657					
1132												
1133	**Gamma GOF Test**											
1134	A-D Test Statistic	0.725				**Anderson-Darling Gamma GOF Test**						
1135	5% A-D Critical Value	0.73				Detected data appear Gamma Distributed at 5% Significance Level						
1136	K-S Test Statistic	0.265				**Kolmogorov-Smirnov Gamma GOF Test**						
1137	5% K-S Critical Value	0.282				Detected data appear Gamma Distributed at 5% Significance Level						
1138	**Detected data appear Gamma Distributed at 5% Significance Level**											
1139												
1140	**Gamma Statistics**											
1141	k hat (MLE)	2.089				k star (bias corrected MLE)	1.467					
1142	Theta hat (MLE)	1.713				Theta star (bias corrected MLE)	2.44					
1143	nu hat (MLE)	37.6				nu star (bias corrected)	26.4					
1144	MLE Mean (bias corrected)	3.578				MLE Sd (bias corrected)	2.954					

1145											Approximate Chi Square Value (0.05)	15.69
1146					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	13.97
1147												
1148					**Assuming Gamma Distribution**							
1149					95% Approximate Gamma UCL (use when n>=50)	6.021					95% Adjusted Gamma UCL (use when n<50)	6.759
1150												
1151					**Lognormal GOF Test**							
1152					Shapiro Wilk Test Statistic	0.886					**Shapiro Wilk Lognormal GOF Test**	
1153					5% Shapiro Wilk Critical Value	0.829					Data appear Lognormal at 5% Significance Level	
1154					Lilliefors Test Statistic	0.213					**Lilliefors Lognormal GOF Test**	
1155					5% Lilliefors Critical Value	0.274					Data appear Lognormal at 5% Significance Level	
1156					**Data appear Lognormal at 5% Significance Level**							
1157												
1158					**Lognormal Statistics**							
1159					Minimum of Logged Data	0.262					Mean of logged Data	1.017
1160					Maximum of Logged Data	2.38					SD of logged Data	0.706
1161												
1162					**Assuming Lognormal Distribution**							
1163					95% H-UCL	6.836					90% Chebyshev (MVUE) UCL	5.917
1164					95% Chebyshev (MVUE) UCL	7.042					97.5% Chebyshev (MVUE) UCL	8.603
1165					99% Chebyshev (MVUE) UCL	11.67						
1166												
1167					**Nonparametric Distribution Free UCL Statistics**							
1168					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
1169												
1170					**Nonparametric Distribution Free UCLs**							
1171					95% CLT UCL	5.319					95% Jackknife UCL	5.546
1172					95% Standard Bootstrap UCL	5.248					95% Bootstrap-t UCL	11.27
1173					95% Hall's Bootstrap UCL	15.39					95% Percentile Bootstrap UCL	5.356
1174					95% BCA Bootstrap UCL	6.011						
1175					90% Chebyshev(Mean, Sd) UCL	6.753					95% Chebyshev(Mean, Sd) UCL	8.191
1176					97.5% Chebyshev(Mean, Sd) UCL	10.19					99% Chebyshev(Mean, Sd) UCL	14.11
1177												
1178					**Suggested UCL to Use**							
1179					95% Adjusted Gamma UCL	6.759						
1180												
1181					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1182					Recommendations are based upon data size, data distribution, and skewness.							
1183					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1184					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1185												
1186												
1187	**Arsenic (nfmw8)**											
1188												
1189					**General Statistics**							
1190					Total Number of Observations	8					Number of Distinct Observations	6
1191											Number of Missing Observations	0
1192					Minimum	3					Mean	4.05
1193					Maximum	5.2					Median	4
1194					SD	0.707					Std. Error of Mean	0.25
1195					Coefficient of Variation	0.175					Skewness	0.239
1196												

	A	B	C	D	E	F	G	H	I	J	K	L
1197	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1198	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1199	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1200	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1201												
1202	Normal GOF Test											
1203					Shapiro Wilk Test Statistic	0.962	Shapiro Wilk GOF Test					
1204					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1205					Lilliefors Test Statistic	0.19	Lilliefors GOF Test					
1206					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1207	Data appear Normal at 5% Significance Level											
1208												
1209	Assuming Normal Distribution											
1210					95% Normal UCL		95% UCLs (Adjusted for Skewness)					
1211					95% Student's-t UCL	4.524	95% Adjusted-CLT UCL (Chen-1995)					4.484
1212							95% Modified-t UCL (Johnson-1978)					4.527
1213												
1214	Gamma GOF Test											
1215					A-D Test Statistic	0.264	Anderson-Darling Gamma GOF Test					
1216					5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level					
1217					K-S Test Statistic	0.188	Kolmogorov-Smirnov Gamma GOF Test					
1218					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1219	Detected data appear Gamma Distributed at 5% Significance Level											
1220												
1221	Gamma Statistics											
1222					k hat (MLE)	37.39	k star (bias corrected MLE)					23.45
1223					Theta hat (MLE)	0.108	Theta star (bias corrected MLE)					0.173
1224					nu hat (MLE)	598.2	nu star (bias corrected)					375.2
1225					MLE Mean (bias corrected)	4.05	MLE Sd (bias corrected)					0.836
1226							Approximate Chi Square Value (0.05)					331.3
1227					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value					320.8
1228												
1229	Assuming Gamma Distribution											
1230					95% Approximate Gamma UCL (use when n>=50))	4.587	95% Adjusted Gamma UCL (use when n<50)					4.736
1231												
1232	Lognormal GOF Test											
1233					Shapiro Wilk Test Statistic	0.964	Shapiro Wilk Lognormal GOF Test					
1234					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1235					Lilliefors Test Statistic	0.169	Lilliefors Lognormal GOF Test					
1236					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1237	Data appear Lognormal at 5% Significance Level											
1238												
1239	Lognormal Statistics											
1240					Minimum of Logged Data	1.099	Mean of logged Data					1.385
1241					Maximum of Logged Data	1.649	SD of logged Data					0.176
1242												
1243	Assuming Lognormal Distribution											
1244					95% H-UCL	4.61	90% Chebyshev (MVUE) UCL					4.807
1245					95% Chebyshev (MVUE) UCL	5.149	97.5% Chebyshev (MVUE) UCL					5.625
1246					99% Chebyshev (MVUE) UCL	6.559						
1247												
1248	Nonparametric Distribution Free UCL Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
1249	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1250												
1251	**Nonparametric Distribution Free UCLs**											
1252	95% CLT UCL					4.461	95% Jackknife UCL					4.524
1253	95% Standard Bootstrap UCL					4.432	95% Bootstrap-t UCL					4.615
1254	95% Hall's Bootstrap UCL					4.479	95% Percentile Bootstrap UCL					4.438
1255	95% BCA Bootstrap UCL					4.438						
1256	90% Chebyshev(Mean, Sd) UCL					4.8	95% Chebyshev(Mean, Sd) UCL					5.14
1257	97.5% Chebyshev(Mean, Sd) UCL					5.611	99% Chebyshev(Mean, Sd) UCL					6.537
1258												
1259	**Suggested UCL to Use**											
1260	95% Student's-t UCL					4.524						
1261												
1262	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1263	Recommendations are based upon data size, data distribution, and skewness.											
1264	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1265	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1266												
1267												
1268	**Arsenic (nfmw9)**											
1269												
1270	**General Statistics**											
1271	Total Number of Observations					8	Number of Distinct Observations					8
1272							Number of Missing Observations					0
1273	Minimum					2.9	Mean					18.54
1274	Maximum					32.4	Median					17.35
1275	SD					12.02	Std. Error of Mean					4.249
1276	Coefficient of Variation					0.648	Skewness					-2.604E-4
1277												
1278	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1279	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1280	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1281	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1282												
1283	**Normal GOF Test**											
1284	Shapiro Wilk Test Statistic					0.86	**Shapiro Wilk GOF Test**					
1285	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					
1286	Lilliefors Test Statistic					0.253	**Lilliefors GOF Test**					
1287	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
1288	**Data appear Normal at 5% Significance Level**											
1289												
1290	**Assuming Normal Distribution**											
1291	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1292	95% Student's-t UCL					26.59	95% Adjusted-CLT UCL (Chen-1995)					25.53
1293							95% Modified-t UCL (Johnson-1978)					26.59
1294												
1295	**Gamma GOF Test**											
1296	A-D Test Statistic					0.522	**Anderson-Darling Gamma GOF Test**					
1297	5% A-D Critical Value					0.724	Detected data appear Gamma Distributed at 5% Significance Level					
1298	K-S Test Statistic					0.239	**Kolmogorov-Smirnov Gamma GOF Test**					
1299	5% K-S Critical Value					0.297	Detected data appear Gamma Distributed at 5% Significance Level					
1300	**Detected data appear Gamma Distributed at 5% Significance Level**											

1301												
1302	**Gamma Statistics**											
1303					k hat (MLE)	2.036			k star (bias corrected MLE)	1.356		
1304					Theta hat (MLE)	9.103			Theta star (bias corrected MLE)	13.67		
1305					nu hat (MLE)	32.58			nu star (bias corrected)	21.7		
1306					MLE Mean (bias corrected)	18.54			MLE Sd (bias corrected)	15.92		
1307									Approximate Chi Square Value (0.05)	12.11		
1308					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	10.35		
1309												
1310	**Assuming Gamma Distribution**											
1311					95% Approximate Gamma UCL (use when n>=50))	33.21			95% Adjusted Gamma UCL (use when n<50)	38.87		
1312												
1313	**Lognormal GOF Test**											
1314					Shapiro Wilk Test Statistic	0.871			**Shapiro Wilk Lognormal GOF Test**			
1315					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
1316					Lilliefors Test Statistic	0.234			**Lilliefors Lognormal GOF Test**			
1317					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
1318	**Data appear Lognormal at 5% Significance Level**											
1319												
1320	**Lognormal Statistics**											
1321					Minimum of Logged Data	1.065			Mean of logged Data	2.655		
1322					Maximum of Logged Data	3.478			SD of logged Data	0.864		
1323												
1324	**Assuming Lognormal Distribution**											
1325					95% H-UCL	56.89			90% Chebyshev (MVUE) UCL	37.74		
1326					95% Chebyshev (MVUE) UCL	46			97.5% Chebyshev (MVUE) UCL	57.47		
1327					99% Chebyshev (MVUE) UCL	79.99						
1328												
1329	**Nonparametric Distribution Free UCL Statistics**											
1330	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1331												
1332	**Nonparametric Distribution Free UCLs**											
1333					95% CLT UCL	25.53			95% Jackknife UCL	26.59		
1334					95% Standard Bootstrap UCL	25.1			95% Bootstrap-t UCL	26.39		
1335					95% Hall's Bootstrap UCL	23.45			95% Percentile Bootstrap UCL	25.1		
1336					95% BCA Bootstrap UCL	25.16						
1337					90% Chebyshev(Mean, Sd) UCL	31.29			95% Chebyshev(Mean, Sd) UCL	37.06		
1338					97.5% Chebyshev(Mean, Sd) UCL	45.08			99% Chebyshev(Mean, Sd) UCL	60.82		
1339												
1340	**Suggested UCL to Use**											
1341					95% Student's-t UCL	26.59						
1342												
1343	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1344	Recommendations are based upon data size, data distribution, and skewness.											
1345	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1346	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1347												
1348	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1349	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1350												
1351												
1352	**Arsenic (smw10)**											

1353												
1354	**General Statistics**											
1355					Total Number of Observations	8				Number of Distinct Observations	8	
1356										Number of Missing Observations	0	
1357					Minimum	29.7				Mean	32.21	
1358					Maximum	37				Median	31.8	
1359					SD	2.525				Std. Error of Mean	0.893	
1360					Coefficient of Variation	0.0784				Skewness	0.915	
1361												
1362	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1363	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1364	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1365	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1366												
1367	**Normal GOF Test**											
1368					Shapiro Wilk Test Statistic	0.879				**Shapiro Wilk GOF Test**		
1369					5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level		
1370					Lilliefors Test Statistic	0.238				**Lilliefors GOF Test**		
1371					5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
1372	**Data appear Normal at 5% Significance Level**											
1373												
1374	**Assuming Normal Distribution**											
1375					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
1376					95% Student's-t UCL	33.9				95% Adjusted-CLT UCL (Chen-1995)	33.99	
1377										95% Modified-t UCL (Johnson-1978)	33.95	
1378												
1379	**Gamma GOF Test**											
1380					A-D Test Statistic	0.483				**Anderson-Darling Gamma GOF Test**		
1381					5% A-D Critical Value	0.715				Detected data appear Gamma Distributed at 5% Significance Level		
1382					K-S Test Statistic	0.252				**Kolmogorov-Smirnov Gamma GOF Test**		
1383					5% K-S Critical Value	0.294				Detected data appear Gamma Distributed at 5% Significance Level		
1384	**Detected data appear Gamma Distributed at 5% Significance Level**											
1385												
1386	**Gamma Statistics**											
1387					k hat (MLE)	191.9				k star (bias corrected MLE)	120	
1388					Theta hat (MLE)	0.168				Theta star (bias corrected MLE)	0.268	
1389					nu hat (MLE)	3070				nu star (bias corrected)	1920	
1390					MLE Mean (bias corrected)	32.21				MLE Sd (bias corrected)	2.941	
1391										Approximate Chi Square Value (0.05)	1819	
1392					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	1794	
1393												
1394	**Assuming Gamma Distribution**											
1395					95% Approximate Gamma UCL (use when n>=50))	34				95% Adjusted Gamma UCL (use when n<50)	34.47	
1396												
1397	**Lognormal GOF Test**											
1398					Shapiro Wilk Test Statistic	0.887				**Shapiro Wilk Lognormal GOF Test**		
1399					5% Shapiro Wilk Critical Value	0.818				Data appear Lognormal at 5% Significance Level		
1400					Lilliefors Test Statistic	0.238				**Lilliefors Lognormal GOF Test**		
1401					5% Lilliefors Critical Value	0.283				Data appear Lognormal at 5% Significance Level		
1402	**Data appear Lognormal at 5% Significance Level**											
1403												
1404	**Lognormal Statistics**											

1405					Minimum of Logged Data	3.391				Mean of logged Data		3.47
1406					Maximum of Logged Data	3.611				SD of logged Data		0.0766
1407												
1408					**Assuming Lognormal Distribution**							
1409					95% H-UCL	N/A				90% Chebyshev (MVUE) UCL		34.83
1410					95% Chebyshev (MVUE) UCL	36.02				97.5% Chebyshev (MVUE) UCL		37.66
1411					99% Chebyshev (MVUE) UCL	40.9						
1412												
1413					**Nonparametric Distribution Free UCL Statistics**							
1414					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
1415												
1416					**Nonparametric Distribution Free UCLs**							
1417					95% CLT UCL	33.68				95% Jackknife UCL		33.9
1418					95% Standard Bootstrap UCL	33.59				95% Bootstrap-t UCL		34.35
1419					95% Hall's Bootstrap UCL	33.93				95% Percentile Bootstrap UCL		33.64
1420					95% BCA Bootstrap UCL	33.96						
1421					90% Chebyshev(Mean, Sd) UCL	34.89				95% Chebyshev(Mean, Sd) UCL		36.1
1422					97.5% Chebyshev(Mean, Sd) UCL	37.79				99% Chebyshev(Mean, Sd) UCL		41.09
1423												
1424					**Suggested UCL to Use**							
1425					95% Student's-t UCL	33.9						
1426												
1427					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1428					Recommendations are based upon data size, data distribution, and skewness.							
1429					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1430					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1431												
1432												
1433	**Arsenic (smw11)**											
1434												
1435					**General Statistics**							
1436					Total Number of Observations	9				Number of Distinct Observations		9
1437										Number of Missing Observations		0
1438					Minimum	20				Mean		34.74
1439					Maximum	44.9				Median		37.5
1440					SD	8.612				Std. Error of Mean		2.871
1441					Coefficient of Variation	0.248				Skewness		-0.981
1442												
1443					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1444					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1445					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1446					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1447												
1448					**Normal GOF Test**							
1449					Shapiro Wilk Test Statistic	0.868				**Shapiro Wilk GOF Test**		
1450					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
1451					Lilliefors Test Statistic	0.229				**Lilliefors GOF Test**		
1452					5% Lilliefors Critical Value	0.274				Data appear Normal at 5% Significance Level		
1453					**Data appear Normal at 5% Significance Level**							
1454												
1455					**Assuming Normal Distribution**							
1456					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		

1457				95% Student's-t UCL	40.08			95% Adjusted-CLT UCL (Chen-1995)				38.46
1458								95% Modified-t UCL (Johnson-1978)				39.93
1459												
1460					Gamma GOF Test							
1461				A-D Test Statistic	0.775			Anderson-Darling Gamma GOF Test				
1462				5% A-D Critical Value	0.721			Data Not Gamma Distributed at 5% Significance Level				
1463				K-S Test Statistic	0.26			Kolmogorov-Smirnov Gamma GOF Test				
1464				5% K-S Critical Value	0.279			Detected data appear Gamma Distributed at 5% Significance Level				
1465					Detected data follow Appr. Gamma Distribution at 5% Significance Level							
1466												
1467					Gamma Statistics							
1468				k hat (MLE)	15.26			k star (bias corrected MLE)				10.24
1469				Theta hat (MLE)	2.277			Theta star (bias corrected MLE)				3.392
1470				nu hat (MLE)	274.6			nu star (bias corrected)				184.4
1471				MLE Mean (bias corrected)	34.74			MLE Sd (bias corrected)				10.86
1472								Approximate Chi Square Value (0.05)				154
1473				Adjusted Level of Significance	0.0231			Adjusted Chi Square Value				148.1
1474												
1475					Assuming Gamma Distribution							
1476				95% Approximate Gamma UCL (use when n>=50))	41.61			95% Adjusted Gamma UCL (use when n<50)				43.25
1477												
1478					Lognormal GOF Test							
1479				Shapiro Wilk Test Statistic	0.815			Shapiro Wilk Lognormal GOF Test				
1480				5% Shapiro Wilk Critical Value	0.829			Data Not Lognormal at 5% Significance Level				
1481				Lilliefors Test Statistic	0.265			Lilliefors Lognormal GOF Test				
1482				5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level				
1483					Data appear Approximate Lognormal at 5% Significance Level							
1484												
1485					Lognormal Statistics							
1486				Minimum of Logged Data	2.996			Mean of logged Data				3.515
1487				Maximum of Logged Data	3.804			SD of logged Data				0.287
1488												
1489					Assuming Lognormal Distribution							
1490				95% H-UCL	42.88			90% Chebyshev (MVUE) UCL				44.9
1491				95% Chebyshev (MVUE) UCL	49.45			97.5% Chebyshev (MVUE) UCL				55.77
1492				99% Chebyshev (MVUE) UCL	68.18							
1493												
1494					Nonparametric Distribution Free UCL Statistics							
1495					Data appear to follow a Discernible Distribution at 5% Significance Level							
1496												
1497					Nonparametric Distribution Free UCLs							
1498				95% CLT UCL	39.47			95% Jackknife UCL				40.08
1499				95% Standard Bootstrap UCL	39.21			95% Bootstrap-t UCL				39.1
1500				95% Hall's Bootstrap UCL	38.52			95% Percentile Bootstrap UCL				39
1501				95% BCA Bootstrap UCL	38.72							
1502				90% Chebyshev(Mean, Sd) UCL	43.36			95% Chebyshev(Mean, Sd) UCL				47.26
1503				97.5% Chebyshev(Mean, Sd) UCL	52.67			99% Chebyshev(Mean, Sd) UCL				63.31
1504												
1505					Suggested UCL to Use							
1506				95% Student's-t UCL	40.08							
1507												
1508	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

1509	Recommendations are based upon data size, data distribution, and skewness.											
1510	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1511	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1512												
1513	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1514	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1515												
1516												
1517	**Arsenic (smw12)**											
1518												
1519	**General Statistics**											
1520						Total Number of Observations	8			Number of Distinct Observations	8	
1521										Number of Missing Observations	0	
1522						Minimum	6.7			Mean	12.11	
1523						Maximum	21.9			Median	11.35	
1524						SD	5.005			Std. Error of Mean	1.77	
1525						Coefficient of Variation	0.413			Skewness	1.085	
1526												
1527	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1528	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1529	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1530	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1531												
1532	**Normal GOF Test**											
1533						Shapiro Wilk Test Statistic	0.921			**Shapiro Wilk GOF Test**		
1534						5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level		
1535						Lilliefors Test Statistic	0.172			**Lilliefors GOF Test**		
1536						5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level		
1537	**Data appear Normal at 5% Significance Level**											
1538												
1539	**Assuming Normal Distribution**											
1540	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
1541						95% Student's-t UCL	15.47			95% Adjusted-CLT UCL (Chen-1995)	15.75	
1542										95% Modified-t UCL (Johnson-1978)	15.58	
1543												
1544	**Gamma GOF Test**											
1545						A-D Test Statistic	0.191			**Anderson-Darling Gamma GOF Test**		
1546						5% A-D Critical Value	0.717			Detected data appear Gamma Distributed at 5% Significance Level		
1547						K-S Test Statistic	0.141			**Kolmogorov-Smirnov Gamma GOF Test**		
1548						5% K-S Critical Value	0.295			Detected data appear Gamma Distributed at 5% Significance Level		
1549	**Detected data appear Gamma Distributed at 5% Significance Level**											
1550												
1551	**Gamma Statistics**											
1552						k hat (MLE)	7.366			k star (bias corrected MLE)	4.687	
1553						Theta hat (MLE)	1.644			Theta star (bias corrected MLE)	2.584	
1554						nu hat (MLE)	117.9			nu star (bias corrected)	75	
1555						MLE Mean (bias corrected)	12.11			MLE Sd (bias corrected)	5.595	
1556										Approximate Chi Square Value (0.05)	56.05	
1557						Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	51.93	
1558												
1559	**Assuming Gamma Distribution**											
1560						95% Approximate Gamma UCL (use when n>=50))	16.21			95% Adjusted Gamma UCL (use when n<50)	17.49	

1561												
1562	**Lognormal GOF Test**											
1563					Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**					
1564					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1565					Lilliefors Test Statistic	0.122	**Lilliefors Lognormal GOF Test**					
1566					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1567	**Data appear Lognormal at 5% Significance Level**											
1568												
1569	**Lognormal Statistics**											
1570					Minimum of Logged Data	1.902	Mean of logged Data	2.425				
1571					Maximum of Logged Data	3.086	SD of logged Data	0.393				
1572												
1573	**Assuming Lognormal Distribution**											
1574					95% H-UCL	16.89	90% Chebyshev (MVUE) UCL	17.16				
1575					95% Chebyshev (MVUE) UCL	19.46	97.5% Chebyshev (MVUE) UCL	22.65				
1576					99% Chebyshev (MVUE) UCL	28.91						
1577												
1578	**Nonparametric Distribution Free UCL Statistics**											
1579	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1580												
1581	**Nonparametric Distribution Free UCLs**											
1582					95% CLT UCL	15.02	95% Jackknife UCL	15.47				
1583					95% Standard Bootstrap UCL	14.85	95% Bootstrap-t UCL	17.11				
1584					95% Hall's Bootstrap UCL	19.56	95% Percentile Bootstrap UCL	14.95				
1585					95% BCA Bootstrap UCL	15.31						
1586					90% Chebyshev(Mean, Sd) UCL	17.42	95% Chebyshev(Mean, Sd) UCL	19.83				
1587					97.5% Chebyshev(Mean, Sd) UCL	23.16	99% Chebyshev(Mean, Sd) UCL	29.72				
1588												
1589	**Suggested UCL to Use**											
1590					95% Student's-t UCL	15.47						
1591												
1592	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1593	Recommendations are based upon data size, data distribution, and skewness.											
1594	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1595	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1596												
1597												
1598	**Arsenic (smw13)**											
1599												
1600	**General Statistics**											
1601					Total Number of Observations	8	Number of Distinct Observations	8				
1602							Number of Missing Observations	0				
1603					Minimum	2.3	Mean	6.025				
1604					Maximum	12.6	Median	3.8				
1605					SD	4.373	Std. Error of Mean	1.546				
1606					Coefficient of Variation	0.726	Skewness	0.858				
1607												
1608	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1609	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1610	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1611	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1612												

1613	**Normal GOF Test**											
1614					Shapiro Wilk Test Statistic	0.793	**Shapiro Wilk GOF Test**					
1615					5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level					
1616					Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**					
1617					5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level					
1618	**Data Not Normal at 5% Significance Level**											
1619												
1620	**Assuming Normal Distribution**											
1621				**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**			
1622					95% Student's-t UCL	8.954			95% Adjusted-CLT UCL (Chen-1995)	9.069		
1623									95% Modified-t UCL (Johnson-1978)	9.032		
1624												
1625	**Gamma GOF Test**											
1626					A-D Test Statistic	0.656	**Anderson-Darling Gamma GOF Test**					
1627					5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level					
1628					K-S Test Statistic	0.268	**Kolmogorov-Smirnov Gamma GOF Test**					
1629					5% K-S Critical Value	0.297	Detected data appear Gamma Distributed at 5% Significance Level					
1630	**Detected data appear Gamma Distributed at 5% Significance Level**											
1631												
1632	**Gamma Statistics**											
1633					k hat (MLE)	2.368			k star (bias corrected MLE)	1.563		
1634					Theta hat (MLE)	2.545			Theta star (bias corrected MLE)	3.854		
1635					nu hat (MLE)	37.88			nu star (bias corrected)	25.01		
1636					MLE Mean (bias corrected)	6.025			MLE Sd (bias corrected)	4.819		
1637									Approximate Chi Square Value (0.05)	14.62		
1638					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	12.66		
1639												
1640	**Assuming Gamma Distribution**											
1641					95% Approximate Gamma UCL (use when n>=50)	10.31			95% Adjusted Gamma UCL (use when n<50)	11.91		
1642												
1643	**Lognormal GOF Test**											
1644					Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk Lognormal GOF Test**					
1645					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1646					Lilliefors Test Statistic	0.227	**Lilliefors Lognormal GOF Test**					
1647					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1648	**Data appear Lognormal at 5% Significance Level**											
1649												
1650	**Lognormal Statistics**											
1651					Minimum of Logged Data	0.833			Mean of logged Data	1.57		
1652					Maximum of Logged Data	2.534			SD of logged Data	0.709		
1653												
1654	**Assuming Lognormal Distribution**											
1655					95% H-UCL	12.92			90% Chebyshev (MVUE) UCL	10.51		
1656					95% Chebyshev (MVUE) UCL	12.57			97.5% Chebyshev (MVUE) UCL	15.43		
1657					99% Chebyshev (MVUE) UCL	21.05						
1658												
1659	**Nonparametric Distribution Free UCL Statistics**											
1660	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1661												
1662	**Nonparametric Distribution Free UCLs**											
1663					95% CLT UCL	8.568			95% Jackknife UCL	8.954		
1664					95% Standard Bootstrap UCL	8.361			95% Bootstrap-t UCL	11.19		

1665				95% Hall's Bootstrap UCL		8.427				95% Percentile Bootstrap UCL		8.613
1666				95% BCA Bootstrap UCL		8.525						
1667				90% Chebyshev(Mean, Sd) UCL		10.66				95% Chebyshev(Mean, Sd) UCL		12.76
1668				97.5% Chebyshev(Mean, Sd) UCL		15.68				99% Chebyshev(Mean, Sd) UCL		21.41
1669												
1670						**Suggested UCL to Use**						
1671				95% Adjusted Gamma UCL		11.91						
1672												
1673						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1674						Recommendations are based upon data size, data distribution, and skewness.						
1675						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1676						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1677												
1678												
1679	**Arsenic (smw14)**											
1680												
1681						**General Statistics**						
1682				Total Number of Observations		8				Number of Distinct Observations		8
1683										Number of Missing Observations		0
1684				Minimum		10.9				Mean		18.41
1685				Maximum		24.5				Median		18.15
1686				SD		5.257				Std. Error of Mean		1.859
1687				Coefficient of Variation		0.286				Skewness		-0.199
1688												
1689						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1690						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
1691						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
1692						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
1693												
1694						**Normal GOF Test**						
1695				Shapiro Wilk Test Statistic		0.918				**Shapiro Wilk GOF Test**		
1696				5% Shapiro Wilk Critical Value		0.818				Data appear Normal at 5% Significance Level		
1697				Lilliefors Test Statistic		0.173				**Lilliefors GOF Test**		
1698				5% Lilliefors Critical Value		0.283				Data appear Normal at 5% Significance Level		
1699						**Data appear Normal at 5% Significance Level**						
1700												
1701						**Assuming Normal Distribution**						
1702						**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**
1703				95% Student's-t UCL		21.93				95% Adjusted-CLT UCL (Chen-1995)		21.33
1704										95% Modified-t UCL (Johnson-1978)		21.91
1705												
1706						**Gamma GOF Test**						
1707				A-D Test Statistic		0.341				**Anderson-Darling Gamma GOF Test**		
1708				5% A-D Critical Value		0.715				Detected data appear Gamma Distributed at 5% Significance Level		
1709				K-S Test Statistic		0.188				**Kolmogorov-Smirnov Gamma GOF Test**		
1710				5% K-S Critical Value		0.294				Detected data appear Gamma Distributed at 5% Significance Level		
1711						**Detected data appear Gamma Distributed at 5% Significance Level**						
1712												
1713						**Gamma Statistics**						
1714				k hat (MLE)		12.94				k star (bias corrected MLE)		8.169
1715				Theta hat (MLE)		1.423				Theta star (bias corrected MLE)		2.254
1716				nu hat (MLE)		207				nu star (bias corrected)		130.7

	A	B	C	D	E	F	G	H	I	J	K	L
1717	MLE Mean (bias corrected)					18.41	MLE Sd (bias corrected)					6.442
1718							Approximate Chi Square Value (0.05)					105.3
1719	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					99.53
1720												
1721	**Assuming Gamma Distribution**											
1722	95% Approximate Gamma UCL (use when n>=50))					22.86	95% Adjusted Gamma UCL (use when n<50)					24.18
1723												
1724	**Lognormal GOF Test**											
1725	Shapiro Wilk Test Statistic					0.91	**Shapiro Wilk Lognormal GOF Test**					
1726	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1727	Lilliefors Test Statistic					0.17	**Lilliefors Lognormal GOF Test**					
1728	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
1729	**Data appear Lognormal at 5% Significance Level**											
1730												
1731	**Lognormal Statistics**											
1732	Minimum of Logged Data					2.389	Mean of logged Data					2.874
1733	Maximum of Logged Data					3.199	SD of logged Data					0.307
1734												
1735	**Assuming Lognormal Distribution**											
1736	95% H-UCL					23.58	90% Chebyshev (MVUE) UCL					24.47
1737	95% Chebyshev (MVUE) UCL					27.2	97.5% Chebyshev (MVUE) UCL					30.98
1738	99% Chebyshev (MVUE) UCL					38.42						
1739												
1740	**Nonparametric Distribution Free UCL Statistics**											
1741	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1742												
1743	**Nonparametric Distribution Free UCLs**											
1744	95% CLT UCL					21.47	95% Jackknife UCL					21.93
1745	95% Standard Bootstrap UCL					21.24	95% Bootstrap-t UCL					21.86
1746	95% Hall's Bootstrap UCL					20.9	95% Percentile Bootstrap UCL					21.19
1747	95% BCA Bootstrap UCL					21.2						
1748	90% Chebyshev(Mean, Sd) UCL					23.99	95% Chebyshev(Mean, Sd) UCL					26.51
1749	97.5% Chebyshev(Mean, Sd) UCL					30.02	99% Chebyshev(Mean, Sd) UCL					36.91
1750												
1751	**Suggested UCL to Use**											
1752	95% Student's-t UCL					21.93						
1753												
1754	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1755	Recommendations are based upon data size, data distribution, and skewness.											
1756	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1757	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1758												
1759	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1760	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1761												
1762												
1763	**Arsenic (smw15)**											
1764												
1765	**General Statistics**											
1766	Total Number of Observations					9	Number of Distinct Observations					9
1767							Number of Missing Observations					0
1768	Minimum					0.53	Mean					2.921

1769					Maximum	9.9					Median	0.97
1770					SD	3.646					Std. Error of Mean	1.215
1771					Coefficient of Variation	1.248					Skewness	1.558
1772												
1773	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1774	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1775	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1776	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1777												
1778	**Normal GOF Test**											
1779					Shapiro Wilk Test Statistic	0.674	**Shapiro Wilk GOF Test**					
1780					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
1781					Lilliefors Test Statistic	0.345	**Lilliefors GOF Test**					
1782					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
1783	**Data Not Normal at 5% Significance Level**											
1784												
1785	**Assuming Normal Distribution**											
1786	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1787					95% Student's-t UCL	5.181					95% Adjusted-CLT UCL (Chen-1995)	5.594
1788											95% Modified-t UCL (Johnson-1978)	5.286
1789												
1790	**Gamma GOF Test**											
1791					A-D Test Statistic	0.931	**Anderson-Darling Gamma GOF Test**					
1792					5% A-D Critical Value	0.744	Data Not Gamma Distributed at 5% Significance Level					
1793					K-S Test Statistic	0.268	**Kolmogorov-Smirnov Gamma GOF Test**					
1794					5% K-S Critical Value	0.287	Detected data appear Gamma Distributed at 5% Significance Level					
1795	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
1796												
1797	**Gamma Statistics**											
1798					k hat (MLE)	0.978					k star (bias corrected MLE)	0.726
1799					Theta hat (MLE)	2.986					Theta star (bias corrected MLE)	4.023
1800					nu hat (MLE)	17.61					nu star (bias corrected)	13.07
1801					MLE Mean (bias corrected)	2.921					MLE Sd (bias corrected)	3.428
1802											Approximate Chi Square Value (0.05)	5.94
1803					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	4.964
1804												
1805	**Assuming Gamma Distribution**											
1806					95% Approximate Gamma UCL (use when n>=50)	6.427					95% Adjusted Gamma UCL (use when n<50)	7.691
1807												
1808	**Lognormal GOF Test**											
1809					Shapiro Wilk Test Statistic	0.848	**Shapiro Wilk Lognormal GOF Test**					
1810					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1811					Lilliefors Test Statistic	0.237	**Lilliefors Lognormal GOF Test**					
1812					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1813	**Data appear Lognormal at 5% Significance Level**											
1814												
1815	**Lognormal Statistics**											
1816					Minimum of Logged Data	-0.635					Mean of logged Data	0.48
1817					Maximum of Logged Data	2.293					SD of logged Data	1.086
1818												
1819	**Assuming Lognormal Distribution**											
1820					95% H-UCL	10.89					90% Chebyshev (MVUE) UCL	5.665

1821				95% Chebyshev (MVUE) UCL		7.024			97.5% Chebyshev (MVUE) UCL			8.911
1822				99% Chebyshev (MVUE) UCL		12.62						
1823												
1824						**Nonparametric Distribution Free UCL Statistics**							
1825						**Data appear to follow a Discernible Distribution at 5% Significance Level**						
1826												
1827						**Nonparametric Distribution Free UCLs**						
1828				95% CLT UCL		4.92			95% Jackknife UCL			5.181
1829				95% Standard Bootstrap UCL		4.838			95% Bootstrap-t UCL			13.56
1830				95% Hall's Bootstrap UCL		17.98			95% Percentile Bootstrap UCL			4.853
1831				95% BCA Bootstrap UCL		5.499						
1832				90% Chebyshev(Mean, Sd) UCL		6.567			95% Chebyshev(Mean, Sd) UCL			8.218
1833				97.5% Chebyshev(Mean, Sd) UCL		10.51			99% Chebyshev(Mean, Sd) UCL			15.01
1834												
1835						**Suggested UCL to Use**						
1836				95% Adjusted Gamma UCL		7.691						
1837												
1838						When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test						
1839						When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL						
1840												
1841						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1842						Recommendations are based upon data size, data distribution, and skewness.						
1843						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1844						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1845												
1846												
1847	**Arsenic (smw16)**											
1848												
1849						**General Statistics**						
1850				Total Number of Observations		9			Number of Distinct Observations			9
1851									Number of Missing Observations			0
1852				Minimum		11.1			Mean			25.93
1853				Maximum		36.8			Median			26.2
1854				SD		7.478			Std. Error of Mean			2.493
1855				Coefficient of Variation		0.288			Skewness			-0.673
1856												
1857						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1858						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
1859						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
1860						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
1861												
1862						**Normal GOF Test**						
1863				Shapiro Wilk Test Statistic		0.961			**Shapiro Wilk GOF Test**			
1864				5% Shapiro Wilk Critical Value		0.829			Data appear Normal at 5% Significance Level			
1865				Lilliefors Test Statistic		0.161			**Lilliefors GOF Test**			
1866				5% Lilliefors Critical Value		0.274			Data appear Normal at 5% Significance Level			
1867						**Data appear Normal at 5% Significance Level**						
1868												
1869						**Assuming Normal Distribution**						
1870				**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**			
1871				95% Student's-t UCL		30.57			95% Adjusted-CLT UCL (Chen-1995)			29.44
1872									95% Modified-t UCL (Johnson-1978)			30.48

1873												
1874	**Gamma GOF Test**											
1875					A-D Test Statistic	0.407	**Anderson-Darling Gamma GOF Test**					
1876					5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level					
1877					K-S Test Statistic	0.195	**Kolmogorov-Smirnov Gamma GOF Test**					
1878					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
1879	**Detected data appear Gamma Distributed at 5% Significance Level**											
1880												
1881	**Gamma Statistics**											
1882					k hat (MLE)	10.77	k star (bias corrected MLE)	7.257				
1883					Theta hat (MLE)	2.407	Theta star (bias corrected MLE)	3.574				
1884					nu hat (MLE)	193.9	nu star (bias corrected)	130.6				
1885					MLE Mean (bias corrected)	25.93	MLE Sd (bias corrected)	9.627				
1886							Approximate Chi Square Value (0.05)	105.2				
1887					Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	100.4				
1888												
1889	**Assuming Gamma Distribution**											
1890					95% Approximate Gamma UCL (use when n>=50))	32.19	95% Adjusted Gamma UCL (use when n<50)	33.73				
1891												
1892	**Lognormal GOF Test**											
1893					Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk Lognormal GOF Test**					
1894					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1895					Lilliefors Test Statistic	0.228	**Lilliefors Lognormal GOF Test**					
1896					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1897	**Data appear Lognormal at 5% Significance Level**											
1898												
1899	**Lognormal Statistics**											
1900					Minimum of Logged Data	2.407	Mean of logged Data	3.208				
1901					Maximum of Logged Data	3.605	SD of logged Data	0.35				
1902												
1903	**Assuming Lognormal Distribution**											
1904					95% H-UCL	33.96	90% Chebyshev (MVUE) UCL	35.31				
1905					95% Chebyshev (MVUE) UCL	39.48	97.5% Chebyshev (MVUE) UCL	45.26				
1906					99% Chebyshev (MVUE) UCL	56.62						
1907												
1908	**Nonparametric Distribution Free UCL Statistics**											
1909	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1910												
1911	**Nonparametric Distribution Free UCLs**											
1912					95% CLT UCL	30.03	95% Jackknife UCL	30.57				
1913					95% Standard Bootstrap UCL	29.74	95% Bootstrap-t UCL	29.82				
1914					95% Hall's Bootstrap UCL	29.87	95% Percentile Bootstrap UCL	29.57				
1915					95% BCA Bootstrap UCL	29.36						
1916					90% Chebyshev(Mean, Sd) UCL	33.41	95% Chebyshev(Mean, Sd) UCL	36.8				
1917					97.5% Chebyshev(Mean, Sd) UCL	41.5	99% Chebyshev(Mean, Sd) UCL	50.73				
1918												
1919	**Suggested UCL to Use**											
1920					95% Student's-t UCL	30.57						
1921												
1922	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1923	Recommendations are based upon data size, data distribution, and skewness.											
1924	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

1925	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1926												
1927	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1928	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1929												
1930	**Arsenic (smw16d)**											
1931												
1932	**General Statistics**											
1933						Total Number of Observations	8			Number of Distinct Observations	5	
1934						Number of Detects	7			Number of Non-Detects	1	
1935						Number of Distinct Detects	4			Number of Distinct Non-Detects	1	
1936						Minimum Detect	1.7			Minimum Non-Detect	2.3	
1937						Maximum Detect	2			Maximum Non-Detect	2.3	
1938						Variance Detects	0.0114			Percent Non-Detects	12.5%	
1939						Mean Detects	1.814			SD Detects	0.107	
1940						Median Detects	1.8			CV Detects	0.0589	
1941						Skewness Detects	0.772			Kurtosis Detects	0.262	
1942						Mean of Logged Detects	0.594			SD of Logged Detects	0.0581	
1943												
1944	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1945	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1946	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1947	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1948												
1949	**Normal GOF Test on Detects Only**											
1950						Shapiro Wilk Test Statistic	0.894			**Shapiro Wilk GOF Test**		
1951						5% Shapiro Wilk Critical Value	0.803			Detected Data appear Normal at 5% Significance Level		
1952						Lilliefors Test Statistic	0.267			**Lilliefors GOF Test**		
1953						5% Lilliefors Critical Value	0.304			Detected Data appear Normal at 5% Significance Level		
1954	**Detected Data appear Normal at 5% Significance Level**											
1955												
1956	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1957						KM Mean	1.814			KM Standard Error of Mean	0.0404	
1958						KM SD	0.099			95% KM (BCA) UCL	N/A	
1959						95% KM (t) UCL	1.891			95% KM (Percentile Bootstrap) UCL	N/A	
1960						95% KM (z) UCL	1.881			95% KM Bootstrap t UCL	N/A	
1961						90% KM Chebyshev UCL	1.936			95% KM Chebyshev UCL	1.99	
1962						97.5% KM Chebyshev UCL	2.067			99% KM Chebyshev UCL	2.216	
1963												
1964	**Gamma GOF Tests on Detected Observations Only**											
1965						A-D Test Statistic	0.435			**Anderson-Darling GOF Test**		
1966						5% A-D Critical Value	0.708			Detected data appear Gamma Distributed at 5% Significance Level		
1967						K-S Test Statistic	0.265			**Kolmogorov-Smirnov GOF**		
1968						5% K-S Critical Value	0.311			Detected data appear Gamma Distributed at 5% Significance Level		
1969	**Detected data appear Gamma Distributed at 5% Significance Level**											
1970												
1971	**Gamma Statistics on Detected Data Only**											
1972						k hat (MLE)	342.5			k star (bias corrected MLE)	195.8	
1973						Theta hat (MLE)	0.0053			Theta star (bias corrected MLE)	0.00927	
1974						nu hat (MLE)	4794			nu star (bias corrected)	2741	
1975						Mean (detects)	1.814					
1976												

	A	B	C	D	E	F	G	H	I	J	K	L
1977	**Gamma ROS Statistics using Imputed Non-Detects**											
1978	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1979	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1980	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1981	This is especially true when the sample size is small.											
1982	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1983					Minimum	1.7				Mean	1.814	
1984					Maximum	2				Median	1.8	
1985					SD	0.099				CV	0.0546	
1986					k hat (MLE)	391.3				k star (bias corrected MLE)	244.7	
1987					Theta hat (MLE)	0.00464				Theta star (bias corrected MLE)	0.00741	
1988					nu hat (MLE)	6261				nu star (bias corrected)	3915	
1989					Adjusted Level of Significance (β)	0.0195						
1990					Approximate Chi Square Value (N/A, α)	3770				Adjusted Chi Square Value (N/A, β)	3734	
1991					95% Gamma Approximate UCL (use when n>=50)	1.884				95% Gamma Adjusted UCL (use when n<50)	1.902	
1992												
1993	**Estimates of Gamma Parameters using KM Estimates**											
1994					Mean (KM)	1.814				SD (KM)	0.099	
1995					Variance (KM)	0.0098				SE of Mean (KM)	0.0404	
1996					k hat (KM)	336				k star (KM)	210.1	
1997					nu hat (KM)	5376				nu star (KM)	3362	
1998					theta hat (KM)	0.0054				theta star (KM)	0.00864	
1999					80% gamma percentile (KM)	1.919				90% gamma percentile (KM)	1.976	
2000					95% gamma percentile (KM)	2.025				99% gamma percentile (KM)	2.118	
2001												
2002	**Gamma Kaplan-Meier (KM) Statistics**											
2003					Approximate Chi Square Value (N/A, α)	3228				Adjusted Chi Square Value (N/A, β)	3194	
2004					95% Gamma Approximate KM-UCL (use when n>=50)	1.889				95% Gamma Adjusted KM-UCL (use when n<50)	1.909	
2005												
2006	**Lognormal GOF Test on Detected Observations Only**											
2007					Shapiro Wilk Test Statistic	0.899				**Shapiro Wilk GOF Test**		
2008					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
2009					Lilliefors Test Statistic	0.258				**Lilliefors GOF Test**		
2010					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
2011	**Detected Data appear Lognormal at 5% Significance Level**											
2012												
2013	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2014					Mean in Original Scale	1.814				Mean in Log Scale	0.594	
2015					SD in Original Scale	0.099				SD in Log Scale	0.0538	
2016					95% t UCL (assumes normality of ROS data)	1.88				95% Percentile Bootstrap UCL	1.865	
2017					95% BCA Bootstrap UCL	1.879				95% Bootstrap t UCL	1.902	
2018					95% H-UCL (Log ROS)	N/A						
2019												
2020	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2021					KM Mean (logged)	0.594				KM Geo Mean	1.812	
2022					KM SD (logged)	0.0538				95% Critical H Value (KM-Log)	N/A	
2023					KM Standard Error of Mean (logged)	0.022				95% H-UCL (KM -Log)	N/A	
2024					KM SD (logged)	0.0538				95% Critical H Value (KM-Log)	N/A	
2025					KM Standard Error of Mean (logged)	0.022						
2026												
2027	**DL/2 Statistics**											
2028	**DL/2 Normal**									**DL/2 Log-Transformed**		

2029				Mean in Original Scale		1.731				Mean in Log Scale		0.537
2030				SD in Original Scale		0.255				SD in Log Scale		0.169
2031				95% t UCL (Assumes normality)		1.902				95% H-Stat UCL		1.963
2032	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2033												
2034	**Nonparametric Distribution Free UCL Statistics**											
2035	**Detected Data appear Normal Distributed at 5% Significance Level**											
2036												
2037	**Suggested UCL to Use**											
2038				95% KM (t) UCL		1.891						
2039												
2040	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2041	Recommendations are based upon data size, data distribution, and skewness.											
2042	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2043	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2044												
2045												
2046	**Arsenic (smw17)**											
2047												
2048	**General Statistics**											
2049				Total Number of Observations		8				Number of Distinct Observations		8
2050										Number of Missing Observations		0
2051				Minimum		14.7				Mean		41.6
2052				Maximum		54.3				Median		46.75
2053				SD		13.12				Std. Error of Mean		4.638
2054				Coefficient of Variation		0.315				Skewness		-1.466
2055												
2056	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2057	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2058	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2059	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2060												
2061	**Normal GOF Test**											
2062				Shapiro Wilk Test Statistic		0.849				**Shapiro Wilk GOF Test**		
2063				5% Shapiro Wilk Critical Value		0.818				Data appear Normal at 5% Significance Level		
2064				Lilliefors Test Statistic		0.273				**Lilliefors GOF Test**		
2065				5% Lilliefors Critical Value		0.283				Data appear Normal at 5% Significance Level		
2066	**Data appear Normal at 5% Significance Level**											
2067												
2068	**Assuming Normal Distribution**											
2069	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
2070				95% Student's-t UCL		50.39				95% Adjusted-CLT UCL (Chen-1995)		46.66
2071										95% Modified-t UCL (Johnson-1978)		49.99
2072												
2073	**Gamma GOF Test**											
2074				A-D Test Statistic		0.833				**Anderson-Darling Gamma GOF Test**		
2075				5% A-D Critical Value		0.717				Data Not Gamma Distributed at 5% Significance Level		
2076				K-S Test Statistic		0.295				**Kolmogorov-Smirnov Gamma GOF Test**		
2077				5% K-S Critical Value		0.295				Data Not Gamma Distributed at 5% Significance Level		
2078	**Data Not Gamma Distributed at 5% Significance Level**											
2079												
2080	**Gamma Statistics**											

2081					k hat (MLE)	7.75				k star (bias corrected MLE)		4.927
2082					Theta hat (MLE)	5.368				Theta star (bias corrected MLE)		8.443
2083					nu hat (MLE)	124				nu star (bias corrected)		78.83
2084					MLE Mean (bias corrected)	41.6				MLE Sd (bias corrected)		18.74
2085										Approximate Chi Square Value (0.05)		59.38
2086					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		55.13
2087												
2088					**Assuming Gamma Distribution**							
2089				95% Approximate Gamma UCL (use when n>=50))		55.23				95% Adjusted Gamma UCL (use when n<50)		59.49
2090												
2091					**Lognormal GOF Test**							
2092					Shapiro Wilk Test Statistic	0.744				**Shapiro Wilk Lognormal GOF Test**		
2093					5% Shapiro Wilk Critical Value	0.818				Data Not Lognormal at 5% Significance Level		
2094					Lilliefors Test Statistic	0.286				**Lilliefors Lognormal GOF Test**		
2095					5% Lilliefors Critical Value	0.283				Data Not Lognormal at 5% Significance Level		
2096					**Data Not Lognormal at 5% Significance Level**							
2097												
2098					**Lognormal Statistics**							
2099					Minimum of Logged Data	2.688				Mean of logged Data		3.662
2100					Maximum of Logged Data	3.995				SD of logged Data		0.433
2101												
2102					**Assuming Lognormal Distribution**							
2103					95% H-UCL	61.76				90% Chebyshev (MVUE) UCL		61.79
2104					95% Chebyshev (MVUE) UCL	70.65				97.5% Chebyshev (MVUE) UCL		82.94
2105					99% Chebyshev (MVUE) UCL	107.1						
2106												
2107					**Nonparametric Distribution Free UCL Statistics**							
2108					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
2109												
2110					**Nonparametric Distribution Free UCLs**							
2111					95% CLT UCL	49.23				95% Jackknife UCL		50.39
2112					95% Standard Bootstrap UCL	48.88				95% Bootstrap-t UCL		48.58
2113					95% Hall's Bootstrap UCL	47.18				95% Percentile Bootstrap UCL		47.95
2114					95% BCA Bootstrap UCL	47.19						
2115					90% Chebyshev(Mean, Sd) UCL	55.51				95% Chebyshev(Mean, Sd) UCL		61.82
2116					97.5% Chebyshev(Mean, Sd) UCL	70.57				99% Chebyshev(Mean, Sd) UCL		87.75
2117												
2118					**Suggested UCL to Use**							
2119					95% Student's-t UCL	50.39						
2120												
2121					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2122					Recommendations are based upon data size, data distribution, and skewness.							
2123					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2124					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2125												
2126					**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**							
2127					**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**							
2128												
2129												
2130	**Arsenic (smw17d)**											
2131												
2132					**General Statistics**							

2133				Total Number of Observations		8				Number of Distinct Observations		7
2134										Number of Missing Observations		0
2135				Minimum		2.6				Mean		2.975
2136				Maximum		3.8				Median		2.85
2137				SD		0.399				Std. Error of Mean		0.141
2138				Coefficient of Variation		0.134				Skewness		1.485
2139												
2140	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2141	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2142	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2143	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2144												
2145	**Normal GOF Test**											
2146				Shapiro Wilk Test Statistic		0.851	**Shapiro Wilk GOF Test**					
2147				5% Shapiro Wilk Critical Value		0.818	Data appear Normal at 5% Significance Level					
2148				Lilliefors Test Statistic		0.225	**Lilliefors GOF Test**					
2149				5% Lilliefors Critical Value		0.283	Data appear Normal at 5% Significance Level					
2150	**Data appear Normal at 5% Significance Level**											
2151												
2152	**Assuming Normal Distribution**											
2153	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2154				95% Student's-t UCL		3.242				95% Adjusted-CLT UCL (Chen-1995)		3.286
2155										95% Modified-t UCL (Johnson-1978)		3.255
2156												
2157	**Gamma GOF Test**											
2158				A-D Test Statistic		0.503	**Anderson-Darling Gamma GOF Test**					
2159				5% A-D Critical Value		0.715	Detected data appear Gamma Distributed at 5% Significance Level					
2160				K-S Test Statistic		0.206	**Kolmogorov-Smirnov Gamma GOF Test**					
2161				5% K-S Critical Value		0.293	Detected data appear Gamma Distributed at 5% Significance Level					
2162	**Detected data appear Gamma Distributed at 5% Significance Level**											
2163												
2164	**Gamma Statistics**											
2165				k hat (MLE)		69.05				k star (bias corrected MLE)		43.24
2166				Theta hat (MLE)		0.0431				Theta star (bias corrected MLE)		0.0688
2167				nu hat (MLE)		1105				nu star (bias corrected)		691.8
2168				MLE Mean (bias corrected)		2.975				MLE Sd (bias corrected)		0.452
2169										Approximate Chi Square Value (0.05)		631.8
2170				Adjusted Level of Significance		0.0195				Adjusted Chi Square Value		617.2
2171												
2172	**Assuming Gamma Distribution**											
2173				95% Approximate Gamma UCL (use when n>=50))		3.258				95% Adjusted Gamma UCL (use when n<50)		3.335
2174												
2175	**Lognormal GOF Test**											
2176				Shapiro Wilk Test Statistic		0.881	**Shapiro Wilk Lognormal GOF Test**					
2177				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
2178				Lilliefors Test Statistic		0.201	**Lilliefors Lognormal GOF Test**					
2179				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
2180	**Data appear Lognormal at 5% Significance Level**											
2181												
2182	**Lognormal Statistics**											
2183				Minimum of Logged Data		0.956				Mean of logged Data		1.083
2184				Maximum of Logged Data		1.335				SD of logged Data		0.126

2185												
2186	**Assuming Lognormal Distribution**											
2187				95% H-UCL	3.255			90% Chebyshev (MVUE) UCL	3.373			
2188				95% Chebyshev (MVUE) UCL	3.553			97.5% Chebyshev (MVUE) UCL	3.804			
2189				99% Chebyshev (MVUE) UCL	4.296							
2190												
2191	**Nonparametric Distribution Free UCL Statistics**											
2192	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2193												
2194	**Nonparametric Distribution Free UCLs**											
2195				95% CLT UCL	3.207			95% Jackknife UCL	3.242			
2196				95% Standard Bootstrap UCL	3.19			95% Bootstrap-t UCL	3.55			
2197				95% Hall's Bootstrap UCL	4.404			95% Percentile Bootstrap UCL	3.213			
2198				95% BCA Bootstrap UCL	3.25							
2199				90% Chebyshev(Mean, Sd) UCL	3.398			95% Chebyshev(Mean, Sd) UCL	3.59			
2200				97.5% Chebyshev(Mean, Sd) UCL	3.856			99% Chebyshev(Mean, Sd) UCL	4.379			
2201												
2202	**Suggested UCL to Use**											
2203				95% Student's-t UCL	3.242							
2204												
2205	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2206	Recommendations are based upon data size, data distribution, and skewness.											
2207	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2208	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2209												
2210												
2211	**Arsenic (smw18)**											
2212												
2213	**General Statistics**											
2214				Total Number of Observations	8			Number of Distinct Observations	7			
2215								Number of Missing Observations	0			
2216				Minimum	3.2			Mean	7.575			
2217				Maximum	14.1			Median	7.6			
2218				SD	3.127			Std. Error of Mean	1.105			
2219				Coefficient of Variation	0.413			Skewness	1.144			
2220												
2221	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2222	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2223	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2224	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2225												
2226	**Normal GOF Test**											
2227				Shapiro Wilk Test Statistic	0.887			**Shapiro Wilk GOF Test**				
2228				5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level				
2229				Lilliefors Test Statistic	0.271			**Lilliefors GOF Test**				
2230				5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level				
2231	**Data appear Normal at 5% Significance Level**											
2232												
2233	**Assuming Normal Distribution**											
2234	**95% Normal UCL**							**95% UCLs (Adjusted for Skewness)**				
2235				95% Student's-t UCL	9.669			95% Adjusted-CLT UCL (Chen-1995)	9.871			
2236								95% Modified-t UCL (Johnson-1978)	9.744			

2237												
2238	**Gamma GOF Test**											
2239					A-D Test Statistic	0.4	**Anderson-Darling Gamma GOF Test**					
2240					5% A-D Critical Value	0.718	Detected data appear Gamma Distributed at 5% Significance Level					
2241					K-S Test Statistic	0.219	**Kolmogorov-Smirnov Gamma GOF Test**					
2242					5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level					
2243	**Detected data appear Gamma Distributed at 5% Significance Level**											
2244												
2245	**Gamma Statistics**											
2246					k hat (MLE)	6.91	k star (bias corrected MLE)	4.402				
2247					Theta hat (MLE)	1.096	Theta star (bias corrected MLE)	1.721				
2248					nu hat (MLE)	110.6	nu star (bias corrected)	70.43				
2249					MLE Mean (bias corrected)	7.575	MLE Sd (bias corrected)	3.61				
2250							Approximate Chi Square Value (0.05)	52.11				
2251					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	48.15				
2252												
2253	**Assuming Gamma Distribution**											
2254				95% Approximate Gamma UCL (use when n>=50))		10.24	95% Adjusted Gamma UCL (use when n<50)	11.08				
2255												
2256	**Lognormal GOF Test**											
2257					Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk Lognormal GOF Test**					
2258					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
2259					Lilliefors Test Statistic	0.211	**Lilliefors Lognormal GOF Test**					
2260					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
2261	**Data appear Lognormal at 5% Significance Level**											
2262												
2263	**Lognormal Statistics**											
2264					Minimum of Logged Data	1.163	Mean of logged Data	1.951				
2265					Maximum of Logged Data	2.646	SD of logged Data	0.42				
2266												
2267	**Assuming Lognormal Distribution**											
2268					95% H-UCL	10.93	90% Chebyshev (MVUE) UCL	11				
2269					95% Chebyshev (MVUE) UCL	12.54	97.5% Chebyshev (MVUE) UCL	14.68				
2270					99% Chebyshev (MVUE) UCL	18.89						
2271												
2272	**Nonparametric Distribution Free UCL Statistics**											
2273	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2274												
2275	**Nonparametric Distribution Free UCLs**											
2276					95% CLT UCL	9.393	95% Jackknife UCL	9.669				
2277					95% Standard Bootstrap UCL	9.267	95% Bootstrap-t UCL	10.13				
2278					95% Hall's Bootstrap UCL	19.86	95% Percentile Bootstrap UCL	9.363				
2279					95% BCA Bootstrap UCL	9.65						
2280					90% Chebyshev(Mean, Sd) UCL	10.89	95% Chebyshev(Mean, Sd) UCL	12.39				
2281					97.5% Chebyshev(Mean, Sd) UCL	14.48	99% Chebyshev(Mean, Sd) UCL	18.57				
2282												
2283	**Suggested UCL to Use**											
2284					95% Student's-t UCL	9.669						
2285												
2286	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2287	Recommendations are based upon data size, data distribution, and skewness.											
2288	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

2289	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2290												
2291												
2292	**Arsenic (smw18d)**											
2293												
2294	**General Statistics**											
2295						Total Number of Observations	8			Number of Distinct Observations	8	
2296										Number of Missing Observations	0	
2297						Minimum	3.5			Mean	4.1	
2298						Maximum	5			Median	4	
2299						SD	0.513			Std. Error of Mean	0.181	
2300						Coefficient of Variation	0.125			Skewness	0.687	
2301												
2302	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2303	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2304	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2305	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2306												
2307	**Normal GOF Test**											
2308						Shapiro Wilk Test Statistic	0.951			**Shapiro Wilk GOF Test**		
2309						5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level		
2310						Lilliefors Test Statistic	0.152			**Lilliefors GOF Test**		
2311						5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level		
2312	**Data appear Normal at 5% Significance Level**											
2313												
2314	**Assuming Normal Distribution**											
2315						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
2316						95% Student's-t UCL	4.443			95% Adjusted-CLT UCL (Chen-1995)	4.445	
2317										95% Modified-t UCL (Johnson-1978)	4.451	
2318												
2319	**Gamma GOF Test**											
2320						A-D Test Statistic	0.207			**Anderson-Darling Gamma GOF Test**		
2321						5% A-D Critical Value	0.715			Detected data appear Gamma Distributed at 5% Significance Level		
2322						K-S Test Statistic	0.153			**Kolmogorov-Smirnov Gamma GOF Test**		
2323						5% K-S Critical Value	0.293			Detected data appear Gamma Distributed at 5% Significance Level		
2324	**Detected data appear Gamma Distributed at 5% Significance Level**											
2325												
2326	**Gamma Statistics**											
2327						k hat (MLE)	75.46			k star (bias corrected MLE)	47.25	
2328						Theta hat (MLE)	0.0543			Theta star (bias corrected MLE)	0.0868	
2329						nu hat (MLE)	1207			nu star (bias corrected)	755.9	
2330						MLE Mean (bias corrected)	4.1			MLE Sd (bias corrected)	0.596	
2331										Approximate Chi Square Value (0.05)	693.1	
2332						Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	677.8	
2333												
2334	**Assuming Gamma Distribution**											
2335						95% Approximate Gamma UCL (use when n>=50))	4.471			95% Adjusted Gamma UCL (use when n<50)	4.572	
2336												
2337	**Lognormal GOF Test**											
2338						Shapiro Wilk Test Statistic	0.964			**Shapiro Wilk Lognormal GOF Test**		
2339						5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level		
2340						Lilliefors Test Statistic	0.139			**Lilliefors Lognormal GOF Test**		

2341				5% Lilliefors Critical Value		0.283		Data appear Lognormal at 5% Significance Level				
2342	**Data appear Lognormal at 5% Significance Level**											
2343												
2344	**Lognormal Statistics**											
2345				Minimum of Logged Data		1.253				Mean of logged Data		1.404
2346				Maximum of Logged Data		1.609				SD of logged Data		0.122
2347												
2348	**Assuming Lognormal Distribution**											
2349				95% H-UCL		4.474				90% Chebyshev (MVUE) UCL		4.632
2350				95% Chebyshev (MVUE) UCL		4.873				97.5% Chebyshev (MVUE) UCL		5.208
2351				99% Chebyshev (MVUE) UCL		5.865						
2352												
2353	**Nonparametric Distribution Free UCL Statistics**											
2354	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2355												
2356	**Nonparametric Distribution Free UCLs**											
2357				95% CLT UCL		4.398				95% Jackknife UCL		4.443
2358				95% Standard Bootstrap UCL		4.379				95% Bootstrap-t UCL		4.552
2359				95% Hall's Bootstrap UCL		4.579				95% Percentile Bootstrap UCL		4.375
2360				95% BCA Bootstrap UCL		4.4						
2361				90% Chebyshev(Mean, Sd) UCL		4.644				95% Chebyshev(Mean, Sd) UCL		4.89
2362				97.5% Chebyshev(Mean, Sd) UCL		5.232				99% Chebyshev(Mean, Sd) UCL		5.904
2363												
2364	**Suggested UCL to Use**											
2365				95% Student's-t UCL		4.443						
2366												
2367	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2368	Recommendations are based upon data size, data distribution, and skewness.											
2369	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2370	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2371												
2372	**Arsenic (smw19)**											
2373												
2374	**General Statistics**											
2375				Total Number of Observations		8				Number of Distinct Observations		8
2376				Number of Detects		7				Number of Non-Detects		1
2377				Number of Distinct Detects		7				Number of Distinct Non-Detects		1
2378				Minimum Detect		1.3				Minimum Non-Detect		2.3
2379				Maximum Detect		4.2				Maximum Non-Detect		2.3
2380				Variance Detects		0.963				Percent Non-Detects		12.5%
2381				Mean Detects		2.643				SD Detects		0.981
2382				Median Detects		2.8				CV Detects		0.371
2383				Skewness Detects		0.25				Kurtosis Detects		-0.462
2384				Mean of Logged Detects		0.908				SD of Logged Detects		0.397
2385												
2386	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2387	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2388	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2389	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2390												
2391	**Normal GOF Test on Detects Only**											
2392				Shapiro Wilk Test Statistic		0.974		**Shapiro Wilk GOF Test**				

	A	B	C	D	E	F	G	H	I	J	K	L
2393				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Normal at 5% Significance Level					
2394				Lilliefors Test Statistic		0.172	**Lilliefors GOF Test**					
2395				5% Lilliefors Critical Value		0.304	Detected Data appear Normal at 5% Significance Level					
2396	**Detected Data appear Normal at 5% Significance Level**											
2397												
2398	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2399				KM Mean		2.529	KM Standard Error of Mean					0.35
2400				KM SD		0.908	95% KM (BCA) UCL					3.05
2401				95% KM (t) UCL		3.192	95% KM (Percentile Bootstrap) UCL					3.063
2402				95% KM (z) UCL		3.105	95% KM Bootstrap t UCL					3.218
2403				90% KM Chebyshev UCL		3.579	95% KM Chebyshev UCL					4.055
2404				97.5% KM Chebyshev UCL		4.716	99% KM Chebyshev UCL					6.013
2405												
2406	**Gamma GOF Tests on Detected Observations Only**											
2407				A-D Test Statistic		0.214	**Anderson-Darling GOF Test**					
2408				5% A-D Critical Value		0.709	Detected data appear Gamma Distributed at 5% Significance Level					
2409				K-S Test Statistic		0.183	**Kolmogorov-Smirnov GOF**					
2410				5% K-S Critical Value		0.312	Detected data appear Gamma Distributed at 5% Significance Level					
2411	**Detected data appear Gamma Distributed at 5% Significance Level**											
2412												
2413	**Gamma Statistics on Detected Data Only**											
2414				k hat (MLE)		7.968	k star (bias corrected MLE)					4.648
2415				Theta hat (MLE)		0.332	Theta star (bias corrected MLE)					0.569
2416				nu hat (MLE)		111.6	nu star (bias corrected)					65.08
2417				Mean (detects)		2.643						
2418												
2419	**Gamma ROS Statistics using Imputed Non-Detects**											
2420	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2421	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2422	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2423	This is especially true when the sample size is small.											
2424	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2425				Minimum		1.3	Mean					2.531
2426				Maximum		4.2	Median					2.4
2427				SD		0.962	CV					0.38
2428				k hat (MLE)		7.927	k star (bias corrected MLE)					5.038
2429				Theta hat (MLE)		0.319	Theta star (bias corrected MLE)					0.503
2430				nu hat (MLE)		126.8	nu star (bias corrected)					80.6
2431				Adjusted Level of Significance (β)		0.0195						
2432				Approximate Chi Square Value (80.60, α)		60.91	Adjusted Chi Square Value (80.60, β)					56.6
2433				95% Gamma Approximate UCL (use when n>=50)		3.35	95% Gamma Adjusted UCL (use when n<50)					3.605
2434												
2435	**Estimates of Gamma Parameters using KM Estimates**											
2436				Mean (KM)		2.529	SD (KM)					0.908
2437				Variance (KM)		0.825	SE of Mean (KM)					0.35
2438				k hat (KM)		7.758	k star (KM)					4.932
2439				nu hat (KM)		124.1	nu star (KM)					78.91
2440				theta hat (KM)		0.326	theta star (KM)					0.513
2441				80% gamma percentile (KM)		3.405	90% gamma percentile (KM)					4.054
2442				95% gamma percentile (KM)		4.646	99% gamma percentile (KM)					5.898
2443												
2444	**Gamma Kaplan-Meier (KM) Statistics**											

	A	B	C	D	E	F	G	H	I	J	K	L
2445	Approximate Chi Square Value (78.91, α)					59.44	Adjusted Chi Square Value (78.91, β)					55.19
2446	95% Gamma Approximate KM-UCL (use when n>=50)					3.357	95% Gamma Adjusted KM-UCL (use when n<50)					3.616
2447												
2448	**Lognormal GOF Test on Detected Observations Only**											
2449	Shapiro Wilk Test Statistic					0.966	**Shapiro Wilk GOF Test**					
2450	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Lognormal at 5% Significance Level					
2451	Lilliefors Test Statistic					0.192	**Lilliefors GOF Test**					
2452	5% Lilliefors Critical Value					0.304	Detected Data appear Lognormal at 5% Significance Level					
2453	**Detected Data appear Lognormal at 5% Significance Level**											
2454												
2455	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2456	Mean in Original Scale					2.53	Mean in Log Scale					0.863
2457	SD in Original Scale					0.963	SD in Log Scale					0.388
2458	95% t UCL (assumes normality of ROS data)					3.175	95% Percentile Bootstrap UCL					3.05
2459	95% BCA Bootstrap UCL					3.088	95% Bootstrap t UCL					3.281
2460	95% H-UCL (Log ROS)					3.519						
2461												
2462	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2463	KM Mean (logged)					0.861	KM Geo Mean					2.365
2464	KM SD (logged)					0.372	95% Critical H Value (KM-Log)					2.154
2465	KM Standard Error of Mean (logged)					0.145	95% H-UCL (KM -Log)					3.43
2466	KM SD (logged)					0.372	95% Critical H Value (KM-Log)					2.154
2467	KM Standard Error of Mean (logged)					0.145						
2468												
2469	**DL/2 Statistics**											
2470	**DL/2 Normal**						**DL/2 Log-Transformed**					
2471	Mean in Original Scale					2.456	Mean in Log Scale					0.812
2472	SD in Original Scale					1.051	SD in Log Scale					0.457
2473	95% t UCL (Assumes normality)					3.16	95% H-Stat UCL					3.707
2474	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2475												
2476	**Nonparametric Distribution Free UCL Statistics**											
2477	**Detected Data appear Normal Distributed at 5% Significance Level**											
2478												
2479	**Suggested UCL to Use**											
2480	95% KM (t) UCL					3.192						
2481												
2482	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2483	Recommendations are based upon data size, data distribution, and skewness.											
2484	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2485	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2486												
2487	**Arsenic (smw7)**											
2488												
2489	**General Statistics**											
2490	Total Number of Observations					8	Number of Distinct Observations					6
2491	Number of Detects					7	Number of Non-Detects					1
2492	Number of Distinct Detects					5	Number of Distinct Non-Detects					1
2493	Minimum Detect					2.6	Minimum Non-Detect					2.3
2494	Maximum Detect					3.6	Maximum Non-Detect					2.3
2495	Variance Detects					0.126	Percent Non-Detects					12.5%
2496	Mean Detects					3.157	SD Detects					0.355

2497					Median Detects	3.2					CV Detects	0.113
2498					Skewness Detects	-0.474					Kurtosis Detects	-0.567
2499					Mean of Logged Detects	1.144					SD of Logged Detects	0.116
2500												
2501	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2502	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2503	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2504	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2505												
2506	**Normal GOF Test on Detects Only**											
2507					Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**					
2508					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level					
2509					Lilliefors Test Statistic	0.262	**Lilliefors GOF Test**					
2510					5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level					
2511	**Detected Data appear Normal at 5% Significance Level**											
2512												
2513	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2514					KM Mean	3.05					KM Standard Error of Mean	0.16
2515					KM SD	0.418					95% KM (BCA) UCL	3.275
2516					95% KM (t) UCL	3.353					95% KM (Percentile Bootstrap) UCL	3.288
2517					95% KM (z) UCL	3.313					95% KM Bootstrap t UCL	3.331
2518					90% KM Chebyshev UCL	3.529					95% KM Chebyshev UCL	3.746
2519					97.5% KM Chebyshev UCL	4.048					99% KM Chebyshev UCL	4.64
2520												
2521	**Gamma GOF Tests on Detected Observations Only**											
2522					A-D Test Statistic	0.41	**Anderson-Darling GOF Test**					
2523					5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level					
2524					K-S Test Statistic	0.279	**Kolmogorov-Smirnov GOF**					
2525					5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level					
2526	**Detected data appear Gamma Distributed at 5% Significance Level**											
2527												
2528	**Gamma Statistics on Detected Data Only**											
2529					k hat (MLE)	89.02					k star (bias corrected MLE)	50.96
2530					Theta hat (MLE)	0.0355					Theta star (bias corrected MLE)	0.062
2531					nu hat (MLE)	1246					nu star (bias corrected)	713.5
2532					Mean (detects)	3.157						
2533												
2534	**Gamma ROS Statistics using Imputed Non-Detects**											
2535	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2536	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2537	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2538	This is especially true when the sample size is small.											
2539	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2540					Minimum	2.349					Mean	3.056
2541					Maximum	3.6					Median	3.2
2542					SD	0.436					CV	0.143
2543					k hat (MLE)	53.53					k star (bias corrected MLE)	33.54
2544					Theta hat (MLE)	0.0571					Theta star (bias corrected MLE)	0.0911
2545					nu hat (MLE)	856.4					nu star (bias corrected)	536.6
2546					Adjusted Level of Significance (β)	0.0195						
2547					Approximate Chi Square Value (536.61, α)	483.9					Adjusted Chi Square Value (536.61, β)	471.2
2548					95% Gamma Approximate UCL (use when n>=50)	3.389					95% Gamma Adjusted UCL (use when n<50)	3.481

	A	B	C	D	E	F	G	H	I	J	K	L
2549												
2550	**Estimates of Gamma Parameters using KM Estimates**											
2551					Mean (KM)	3.05				SD (KM)	0.418	
2552					Variance (KM)	0.175				SE of Mean (KM)	0.16	
2553					k hat (KM)	53.16				k star (KM)	33.31	
2554					nu hat (KM)	850.5				nu star (KM)	532.9	
2555					theta hat (KM)	0.0574				theta star (KM)	0.0916	
2556					80% gamma percentile (KM)	3.484				90% gamma percentile (KM)	3.744	
2557					95% gamma percentile (KM)	3.968				99% gamma percentile (KM)	4.412	
2558												
2559	**Gamma Kaplan-Meier (KM) Statistics**											
2560					Approximate Chi Square Value (532.90, α)	480.4				Adjusted Chi Square Value (532.90, β)	467.7	
2561					95% Gamma Approximate KM-UCL (use when n>=50)	3.384				95% Gamma Adjusted KM-UCL (use when n<50)	3.475	
2562												
2563	**Lognormal GOF Test on Detected Observations Only**											
2564					Shapiro Wilk Test Statistic	0.911				**Shapiro Wilk GOF Test**		
2565					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
2566					Lilliefors Test Statistic	0.28				**Lilliefors GOF Test**		
2567					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
2568	**Detected Data appear Lognormal at 5% Significance Level**											
2569												
2570	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2571					Mean in Original Scale	3.06				Mean in Log Scale	1.109	
2572					SD in Original Scale	0.429				SD in Log Scale	0.145	
2573					95% t UCL (assumes normality of ROS data)	3.347				95% Percentile Bootstrap UCL	3.288	
2574					95% BCA Bootstrap UCL	3.288				95% Bootstrap t UCL	3.323	
2575					95% H-UCL (Log ROS)	3.399						
2576												
2577	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2578					KM Mean (logged)	1.105				KM Geo Mean	3.02	
2579					KM SD (logged)	0.144				95% Critical H Value (KM-Log)	1.887	
2580					KM Standard Error of Mean (logged)	0.0548				95% H-UCL (KM -Log)	3.38	
2581					KM SD (logged)	0.144				95% Critical H Value (KM-Log)	1.887	
2582					KM Standard Error of Mean (logged)	0.0548						
2583												
2584	**DL/2 Statistics**											
2585	**DL/2 Normal**									**DL/2 Log-Transformed**		
2586					Mean in Original Scale	2.906				Mean in Log Scale	1.019	
2587					SD in Original Scale	0.782				SD in Log Scale	0.371	
2588					95% t UCL (Assumes normality)	3.43				95% H-Stat UCL	4.011	
2589	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2590												
2591	**Nonparametric Distribution Free UCL Statistics**											
2592	**Detected Data appear Normal Distributed at 5% Significance Level**											
2593												
2594	**Suggested UCL to Use**											
2595					95% KM (t) UCL	3.353						
2596												
2597	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2598	Recommendations are based upon data size, data distribution, and skewness.											
2599	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2600	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

2601												
2602												
2603	**Arsenic (smw8)**											
2604												
2605	**General Statistics**											
2606					Total Number of Observations	8			Number of Distinct Observations	7		
2607									Number of Missing Observations	0		
2608					Minimum	3.9			Mean	5.625		
2609					Maximum	7.5			Median	5.7		
2610					SD	1.04			Std. Error of Mean	0.368		
2611					Coefficient of Variation	0.185			Skewness	0.197		
2612												
2613	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2614	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2615	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2616	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2617												
2618	**Normal GOF Test**											
2619					Shapiro Wilk Test Statistic	0.961			**Shapiro Wilk GOF Test**			
2620					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
2621					Lilliefors Test Statistic	0.199			**Lilliefors GOF Test**			
2622					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
2623	**Data appear Normal at 5% Significance Level**											
2624												
2625	**Assuming Normal Distribution**											
2626					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
2627					95% Student's-t UCL	6.322			95% Adjusted-CLT UCL (Chen-1995)	6.257		
2628									95% Modified-t UCL (Johnson-1978)	6.326		
2629												
2630	**Gamma GOF Test**											
2631					A-D Test Statistic	0.281			**Anderson-Darling Gamma GOF Test**			
2632					5% A-D Critical Value	0.716			Detected data appear Gamma Distributed at 5% Significance Level			
2633					K-S Test Statistic	0.178			**Kolmogorov-Smirnov Gamma GOF Test**			
2634					5% K-S Critical Value	0.294			Detected data appear Gamma Distributed at 5% Significance Level			
2635	**Detected data appear Gamma Distributed at 5% Significance Level**											
2636												
2637	**Gamma Statistics**											
2638					k hat (MLE)	32.68			k star (bias corrected MLE)	20.51		
2639					Theta hat (MLE)	0.172			Theta star (bias corrected MLE)	0.274		
2640					nu hat (MLE)	522.9			nu star (bias corrected)	328.2		
2641					MLE Mean (bias corrected)	5.625			MLE Sd (bias corrected)	1.242		
2642									Approximate Chi Square Value (0.05)	287.2		
2643					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	277.5		
2644												
2645	**Assuming Gamma Distribution**											
2646					95% Approximate Gamma UCL (use when n>=50))	6.427			95% Adjusted Gamma UCL (use when n<50)	6.653		
2647												
2648	**Lognormal GOF Test**											
2649					Shapiro Wilk Test Statistic	0.955			**Shapiro Wilk Lognormal GOF Test**			
2650					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
2651					Lilliefors Test Statistic	0.185			**Lilliefors Lognormal GOF Test**			
2652					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			

	A	B	C	D	E	F	G	H	I	J	K	L
2653	**Data appear Lognormal at 5% Significance Level**											
2654												
2655	**Lognormal Statistics**											
2656					Minimum of Logged Data	1.361				Mean of logged Data		1.712
2657					Maximum of Logged Data	2.015				SD of logged Data		0.189
2658												
2659	**Assuming Lognormal Distribution**											
2660					95% H-UCL	6.476				90% Chebyshev (MVUE) UCL		6.759
2661					95% Chebyshev (MVUE) UCL	7.272				97.5% Chebyshev (MVUE) UCL		7.985
2662					99% Chebyshev (MVUE) UCL	9.383						
2663												
2664	**Nonparametric Distribution Free UCL Statistics**											
2665	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2666												
2667	**Nonparametric Distribution Free UCLs**											
2668					95% CLT UCL	6.23				95% Jackknife UCL		6.322
2669					95% Standard Bootstrap UCL	6.199				95% Bootstrap-t UCL		6.38
2670					95% Hall's Bootstrap UCL	6.487				95% Percentile Bootstrap UCL		6.188
2671					95% BCA Bootstrap UCL	6.175						
2672					90% Chebyshev(Mean, Sd) UCL	6.728				95% Chebyshev(Mean, Sd) UCL		7.228
2673					97.5% Chebyshev(Mean, Sd) UCL	7.922				99% Chebyshev(Mean, Sd) UCL		9.284
2674												
2675	**Suggested UCL to Use**											
2676					95% Student's-t UCL	6.322						
2677												
2678	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2679	Recommendations are based upon data size, data distribution, and skewness.											
2680	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2681	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2682												
2683												
2684	**Arsenic (smw9)**											
2685												
2686	**General Statistics**											
2687					Total Number of Observations	9				Number of Distinct Observations		9
2688										Number of Missing Observations		0
2689					Minimum	7.2				Mean		9.044
2690					Maximum	11.6				Median		8.8
2691					SD	1.23				Std. Error of Mean		0.41
2692					Coefficient of Variation	0.136				Skewness		0.956
2693												
2694	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2695	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2696	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2697	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2698												
2699	**Normal GOF Test**											
2700					Shapiro Wilk Test Statistic	0.916				**Shapiro Wilk GOF Test**		
2701					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
2702					Lilliefors Test Statistic	0.213				**Lilliefors GOF Test**		
2703					5% Lilliefors Critical Value	0.274				Data appear Normal at 5% Significance Level		
2704	**Data appear Normal at 5% Significance Level**											

2705												
2706	**Assuming Normal Distribution**											
2707	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2708	95% Student's-t UCL				9.807		95% Adjusted-CLT UCL (Chen-1995)				9.858	
2709							95% Modified-t UCL (Johnson-1978)				9.829	
2710												
2711	**Gamma GOF Test**											
2712	A-D Test Statistic				0.409		**Anderson-Darling Gamma GOF Test**					
2713	5% A-D Critical Value				0.72		Detected data appear Gamma Distributed at 5% Significance Level					
2714	K-S Test Statistic				0.201		**Kolmogorov-Smirnov Gamma GOF Test**					
2715	5% K-S Critical Value				0.279		Detected data appear Gamma Distributed at 5% Significance Level					
2716	**Detected data appear Gamma Distributed at 5% Significance Level**											
2717												
2718	**Gamma Statistics**											
2719	k hat (MLE)				63.67		k star (bias corrected MLE)				42.52	
2720	Theta hat (MLE)				0.142		Theta star (bias corrected MLE)				0.213	
2721	nu hat (MLE)				1146		nu star (bias corrected)				765.4	
2722	MLE Mean (bias corrected)				9.044		MLE Sd (bias corrected)				1.387	
2723							Approximate Chi Square Value (0.05)				702.2	
2724	Adjusted Level of Significance				0.0231		Adjusted Chi Square Value				689.4	
2725												
2726	**Assuming Gamma Distribution**											
2727	95% Approximate Gamma UCL (use when n>=50))				9.858		95% Adjusted Gamma UCL (use when n<50)				10.04	
2728												
2729	**Lognormal GOF Test**											
2730	Shapiro Wilk Test Statistic				0.939		**Shapiro Wilk Lognormal GOF Test**					
2731	5% Shapiro Wilk Critical Value				0.829		Data appear Lognormal at 5% Significance Level					
2732	Lilliefors Test Statistic				0.197		**Lilliefors Lognormal GOF Test**					
2733	5% Lilliefors Critical Value				0.274		Data appear Lognormal at 5% Significance Level					
2734	**Data appear Lognormal at 5% Significance Level**											
2735												
2736	**Lognormal Statistics**											
2737	Minimum of Logged Data				1.974		Mean of logged Data				2.194	
2738	Maximum of Logged Data				2.451		SD of logged Data				0.132	
2739												
2740	**Assuming Lognormal Distribution**											
2741	95% H-UCL				9.867		90% Chebyshev (MVUE) UCL				10.24	
2742	95% Chebyshev (MVUE) UCL				10.78		97.5% Chebyshev (MVUE) UCL				11.53	
2743	99% Chebyshev (MVUE) UCL				13							
2744												
2745	**Nonparametric Distribution Free UCL Statistics**											
2746	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2747												
2748	**Nonparametric Distribution Free UCLs**											
2749	95% CLT UCL				9.719		95% Jackknife UCL				9.807	
2750	95% Standard Bootstrap UCL				9.679		95% Bootstrap-t UCL				10.07	
2751	95% Hall's Bootstrap UCL				14.81		95% Percentile Bootstrap UCL				9.722	
2752	95% BCA Bootstrap UCL				9.744							
2753	90% Chebyshev(Mean, Sd) UCL				10.27		95% Chebyshev(Mean, Sd) UCL				10.83	
2754	97.5% Chebyshev(Mean, Sd) UCL				11.6		99% Chebyshev(Mean, Sd) UCL				13.12	
2755												
2756	**Suggested UCL to Use**											

2757				95% Student's-t UCL	9.807							
2758												
2759	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2760	Recommendations are based upon data size, data distribution, and skewness.											
2761	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2762	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2763												
2764	**Arsenic (tw2r)**											
2765												
2766	**General Statistics**											
2767				Total Number of Observations	9			Number of Distinct Observations	9			
2768				Number of Detects	8			Number of Non-Detects	1			
2769				Number of Distinct Detects	8			Number of Distinct Non-Detects	1			
2770				Minimum Detect	0.21			Minimum Non-Detect	0.7			
2771				Maximum Detect	8.3			Maximum Non-Detect	0.7			
2772				Variance Detects	7.611			Percent Non-Detects	11.11%			
2773				Mean Detects	2.229			SD Detects	2.759			
2774				Median Detects	0.885			CV Detects	1.238			
2775				Skewness Detects	1.876			Kurtosis Detects	3.431			
2776				Mean of Logged Detects	0.175			SD of Logged Detects	1.205			
2777												
2778	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2779	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2780	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2781	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2782												
2783	**Normal GOF Test on Detects Only**											
2784				Shapiro Wilk Test Statistic	0.752			**Shapiro Wilk GOF Test**				
2785				5% Shapiro Wilk Critical Value	0.818			Detected Data Not Normal at 5% Significance Level				
2786				Lilliefors Test Statistic	0.284			**Lilliefors GOF Test**				
2787				5% Lilliefors Critical Value	0.283			Detected Data Not Normal at 5% Significance Level				
2788	**Detected Data Not Normal at 5% Significance Level**											
2789												
2790	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2791				KM Mean	2.038			KM Standard Error of Mean	0.889			
2792				KM SD	2.493			95% KM (BCA) UCL	3.474			
2793				95% KM (t) UCL	3.69			95% KM (Percentile Bootstrap) UCL	3.557			
2794				95% KM (z) UCL	3.499			95% KM Bootstrap t UCL	6.961			
2795				90% KM Chebyshev UCL	4.704			95% KM Chebyshev UCL	5.912			
2796				97.5% KM Chebyshev UCL	7.588			99% KM Chebyshev UCL	10.88			
2797												
2798	**Gamma GOF Tests on Detected Observations Only**											
2799				A-D Test Statistic	0.398			**Anderson-Darling GOF Test**				
2800				5% A-D Critical Value	0.738			Detected data appear Gamma Distributed at 5% Significance Level				
2801				K-S Test Statistic	0.224			**Kolmogorov-Smirnov GOF**				
2802				5% K-S Critical Value	0.302			Detected data appear Gamma Distributed at 5% Significance Level				
2803	**Detected data appear Gamma Distributed at 5% Significance Level**											
2804												
2805	**Gamma Statistics on Detected Data Only**											
2806				k hat (MLE)	0.929			k star (bias corrected MLE)	0.664			
2807				Theta hat (MLE)	2.398			Theta star (bias corrected MLE)	3.355			
2808				nu hat (MLE)	14.87			nu star (bias corrected)	10.63			

2809					Mean (detects)	2.229						
2810												
2811					**Gamma ROS Statistics using Imputed Non-Detects**							
2812					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2813					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2814					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2815					This is especially true when the sample size is small.							
2816					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2817					Minimum	0.0975				Mean	1.992	
2818					Maximum	8.3				Median	0.67	
2819					SD	2.677				CV	1.344	
2820					k hat (MLE)	0.755				k star (bias corrected MLE)	0.577	
2821					Theta hat (MLE)	2.639				Theta star (bias corrected MLE)	3.45	
2822					nu hat (MLE)	13.59				nu star (bias corrected)	10.39	
2823					Adjusted Level of Significance (β)	0.0231						
2824					Approximate Chi Square Value (10.39, α)	4.188				Adjusted Chi Square Value (10.39, β)	3.398	
2825					95% Gamma Approximate UCL (use when n>=50)	4.942				95% Gamma Adjusted UCL (use when n<50)	6.092	
2826												
2827					**Estimates of Gamma Parameters using KM Estimates**							
2828					Mean (KM)	2.038				SD (KM)	2.493	
2829					Variance (KM)	6.216				SE of Mean (KM)	0.889	
2830					k hat (KM)	0.668				k star (KM)	0.519	
2831					nu hat (KM)	12.02				nu star (KM)	9.347	
2832					theta hat (KM)	3.051				theta star (KM)	3.924	
2833					80% gamma percentile (KM)	3.351				90% gamma percentile (KM)	5.469	
2834					95% gamma percentile (KM)	7.722				99% gamma percentile (KM)	13.24	
2835												
2836					**Gamma Kaplan-Meier (KM) Statistics**							
2837					Approximate Chi Square Value (9.35, α)	3.538				Adjusted Chi Square Value (9.35, β)	2.826	
2838					95% Gamma Approximate KM-UCL (use when n>=50)	5.383				95% Gamma Adjusted KM-UCL (use when n<50)	6.739	
2839												
2840					**Lognormal GOF Test on Detected Observations Only**							
2841					Shapiro Wilk Test Statistic	0.963				**Shapiro Wilk GOF Test**		
2842					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Lognormal at 5% Significance Level		
2843					Lilliefors Test Statistic	0.184				**Lilliefors GOF Test**		
2844					5% Lilliefors Critical Value	0.283				Detected Data appear Lognormal at 5% Significance Level		
2845					**Detected Data appear Lognormal at 5% Significance Level**							
2846												
2847					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2848					Mean in Original Scale	2.035				Mean in Log Scale	0.0741	
2849					SD in Original Scale	2.646				SD in Log Scale	1.167	
2850					95% t UCL (assumes normality of ROS data)	3.674				95% Percentile Bootstrap UCL	3.521	
2851					95% BCA Bootstrap UCL	3.98				95% Bootstrap t UCL	7.068	
2852					95% H-UCL (Log ROS)	9.472						
2853												
2854					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2855					KM Mean (logged)	0.0701				KM Geo Mean	1.073	
2856					KM SD (logged)	1.114				95% Critical H Value (KM-Log)	3.497	
2857					KM Standard Error of Mean (logged)	0.402				95% H-UCL (KM -Log)	7.906	
2858					KM SD (logged)	1.114				95% Critical H Value (KM-Log)	3.497	
2859					KM Standard Error of Mean (logged)	0.402						
2860												

2861	**DL/2 Statistics**											
2862	**DL/2 Normal**						**DL/2 Log-Transformed**					
2863					Mean in Original Scale	2.02					Mean in Log Scale	0.0388
2864					SD in Original Scale	2.656					SD in Log Scale	1.199
2865					95% t UCL (Assumes normality)	3.666					95% H-Stat UCL	10.21
2866	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2867												
2868	**Nonparametric Distribution Free UCL Statistics**											
2869	**Detected Data appear Gamma Distributed at 5% Significance Level**											
2870												
2871	**Suggested UCL to Use**											
2872					95% KM Bootstrap t UCL	6.961					Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	6.739
2873												
2874	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2875	Recommendations are based upon data size, data distribution, and skewness.											
2876	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2877	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2878												
2879	**Arsenic (tw5r)**											
2880												
2881	**General Statistics**											
2882					Total Number of Observations	8					Number of Distinct Observations	8
2883					Number of Detects	7					Number of Non-Detects	1
2884					Number of Distinct Detects	7					Number of Distinct Non-Detects	1
2885					Minimum Detect	0.91					Minimum Non-Detect	2.3
2886					Maximum Detect	8.1					Maximum Non-Detect	2.3
2887					Variance Detects	5.964					Percent Non-Detects	12.5%
2888					Mean Detects	3.187					SD Detects	2.442
2889					Median Detects	2.7					CV Detects	0.766
2890					Skewness Detects	1.618					Kurtosis Detects	2.786
2891					Mean of Logged Detects	0.933					SD of Logged Detects	0.722
2892												
2893	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2894	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2895	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2896	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2897												
2898	**Normal GOF Test on Detects Only**											
2899					Shapiro Wilk Test Statistic	0.846	**Shapiro Wilk GOF Test**					
2900					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level					
2901					Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**					
2902					5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level					
2903	**Detected Data appear Normal at 5% Significance Level**											
2904												
2905	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2906					KM Mean	2.968					KM Standard Error of Mean	0.842
2907					KM SD	2.198					95% KM (BCA) UCL	4.513
2908					95% KM (t) UCL	4.564					95% KM (Percentile Bootstrap) UCL	4.306
2909					95% KM (z) UCL	4.354					95% KM Bootstrap t UCL	6.305
2910					90% KM Chebyshev UCL	5.496					95% KM Chebyshev UCL	6.64
2911					97.5% KM Chebyshev UCL	8.229					99% KM Chebyshev UCL	11.35
2912												

	A	B	C	D	E	F	G	H	I	J	K	L
2913	**Gamma GOF Tests on Detected Observations Only**											
2914					A-D Test Statistic	0.231	**Anderson-Darling GOF Test**					
2915					5% A-D Critical Value	0.714	Detected data appear Gamma Distributed at 5% Significance Level					
2916					K-S Test Statistic	0.204	**Kolmogorov-Smirnov GOF**					
2917					5% K-S Critical Value	0.315	Detected data appear Gamma Distributed at 5% Significance Level					
2918	**Detected data appear Gamma Distributed at 5% Significance Level**											
2919												
2920	**Gamma Statistics on Detected Data Only**											
2921					k hat (MLE)	2.365			k star (bias corrected MLE)			1.447
2922					Theta hat (MLE)	1.347			Theta star (bias corrected MLE)			2.203
2923					nu hat (MLE)	33.11			nu star (bias corrected)			20.26
2924					Mean (detects)	3.187						
2925												
2926	**Gamma ROS Statistics using Imputed Non-Detects**											
2927	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2928	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2929	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2930	This is especially true when the sample size is small.											
2931	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2932					Minimum	0.91			Mean			2.926
2933					Maximum	8.1			Median			2.35
2934					SD	2.379			CV			0.813
2935					k hat (MLE)	2.187			k star (bias corrected MLE)			1.45
2936					Theta hat (MLE)	1.338			Theta star (bias corrected MLE)			2.017
2937					nu hat (MLE)	34.99			nu star (bias corrected)			23.2
2938					Adjusted Level of Significance (β)	0.0195						
2939					Approximate Chi Square Value (23.20, α)	13.24			Adjusted Chi Square Value (23.20, β)			11.39
2940					95% Gamma Approximate UCL (use when n>=50)	5.125			95% Gamma Adjusted UCL (use when n<50)			5.961
2941												
2942	**Estimates of Gamma Parameters using KM Estimates**											
2943					Mean (KM)	2.968			SD (KM)			2.198
2944					Variance (KM)	4.833			SE of Mean (KM)			0.842
2945					k hat (KM)	1.823			k star (KM)			1.223
2946					nu hat (KM)	29.17			nu star (KM)			19.56
2947					theta hat (KM)	1.628			theta star (KM)			2.427
2948					80% gamma percentile (KM)	4.691			90% gamma percentile (KM)			6.504
2949					95% gamma percentile (KM)	8.289			99% gamma percentile (KM)			12.37
2950												
2951	**Gamma Kaplan-Meier (KM) Statistics**											
2952					Approximate Chi Square Value (19.56, α)	10.53			Adjusted Chi Square Value (19.56, β)			8.904
2953					95% Gamma Approximate KM-UCL (use when n>=50)	5.515			95% Gamma Adjusted KM-UCL (use when n<50)			6.523
2954												
2955	**Lognormal GOF Test on Detected Observations Only**											
2956					Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk GOF Test**					
2957					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
2958					Lilliefors Test Statistic	0.161	**Lilliefors GOF Test**					
2959					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
2960	**Detected Data appear Lognormal at 5% Significance Level**											
2961												
2962	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2963					Mean in Original Scale	2.956			Mean in Log Scale			0.853
2964					SD in Original Scale	2.353			SD in Log Scale			0.706

2965	95% t UCL (assumes normality of ROS data)					4.533	95% Percentile Bootstrap UCL					4.403
2966	95% BCA Bootstrap UCL					4.705	95% Bootstrap t UCL					6.774
2967	95% H-UCL (Log ROS)					6.261						
2968												
2969	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2970	KM Mean (logged)					0.855	KM Geo Mean					2.352
2971	KM SD (logged)					0.668	95% Critical H Value (KM-Log)					2.668
2972	KM Standard Error of Mean (logged)					0.26	95% H-UCL (KM -Log)					5.764
2973	KM SD (logged)					0.668	95% Critical H Value (KM-Log)					2.668
2974	KM Standard Error of Mean (logged)					0.26						
2975												
2976	**DL/2 Statistics**											
2977	**DL/2 Normal**						**DL/2 Log-Transformed**					
2978	Mean in Original Scale					2.933	Mean in Log Scale					0.834
2979	SD in Original Scale					2.373	SD in Log Scale					0.725
2980	95% t UCL (Assumes normality)					4.522	95% H-Stat UCL					6.423
2981	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2982												
2983	**Nonparametric Distribution Free UCL Statistics**											
2984	**Detected Data appear Normal Distributed at 5% Significance Level**											
2985												
2986	**Suggested UCL to Use**											
2987	95% KM (t) UCL					4.564						
2988												
2989	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2990	Recommendations are based upon data size, data distribution, and skewness.											
2991	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2992	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2993												
2994												
2995	**Arsenic (waste water clarifier well)**											
2996												
2997	**General Statistics**											
2998	Total Number of Observations					1	Number of Distinct Observations					1
2999							Number of Missing Observations					0
3000	Minimum					27.5	Mean					27.5
3001	Maximum					27.5	Median					27.5
3002												
3003	**Warning: This data set only has 1 observations!**											
3004	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
3005	**The data set for variable Arsenic (waste water clarifier well) was not processed!**											
3006												
3007	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
3008	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
3009												
3010												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 10:46:53 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Barium (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	57.2	Mean	81.13
Maximum	113	Median	79.1
SD	16.46	Std. Error of Mean	5.487
Coefficient of Variation	0.203	Skewness	0.66

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.125	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	91.34	95% Adjusted-CLT UCL (Chen-1995)	91.45
		95% Modified-t UCL (Johnson-1978)	91.54

Gamma GOF Test

A-D Test Statistic	0.152	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.122	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	28.17	k star (bias corrected MLE)	18.85
Theta hat (MLE)	2.881	Theta star (bias corrected MLE)	4.304
nu hat (MLE)	507	nu star (bias corrected)	339.3
MLE Mean (bias corrected)	81.13	MLE Sd (bias corrected)	18.69
		Approximate Chi Square Value (0.05)	297.6
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	289.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	92.5	95% Adjusted Gamma UCL (use when n<50)	95.13

56	**Lognormal GOF Test**											
57				Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk Lognormal GOF Test**						
58				5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level						
59				Lilliefors Test Statistic	0.122	**Lilliefors Lognormal GOF Test**						
60				5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level						
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64				Minimum of Logged Data	4.047	Mean of logged Data	4.378					
65				Maximum of Logged Data	4.727	SD of logged Data	0.2					
66												
67	**Assuming Lognormal Distribution**											
68				95% H-UCL	93.04	90% Chebyshev (MVUE) UCL	97.37					
69				95% Chebyshev (MVUE) UCL	104.7	97.5% Chebyshev (MVUE) UCL	115					
70				99% Chebyshev (MVUE) UCL	135							
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
74												
75	**Nonparametric Distribution Free UCLs**											
76				95% CLT UCL	90.16	95% Jackknife UCL	91.34					
77				95% Standard Bootstrap UCL	89.8	95% Bootstrap-t UCL	93.52					
78				95% Hall's Bootstrap UCL	95.54	95% Percentile Bootstrap UCL	89.82					
79				95% BCA Bootstrap UCL	90.5							
80				90% Chebyshev(Mean, Sd) UCL	97.6	95% Chebyshev(Mean, Sd) UCL	105.1					
81				97.5% Chebyshev(Mean, Sd) UCL	115.4	99% Chebyshev(Mean, Sd) UCL	135.7					
82												
83	**Suggested UCL to Use**											
84				95% Student's-t UCL	91.34							
85												
86	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
87	Recommendations are based upon data size, data distribution, and skewness.											
88	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
89	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
90												
91												
92	**Barium (nfmw10)**											
93												
94	**General Statistics**											
95				Total Number of Observations	8	Number of Distinct Observations	8					
96						Number of Missing Observations	0					
97				Minimum	136	Mean	252.3					
98				Maximum	320	Median	269.5					
99				SD	62.87	Std. Error of Mean	22.23					
100				Coefficient of Variation	0.249	Skewness	-0.927					
101												
102	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
103	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
104	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
105	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
106												
107	**Normal GOF Test**											
108				Shapiro Wilk Test Statistic	0.907	**Shapiro Wilk GOF Test**						
109				5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level						
110				Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**						
111				5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level						
112	**Data appear Normal at 5% Significance Level**											

113												
114	**Assuming Normal Distribution**											
115	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
116				95% Student's-t UCL		294.4				95% Adjusted-CLT UCL (Chen-1995)		281
117										95% Modified-t UCL (Johnson-1978)		293.1
118												
119	**Gamma GOF Test**											
120				A-D Test Statistic		0.492	**Anderson-Darling Gamma GOF Test**					
121				5% A-D Critical Value		0.716	Detected data appear Gamma Distributed at 5% Significance Level					
122				K-S Test Statistic		0.249	**Kolmogorov-Smirnov Gamma GOF Test**					
123				5% K-S Critical Value		0.294	Detected data appear Gamma Distributed at 5% Significance Level					
124	**Detected data appear Gamma Distributed at 5% Significance Level**											
125												
126	**Gamma Statistics**											
127				k hat (MLE)		15.36				k star (bias corrected MLE)		9.685
128				Theta hat (MLE)		16.42				Theta star (bias corrected MLE)		26.05
129				nu hat (MLE)		245.8				nu star (bias corrected)		155
130				MLE Mean (bias corrected)		252.3				MLE Sd (bias corrected)		81.06
131										Approximate Chi Square Value (0.05)		127.2
132				Adjusted Level of Significance		0.0195				Adjusted Chi Square Value		120.8
133												
134	**Assuming Gamma Distribution**											
135				95% Approximate Gamma UCL (use when n>=50))		307.3				95% Adjusted Gamma UCL (use when n<50)		323.5
136												
137	**Lognormal GOF Test**											
138				Shapiro Wilk Test Statistic		0.858	**Shapiro Wilk Lognormal GOF Test**					
139				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
140				Lilliefors Test Statistic		0.233	**Lilliefors Lognormal GOF Test**					
141				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
142	**Data appear Lognormal at 5% Significance Level**											
143												
144	**Lognormal Statistics**											
145				Minimum of Logged Data		4.913				Mean of logged Data		5.498
146				Maximum of Logged Data		5.768				SD of logged Data		0.288
147												
148	**Assuming Lognormal Distribution**											
149				95% H-UCL		317.9				90% Chebyshev (MVUE) UCL		330.8
150				95% Chebyshev (MVUE) UCL		366				97.5% Chebyshev (MVUE) UCL		414.9
151				99% Chebyshev (MVUE) UCL		510.9						
152												
153	**Nonparametric Distribution Free UCL Statistics**											
154	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
155												
156	**Nonparametric Distribution Free UCLs**											
157				95% CLT UCL		288.8				95% Jackknife UCL		294.4
158				95% Standard Bootstrap UCL		286.5				95% Bootstrap-t UCL		285.7
159				95% Hall's Bootstrap UCL		281.4				95% Percentile Bootstrap UCL		284.5
160				95% BCA Bootstrap UCL		282.4						
161				90% Chebyshev(Mean, Sd) UCL		318.9				95% Chebyshev(Mean, Sd) UCL		349.1
162				97.5% Chebyshev(Mean, Sd) UCL		391.1				99% Chebyshev(Mean, Sd) UCL		473.4
163												
164	**Suggested UCL to Use**											
165				95% Student's-t UCL		294.4						
166												
167	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
168	Recommendations are based upon data size, data distribution, and skewness.											
169	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

	A	B	C	D	E	F	G	H	I	J	K	L
170	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
171												
172	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
173	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
174												
175												
176	**Barium (nfmw11)**											
177												
178	**General Statistics**											
179						Total Number of Observations	8				Number of Distinct Observations	8	
180											Number of Missing Observations	0	
181						Minimum	89.9				Mean	130.3	
182						Maximum	287				Median	105	
183						SD	64.81				Std. Error of Mean	22.91	
184						Coefficient of Variation	0.498				Skewness	2.588	
185													
186	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
187	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
188	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
189	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
190												
191	**Normal GOF Test**											
192						Shapiro Wilk Test Statistic	0.609				**Shapiro Wilk GOF Test**		
193						5% Shapiro Wilk Critical Value	0.818				Data Not Normal at 5% Significance Level		
194						Lilliefors Test Statistic	0.346				**Lilliefors GOF Test**		
195						5% Lilliefors Critical Value	0.283				Data Not Normal at 5% Significance Level		
196	**Data Not Normal at 5% Significance Level**											
197												
198	**Assuming Normal Distribution**											
199	**95% Normal UCL**										**95% UCLs (Adjusted for Skewness)**		
200						95% Student's-t UCL	173.7				95% Adjusted-CLT UCL (Chen-1995)	190.3	
201											95% Modified-t UCL (Johnson-1978)	177.2	
202													
203	**Gamma GOF Test**											
204						A-D Test Statistic	1.195				**Anderson-Darling Gamma GOF Test**		
205						5% A-D Critical Value	0.717				Data Not Gamma Distributed at 5% Significance Level		
206						K-S Test Statistic	0.293				**Kolmogorov-Smirnov Gamma GOF Test**		
207						5% K-S Critical Value	0.295				Detected data appear Gamma Distributed at 5% Significance Level		
208	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
209													
210	**Gamma Statistics**											
211						k hat (MLE)	7.006				k star (bias corrected MLE)	4.462	
212						Theta hat (MLE)	18.59				Theta star (bias corrected MLE)	29.19	
213						nu hat (MLE)	112.1				nu star (bias corrected)	71.39	
214						MLE Mean (bias corrected)	130.3				MLE Sd (bias corrected)	61.66	
215											Approximate Chi Square Value (0.05)	52.94	
216						Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	48.94	
217													
218	**Assuming Gamma Distribution**											
219						95% Approximate Gamma UCL (use when n>=50)	175.7				95% Adjusted Gamma UCL (use when n<50)	190	
220													
221	**Lognormal GOF Test**											
222						Shapiro Wilk Test Statistic	0.72				**Shapiro Wilk Lognormal GOF Test**		
223						5% Shapiro Wilk Critical Value	0.818				Data Not Lognormal at 5% Significance Level		
224						Lilliefors Test Statistic	0.269				**Lilliefors Lognormal GOF Test**		
225						5% Lilliefors Critical Value	0.283				Data appear Lognormal at 5% Significance Level		
226	**Data appear Approximate Lognormal at 5% Significance Level**											

227												
228	**Lognormal Statistics**											
229					Minimum of Logged Data	4.499			Mean of logged Data	4.796		
230					Maximum of Logged Data	5.659			SD of logged Data	0.37		
231												
232	**Assuming Lognormal Distribution**											
233					95% H-UCL	175.1			90% Chebyshev (MVUE) UCL	179.2		
234					95% Chebyshev (MVUE) UCL	202.1			97.5% Chebyshev (MVUE) UCL	234		
235					99% Chebyshev (MVUE) UCL	296.6						
236												
237	**Nonparametric Distribution Free UCL Statistics**											
238	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
239												
240	**Nonparametric Distribution Free UCLs**											
241					95% CLT UCL	167.9			95% Jackknife UCL	173.7		
242					95% Standard Bootstrap UCL	165.9			95% Bootstrap-t UCL	336.4		
243					95% Hall's Bootstrap UCL	330.1			95% Percentile Bootstrap UCL	174.1		
244					95% BCA Bootstrap UCL	194.4						
245					90% Chebyshev(Mean, Sd) UCL	199			95% Chebyshev(Mean, Sd) UCL	230.1		
246					97.5% Chebyshev(Mean, Sd) UCL	273.3			99% Chebyshev(Mean, Sd) UCL	358.2		
247												
248	**Suggested UCL to Use**											
249					95% Adjusted Gamma UCL	190						
250												
251	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
252	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
253												
254	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
255	Recommendations are based upon data size, data distribution, and skewness.											
256	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
257	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
258												
259												
260	**Barium (nfmw12)**											
261												
262	**General Statistics**											
263					Total Number of Observations	8			Number of Distinct Observations	7		
264									Number of Missing Observations	0		
265					Minimum	34.2			Mean	68.35		
266					Maximum	130			Median	60.8		
267					SD	29.99			Std. Error of Mean	10.6		
268					Coefficient of Variation	0.439			Skewness	1.328		
269												
270	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
271	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
272	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
273	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
274												
275	**Normal GOF Test**											
276					Shapiro Wilk Test Statistic	0.895			**Shapiro Wilk GOF Test**			
277					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
278					Lilliefors Test Statistic	0.224			**Lilliefors GOF Test**			
279					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
280	**Data appear Normal at 5% Significance Level**											
281												
282	**Assuming Normal Distribution**											
283	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			

284					95% Student's-t UCL	88.44			95% Adjusted-CLT UCL (Chen-1995)			91.11
285									95% Modified-t UCL (Johnson-1978)			89.27
286												
287	**Gamma GOF Test**											
288					A-D Test Statistic	0.262	**Anderson-Darling Gamma GOF Test**					
289					5% A-D Critical Value	0.718	Detected data appear Gamma Distributed at 5% Significance Level					
290					K-S Test Statistic	0.192	**Kolmogorov-Smirnov Gamma GOF Test**					
291					5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level					
292	**Detected data appear Gamma Distributed at 5% Significance Level**											
293												
294	**Gamma Statistics**											
295					k hat (MLE)	6.755			k star (bias corrected MLE)			4.305
296					Theta hat (MLE)	10.12			Theta star (bias corrected MLE)			15.88
297					nu hat (MLE)	108.1			nu star (bias corrected)			68.88
298					MLE Mean (bias corrected)	68.35			MLE Sd (bias corrected)			32.94
299									Approximate Chi Square Value (0.05)			50.78
300					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value			46.87
301												
302	**Assuming Gamma Distribution**											
303					95% Approximate Gamma UCL (use when n>=50))	92.72			95% Adjusted Gamma UCL (use when n<50)			100.5
304												
305	**Lognormal GOF Test**											
306					Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk Lognormal GOF Test**					
307					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
308					Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**					
309					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
310	**Data appear Lognormal at 5% Significance Level**											
311												
312	**Lognormal Statistics**											
313					Minimum of Logged Data	3.532			Mean of logged Data			4.149
314					Maximum of Logged Data	4.868			SD of logged Data			0.409
315												
316	**Assuming Lognormal Distribution**											
317					95% H-UCL	96.98			90% Chebyshev (MVUE) UCL			97.94
318					95% Chebyshev (MVUE) UCL	111.4			97.5% Chebyshev (MVUE) UCL			130.2
319					99% Chebyshev (MVUE) UCL	167						
320												
321	**Nonparametric Distribution Free UCL Statistics**											
322	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
323												
324	**Nonparametric Distribution Free UCLs**											
325					95% CLT UCL	85.79			95% Jackknife UCL			88.44
326					95% Standard Bootstrap UCL	84.75			95% Bootstrap-t UCL			102.3
327					95% Hall's Bootstrap UCL	181.5			95% Percentile Bootstrap UCL			85.75
328					95% BCA Bootstrap UCL	90.46						
329					90% Chebyshev(Mean, Sd) UCL	100.2			95% Chebyshev(Mean, Sd) UCL			114.6
330					97.5% Chebyshev(Mean, Sd) UCL	134.6			99% Chebyshev(Mean, Sd) UCL			173.9
331												
332	**Suggested UCL to Use**											
333					95% Student's-t UCL	88.44						
334												
335	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
336	Recommendations are based upon data size, data distribution, and skewness.											
337	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
338	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
339												
340												

341	**Barium (nfmw19)**											
342												
343	**General Statistics**											
344					Total Number of Observations	8			Number of Distinct Observations	8		
345									Number of Missing Observations	0		
346					Minimum	25.3			Mean	33.11		
347					Maximum	40.6			Median	32.3		
348					SD	5.177			Std. Error of Mean	1.83		
349					Coefficient of Variation	0.156			Skewness	0.388		
350												
351	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
352	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
353	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
354	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
355												
356	**Normal GOF Test**											
357					Shapiro Wilk Test Statistic	0.908			**Shapiro Wilk GOF Test**			
358					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
359					Lilliefors Test Statistic	0.228			**Lilliefors GOF Test**			
360					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
361	**Data appear Normal at 5% Significance Level**											
362												
363	**Assuming Normal Distribution**											
364					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
365					95% Student's-t UCL	36.58			95% Adjusted-CLT UCL (Chen-1995)	36.39		
366									95% Modified-t UCL (Johnson-1978)	36.62		
367												
368	**Gamma GOF Test**											
369					A-D Test Statistic	0.408			**Anderson-Darling Gamma GOF Test**			
370					5% A-D Critical Value	0.715			Detected data appear Gamma Distributed at 5% Significance Level			
371					K-S Test Statistic	0.207			**Kolmogorov-Smirnov Gamma GOF Test**			
372					5% K-S Critical Value	0.293			Detected data appear Gamma Distributed at 5% Significance Level			
373	**Detected data appear Gamma Distributed at 5% Significance Level**											
374												
375	**Gamma Statistics**											
376					k hat (MLE)	47.22			k star (bias corrected MLE)	29.6		
377					Theta hat (MLE)	0.701			Theta star (bias corrected MLE)	1.119		
378					nu hat (MLE)	755.5			nu star (bias corrected)	473.5		
379					MLE Mean (bias corrected)	33.11			MLE Sd (bias corrected)	6.087		
380									Approximate Chi Square Value (0.05)	424.1		
381					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	412.2		
382												
383	**Assuming Gamma Distribution**											
384					95% Approximate Gamma UCL (use when n>=50))	36.97			95% Adjusted Gamma UCL (use when n<50)	38.04		
385												
386	**Lognormal GOF Test**											
387					Shapiro Wilk Test Statistic	0.923			**Shapiro Wilk Lognormal GOF Test**			
388					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
389					Lilliefors Test Statistic	0.201			**Lilliefors Lognormal GOF Test**			
390					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
391	**Data appear Lognormal at 5% Significance Level**											
392												
393	**Lognormal Statistics**											
394					Minimum of Logged Data	3.231			Mean of logged Data	3.489		
395					Maximum of Logged Data	3.704			SD of logged Data	0.156		
396												
397	**Assuming Lognormal Distribution**											

398					95% H-UCL	37.09				90% Chebyshev (MVUE) UCL		38.59
399					95% Chebyshev (MVUE) UCL	41.07				97.5% Chebyshev (MVUE) UCL		44.52
400					99% Chebyshev (MVUE) UCL	51.28						
401												
402	**Nonparametric Distribution Free UCL Statistics**											
403	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
404												
405	**Nonparametric Distribution Free UCLs**											
406					95% CLT UCL	36.12				95% Jackknife UCL		36.58
407					95% Standard Bootstrap UCL	35.96				95% Bootstrap-t UCL		38.01
408					95% Hall's Bootstrap UCL	41.43				95% Percentile Bootstrap UCL		36.05
409					95% BCA Bootstrap UCL	36.03						
410					90% Chebyshev(Mean, Sd) UCL	38.6				95% Chebyshev(Mean, Sd) UCL		41.09
411					97.5% Chebyshev(Mean, Sd) UCL	44.54				99% Chebyshev(Mean, Sd) UCL		51.33
412												
413	**Suggested UCL to Use**											
414					95% Student's-t UCL	36.58						
415												
416	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
417	Recommendations are based upon data size, data distribution, and skewness.											
418	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
419	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
420												
421												
422	**Barium (nfmw1d)**											
423												
424	**General Statistics**											
425					Total Number of Observations	9				Number of Distinct Observations		8
426										Number of Missing Observations		0
427					Minimum	400				Mean		483.4
428					Maximum	667				Median		455
429					SD	84.64				Std. Error of Mean		28.21
430					Coefficient of Variation	0.175				Skewness		1.379
431												
432	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
433	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
434	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
435	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
436												
437	**Normal GOF Test**											
438					Shapiro Wilk Test Statistic	0.873				**Shapiro Wilk GOF Test**		
439					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
440					Lilliefors Test Statistic	0.202				**Lilliefors GOF Test**		
441					5% Lilliefors Critical Value	0.274				Data appear Normal at 5% Significance Level		
442	**Data appear Normal at 5% Significance Level**											
443												
444	**Assuming Normal Distribution**											
445	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
446					95% Student's-t UCL	535.9				95% Adjusted-CLT UCL (Chen-1995)		543.7
447										95% Modified-t UCL (Johnson-1978)		538.1
448												
449	**Gamma GOF Test**											
450					A-D Test Statistic	0.408				**Anderson-Darling Gamma GOF Test**		
451					5% A-D Critical Value	0.721				Detected data appear Gamma Distributed at 5% Significance Level		
452					K-S Test Statistic	0.185				**Kolmogorov-Smirnov Gamma GOF Test**		
453					5% K-S Critical Value	0.279				Detected data appear Gamma Distributed at 5% Significance Level		
454	**Detected data appear Gamma Distributed at 5% Significance Level**											

455												
456	**Gamma Statistics**											
457					k hat (MLE)	40.39			k star (bias corrected MLE)			27
458					Theta hat (MLE)	11.97			Theta star (bias corrected MLE)			17.9
459					nu hat (MLE)	727			nu star (bias corrected)			486
460					MLE Mean (bias corrected)	483.4			MLE Sd (bias corrected)			93.04
461									Approximate Chi Square Value (0.05)			435.9
462					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value			425.8
463												
464	**Assuming Gamma Distribution**											
465					95% Approximate Gamma UCL (use when n>=50))	539			95% Adjusted Gamma UCL (use when n<50)			551.7
466												
467	**Lognormal GOF Test**											
468					Shapiro Wilk Test Statistic	0.911			**Shapiro Wilk Lognormal GOF Test**			
469					5% Shapiro Wilk Critical Value	0.829			Data appear Lognormal at 5% Significance Level			
470					Lilliefors Test Statistic	0.174			**Lilliefors Lognormal GOF Test**			
471					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
472	**Data appear Lognormal at 5% Significance Level**											
473												
474	**Lognormal Statistics**											
475					Minimum of Logged Data	5.991			Mean of logged Data			6.169
476					Maximum of Logged Data	6.503			SD of logged Data			0.164
477												
478	**Assuming Lognormal Distribution**											
479					95% H-UCL	539.4			90% Chebyshev (MVUE) UCL			562.4
480					95% Chebyshev (MVUE) UCL	598.3			97.5% Chebyshev (MVUE) UCL			648.1
481					99% Chebyshev (MVUE) UCL	745.9						
482												
483	**Nonparametric Distribution Free UCL Statistics**											
484	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
485												
486	**Nonparametric Distribution Free UCLs**											
487					95% CLT UCL	529.9			95% Jackknife UCL			535.9
488					95% Standard Bootstrap UCL	527.1			95% Bootstrap-t UCL			562.8
489					95% Hall's Bootstrap UCL	742.3			95% Percentile Bootstrap UCL			529.7
490					95% BCA Bootstrap UCL	540.1						
491					90% Chebyshev(Mean, Sd) UCL	568.1			95% Chebyshev(Mean, Sd) UCL			606.4
492					97.5% Chebyshev(Mean, Sd) UCL	659.6			99% Chebyshev(Mean, Sd) UCL			764.2
493												
494	**Suggested UCL to Use**											
495					95% Student's-t UCL	535.9						
496												
497	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
498	Recommendations are based upon data size, data distribution, and skewness.											
499	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
500	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
501												
502												
503	**Barium (nfmw1s)**											
504												
505	**General Statistics**											
506					Total Number of Observations	7			Number of Distinct Observations			7
507									Number of Missing Observations			0
508					Minimum	37			Mean			107.6
509					Maximum	368			Median			52.3
510					SD	119.4			Std. Error of Mean			45.14
511					Coefficient of Variation	1.11			Skewness			2.283

512												
513	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
514	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
515	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
516	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
517												
518	**Normal GOF Test**											
519					Shapiro Wilk Test Statistic	0.64	**Shapiro Wilk GOF Test**					
520					5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level					
521					Lilliefors Test Statistic	0.368	**Lilliefors GOF Test**					
522					5% Lilliefors Critical Value	0.304	Data Not Normal at 5% Significance Level					
523	**Data Not Normal at 5% Significance Level**											
524												
525	**Assuming Normal Distribution**											
526					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
527					95% Student's-t UCL	195.3			95% Adjusted-CLT UCL (Chen-1995)	223.5		
528									95% Modified-t UCL (Johnson-1978)	201.8		
529												
530	**Gamma GOF Test**											
531					A-D Test Statistic	0.937	**Anderson-Darling Gamma GOF Test**					
532					5% A-D Critical Value	0.72	Data Not Gamma Distributed at 5% Significance Level					
533					K-S Test Statistic	0.363	**Kolmogorov-Smirnov Gamma GOF Test**					
534					5% K-S Critical Value	0.317	Data Not Gamma Distributed at 5% Significance Level					
535	**Data Not Gamma Distributed at 5% Significance Level**											
536												
537	**Gamma Statistics**											
538					k hat (MLE)	1.577			k star (bias corrected MLE)	0.996		
539					Theta hat (MLE)	68.24			Theta star (bias corrected MLE)	108		
540					nu hat (MLE)	22.07			nu star (bias corrected)	13.95		
541					MLE Mean (bias corrected)	107.6			MLE Sd (bias corrected)	107.8		
542									Approximate Chi Square Value (0.05)	6.534		
543					Adjusted Level of Significance	0.0158			Adjusted Chi Square Value	5.084		
544												
545	**Assuming Gamma Distribution**											
546					95% Approximate Gamma UCL (use when n>=50))	229.6			95% Adjusted Gamma UCL (use when n<50)	295.1		
547												
548	**Lognormal GOF Test**											
549					Shapiro Wilk Test Statistic	0.801	**Shapiro Wilk Lognormal GOF Test**					
550					5% Shapiro Wilk Critical Value	0.803	Data Not Lognormal at 5% Significance Level					
551					Lilliefors Test Statistic	0.326	**Lilliefors Lognormal GOF Test**					
552					5% Lilliefors Critical Value	0.304	Data Not Lognormal at 5% Significance Level					
553	**Data Not Lognormal at 5% Significance Level**											
554												
555	**Lognormal Statistics**											
556					Minimum of Logged Data	3.611			Mean of logged Data	4.329		
557					Maximum of Logged Data	5.908			SD of logged Data	0.806		
558												
559	**Assuming Lognormal Distribution**											
560					95% H-UCL	298			90% Chebyshev (MVUE) UCL	190.7		
561					95% Chebyshev (MVUE) UCL	232.1			97.5% Chebyshev (MVUE) UCL	289.5		
562					99% Chebyshev (MVUE) UCL	402.4						
563												
564	**Nonparametric Distribution Free UCL Statistics**											
565	**Data do not follow a Discernible Distribution (0.05)**											
566												
567	**Nonparametric Distribution Free UCLs**											
568					95% CLT UCL	181.8			95% Jackknife UCL	195.3		

569					95% Standard Bootstrap UCL	176.7					95% Bootstrap-t UCL	975.6
570					95% Hall's Bootstrap UCL	875.9					95% Percentile Bootstrap UCL	187.5
571					95% BCA Bootstrap UCL	230						
572					90% Chebyshev(Mean, Sd) UCL	243					95% Chebyshev(Mean, Sd) UCL	304.4
573					97.5% Chebyshev(Mean, Sd) UCL	389.5					99% Chebyshev(Mean, Sd) UCL	556.8
574												
575					**Suggested UCL to Use**							
576					95% Chebyshev (Mean, Sd) UCL	304.4						
577												
578					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
579					Recommendations are based upon data size, data distribution, and skewness.							
580					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
581					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
582												
583												
584	**Barium (nfmw2)**											
585												
586					**General Statistics**							
587					Total Number of Observations	9					Number of Distinct Observations	9
588											Number of Missing Observations	0
589					Minimum	123					Mean	176.1
590					Maximum	268					Median	166
591					SD	45.84					Std. Error of Mean	15.28
592					Coefficient of Variation	0.26					Skewness	1.03
593												
594					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
595					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
596					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
597					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
598												
599					**Normal GOF Test**							
600					Shapiro Wilk Test Statistic	0.925					**Shapiro Wilk GOF Test**	
601					5% Shapiro Wilk Critical Value	0.829					Data appear Normal at 5% Significance Level	
602					Lilliefors Test Statistic	0.202					**Lilliefors GOF Test**	
603					5% Lilliefors Critical Value	0.274					Data appear Normal at 5% Significance Level	
604					**Data appear Normal at 5% Significance Level**							
605												
606					**Assuming Normal Distribution**							
607					**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**	
608					95% Student's-t UCL	204.5					95% Adjusted-CLT UCL (Chen-1995)	206.9
609											95% Modified-t UCL (Johnson-1978)	205.4
610												
611					**Gamma GOF Test**							
612					A-D Test Statistic	0.241					**Anderson-Darling Gamma GOF Test**	
613					5% A-D Critical Value	0.721					Detected data appear Gamma Distributed at 5% Significance Level	
614					K-S Test Statistic	0.175					**Kolmogorov-Smirnov Gamma GOF Test**	
615					5% K-S Critical Value	0.279					Detected data appear Gamma Distributed at 5% Significance Level	
616					**Detected data appear Gamma Distributed at 5% Significance Level**							
617												
618					**Gamma Statistics**							
619					k hat (MLE)	18.06					k star (bias corrected MLE)	12.12
620					Theta hat (MLE)	9.75					Theta star (bias corrected MLE)	14.54
621					nu hat (MLE)	325.1					nu star (bias corrected)	218.1
622					MLE Mean (bias corrected)	176.1					MLE Sd (bias corrected)	50.6
623											Approximate Chi Square Value (0.05)	184.9
624					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	178.5
625												

626	**Assuming Gamma Distribution**											
627	95% Approximate Gamma UCL (use when n>=50))					207.7	95% Adjusted Gamma UCL (use when n<50)					215.2
628												
629	**Lognormal GOF Test**											
630	Shapiro Wilk Test Statistic					0.968	**Shapiro Wilk Lognormal GOF Test**					
631	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
632	Lilliefors Test Statistic					0.16	**Lilliefors Lognormal GOF Test**					
633	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
634	**Data appear Lognormal at 5% Significance Level**											
635												
636	**Lognormal Statistics**											
637	Minimum of Logged Data					4.812	Mean of logged Data					5.143
638	Maximum of Logged Data					5.591	SD of logged Data					0.247
639												
640	**Assuming Lognormal Distribution**											
641	95% H-UCL					209.3	90% Chebyshev (MVUE) UCL					219.5
642	95% Chebyshev (MVUE) UCL					239.2	97.5% Chebyshev (MVUE) UCL					266.6
643	99% Chebyshev (MVUE) UCL					320.4						
644												
645	**Nonparametric Distribution Free UCL Statistics**											
646	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
647												
648	**Nonparametric Distribution Free UCLs**											
649	95% CLT UCL					201.2	95% Jackknife UCL					204.5
650	95% Standard Bootstrap UCL					200	95% Bootstrap-t UCL					217.9
651	95% Hall's Bootstrap UCL					234.4	95% Percentile Bootstrap UCL					201.8
652	95% BCA Bootstrap UCL					207						
653	90% Chebyshev(Mean, Sd) UCL					222	95% Chebyshev(Mean, Sd) UCL					242.7
654	97.5% Chebyshev(Mean, Sd) UCL					271.5	99% Chebyshev(Mean, Sd) UCL					328.2
655												
656	**Suggested UCL to Use**											
657	95% Student's-t UCL					204.5						
658												
659	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
660	Recommendations are based upon data size, data distribution, and skewness.											
661	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
662	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
663												
664												
665	**Barium (nfmw20)**											
666												
667	**General Statistics**											
668	Total Number of Observations					8	Number of Distinct Observations					7
669							Number of Missing Observations					0
670	Minimum					38.7	Mean					50.46
671	Maximum					65.1	Median					47.45
672	SD					10.81	Std. Error of Mean					3.821
673	Coefficient of Variation					0.214	Skewness					0.365
674												
675	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
676	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
677	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
678	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
679												
680	**Normal GOF Test**											
681	Shapiro Wilk Test Statistic					0.857	**Shapiro Wilk GOF Test**					
682	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					

683					Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**					
684					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
685	**Data appear Normal at 5% Significance Level**											
686												
687	**Assuming Normal Distribution**											
688	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
689					95% Student's-t UCL	57.7	95% Adjusted-CLT UCL (Chen-1995)					57.28
690							95% Modified-t UCL (Johnson-1978)					57.78
691												
692	**Gamma GOF Test**											
693					A-D Test Statistic	0.565	**Anderson-Darling Gamma GOF Test**					
694					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
695					K-S Test Statistic	0.238	**Kolmogorov-Smirnov Gamma GOF Test**					
696					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
697	**Detected data appear Gamma Distributed at 5% Significance Level**											
698												
699	**Gamma Statistics**											
700					k hat (MLE)	25.4	k star (bias corrected MLE)					15.96
701					Theta hat (MLE)	1.986	Theta star (bias corrected MLE)					3.162
702					nu hat (MLE)	406.4	nu star (bias corrected)					255.4
703					MLE Mean (bias corrected)	50.46	MLE Sd (bias corrected)					12.63
704							Approximate Chi Square Value (0.05)					219.4
705					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value					210.9
706												
707	**Assuming Gamma Distribution**											
708					95% Approximate Gamma UCL (use when n>=50))	58.74	95% Adjusted Gamma UCL (use when n<50)					61.1
709												
710	**Lognormal GOF Test**											
711					Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk Lognormal GOF Test**					
712					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
713					Lilliefors Test Statistic	0.223	**Lilliefors Lognormal GOF Test**					
714					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
715	**Data appear Lognormal at 5% Significance Level**											
716												
717	**Lognormal Statistics**											
718					Minimum of Logged Data	3.656	Mean of logged Data					3.901
719					Maximum of Logged Data	4.176	SD of logged Data					0.212
720												
721	**Assuming Lognormal Distribution**											
722					95% H-UCL	59.18	90% Chebyshev (MVUE) UCL					61.82
723					95% Chebyshev (MVUE) UCL	66.97	97.5% Chebyshev (MVUE) UCL					74.12
724					99% Chebyshev (MVUE) UCL	88.15						
725												
726	**Nonparametric Distribution Free UCL Statistics**											
727	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
728												
729	**Nonparametric Distribution Free UCLs**											
730					95% CLT UCL	56.75	95% Jackknife UCL					57.7
731					95% Standard Bootstrap UCL	56.36	95% Bootstrap-t UCL					58.36
732					95% Hall's Bootstrap UCL	55.24	95% Percentile Bootstrap UCL					56.21
733					95% BCA Bootstrap UCL	56.66						
734					90% Chebyshev(Mean, Sd) UCL	61.93	95% Chebyshev(Mean, Sd) UCL					67.12
735					97.5% Chebyshev(Mean, Sd) UCL	74.33	99% Chebyshev(Mean, Sd) UCL					88.48
736												
737	**Suggested UCL to Use**											
738					95% Student's-t UCL	57.7						
739												

740	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
741	Recommendations are based upon data size, data distribution, and skewness.											
742	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
743	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
744												
745												
746	**Barium (nfmw22)**											
747												
748	**General Statistics**											
749						Total Number of Observations	4			Number of Distinct Observations	4	
750										Number of Missing Observations	0	
751						Minimum	35.1			Mean	40.35	
752						Maximum	46.4			Median	39.95	
753						SD	4.785			Std. Error of Mean	2.393	
754						Coefficient of Variation	0.119			Skewness	0.435	
755												
756	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
757	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
758	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
759	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
760												
761	**Normal GOF Test**											
762						Shapiro Wilk Test Statistic	0.991			**Shapiro Wilk GOF Test**		
763						5% Shapiro Wilk Critical Value	0.748			Data appear Normal at 5% Significance Level		
764						Lilliefors Test Statistic	0.163			**Lilliefors GOF Test**		
765						5% Lilliefors Critical Value	0.375			Data appear Normal at 5% Significance Level		
766	**Data appear Normal at 5% Significance Level**											
767												
768	**Assuming Normal Distribution**											
769	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
770						95% Student's-t UCL	45.98			95% Adjusted-CLT UCL (Chen-1995)	44.84	
771										95% Modified-t UCL (Johnson-1978)	46.07	
772												
773	**Gamma GOF Test**											
774						A-D Test Statistic	0.198			**Anderson-Darling Gamma GOF Test**		
775						5% A-D Critical Value	0.656			Detected data appear Gamma Distributed at 5% Significance Level		
776						K-S Test Statistic	0.174			**Kolmogorov-Smirnov Gamma GOF Test**		
777						5% K-S Critical Value	0.394			Detected data appear Gamma Distributed at 5% Significance Level		
778	**Detected data appear Gamma Distributed at 5% Significance Level**											
779												
780	**Gamma Statistics**											
781						k hat (MLE)	95.74			k star (bias corrected MLE)	24.1	
782						Theta hat (MLE)	0.421			Theta star (bias corrected MLE)	1.674	
783						nu hat (MLE)	765.9			nu star (bias corrected)	192.8	
784						MLE Mean (bias corrected)	40.35			MLE Sd (bias corrected)	8.219	
785										Approximate Chi Square Value (0.05)	161.7	
786						Adjusted Level of Significance	N/A			Adjusted Chi Square Value	N/A	
787												
788	**Assuming Gamma Distribution**											
789						95% Approximate Gamma UCL (use when n>=50))	48.12			95% Adjusted Gamma UCL (use when n<50)	N/A	
790												
791	**Lognormal GOF Test**											
792						Shapiro Wilk Test Statistic	0.998			**Shapiro Wilk Lognormal GOF Test**		
793						5% Shapiro Wilk Critical Value	0.748			Data appear Lognormal at 5% Significance Level		
794						Lilliefors Test Statistic	0.147			**Lilliefors Lognormal GOF Test**		
795						5% Lilliefors Critical Value	0.375			Data appear Lognormal at 5% Significance Level		
796	**Data appear Lognormal at 5% Significance Level**											

797												
798	**Lognormal Statistics**											
799					Minimum of Logged Data	3.558			Mean of logged Data	3.692		
800					Maximum of Logged Data	3.837			SD of logged Data	0.118		
801												
802	**Assuming Lognormal Distribution**											
803					95% H-UCL	47.14			90% Chebyshev (MVUE) UCL	47.48		
804					95% Chebyshev (MVUE) UCL	50.71			97.5% Chebyshev (MVUE) UCL	55.19		
805					99% Chebyshev (MVUE) UCL	63.99						
806												
807	**Nonparametric Distribution Free UCL Statistics**											
808	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
809												
810	**Nonparametric Distribution Free UCLs**											
811					95% CLT UCL	44.29			95% Jackknife UCL	45.98		
812					95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL	N/A		
813					95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL	N/A		
814					95% BCA Bootstrap UCL	N/A						
815					90% Chebyshev(Mean, Sd) UCL	47.53			95% Chebyshev(Mean, Sd) UCL	50.78		
816					97.5% Chebyshev(Mean, Sd) UCL	55.29			99% Chebyshev(Mean, Sd) UCL	64.16		
817												
818	**Suggested UCL to Use**											
819					95% Student's-t UCL	45.98						
820												
821	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
822	Recommendations are based upon data size, data distribution, and skewness.											
823	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
824	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
825												
826												
827	**Barium (nfmw23)**											
828												
829	**General Statistics**											
830					Total Number of Observations	4			Number of Distinct Observations	4		
831									Number of Missing Observations	0		
832					Minimum	84.5			Mean	102.1		
833					Maximum	127			Median	98.5		
834					SD	18.4			Std. Error of Mean	9.202		
835					Coefficient of Variation	0.18			Skewness	0.98		
836												
837	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
838	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
839	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
840	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
841												
842	**Normal GOF Test**											
843					Shapiro Wilk Test Statistic	0.949			**Shapiro Wilk GOF Test**			
844					5% Shapiro Wilk Critical Value	0.748			Data appear Normal at 5% Significance Level			
845					Lilliefors Test Statistic	0.209			**Lilliefors GOF Test**			
846					5% Lilliefors Critical Value	0.375			Data appear Normal at 5% Significance Level			
847	**Data appear Normal at 5% Significance Level**											
848												
849	**Assuming Normal Distribution**											
850	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
851					95% Student's-t UCL	123.8			95% Adjusted-CLT UCL (Chen-1995)	122.1		
852									95% Modified-t UCL (Johnson-1978)	124.5		
853												

	A	B	C	D	E	F	G	H	I	J	K	L
854	**Gamma GOF Test**											
855	A-D Test Statistic					0.252	**Anderson-Darling Gamma GOF Test**					
856	5% A-D Critical Value					0.656	Detected data appear Gamma Distributed at 5% Significance Level					
857	K-S Test Statistic					0.209	**Kolmogorov-Smirnov Gamma GOF Test**					
858	5% K-S Critical Value					0.394	Detected data appear Gamma Distributed at 5% Significance Level					
859	**Detected data appear Gamma Distributed at 5% Significance Level**											
860												
861	**Gamma Statistics**											
862	k hat (MLE)					42.85	k star (bias corrected MLE)					10.88
863	Theta hat (MLE)					2.384	Theta star (bias corrected MLE)					9.388
864	nu hat (MLE)					342.8	nu star (bias corrected)					87.02
865	MLE Mean (bias corrected)					102.1	MLE Sd (bias corrected)					30.96
866							Approximate Chi Square Value (0.05)					66.52
867	Adjusted Level of Significance					N/A	Adjusted Chi Square Value					N/A
868												
869	**Assuming Gamma Distribution**											
870	95% Approximate Gamma UCL (use when n>=50))					133.6	95% Adjusted Gamma UCL (use when n<50)					N/A
871												
872	**Lognormal GOF Test**											
873	Shapiro Wilk Test Statistic					0.971	**Shapiro Wilk Lognormal GOF Test**					
874	5% Shapiro Wilk Critical Value					0.748	Data appear Lognormal at 5% Significance Level					
875	Lilliefors Test Statistic					0.182	**Lilliefors Lognormal GOF Test**					
876	5% Lilliefors Critical Value					0.375	Data appear Lognormal at 5% Significance Level					
877	**Data appear Lognormal at 5% Significance Level**											
878												
879	**Lognormal Statistics**											
880	Minimum of Logged Data					4.437	Mean of logged Data					4.614
881	Maximum of Logged Data					4.844	SD of logged Data					0.175
882												
883	**Assuming Lognormal Distribution**											
884	95% H-UCL					130.6	90% Chebyshev (MVUE) UCL					128.9
885	95% Chebyshev (MVUE) UCL					141	97.5% Chebyshev (MVUE) UCL					157.8
886	99% Chebyshev (MVUE) UCL					190.8						
887												
888	**Nonparametric Distribution Free UCL Statistics**											
889	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
890												
891	**Nonparametric Distribution Free UCLs**											
892	95% CLT UCL					117.3	95% Jackknife UCL					123.8
893	95% Standard Bootstrap UCL					N/A	95% Bootstrap-t UCL					N/A
894	95% Hall's Bootstrap UCL					N/A	95% Percentile Bootstrap UCL					N/A
895	95% BCA Bootstrap UCL					N/A						
896	90% Chebyshev(Mean, Sd) UCL					129.7	95% Chebyshev(Mean, Sd) UCL					142.2
897	97.5% Chebyshev(Mean, Sd) UCL					159.6	99% Chebyshev(Mean, Sd) UCL					193.7
898												
899	**Suggested UCL to Use**											
900	95% Student's-t UCL					123.8						
901												
902	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
903	Recommendations are based upon data size, data distribution, and skewness.											
904	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
905	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
906												
907												
908	**Barium (nfmw3)**											
909												
910	**General Statistics**											

911	Total Number of Observations					9	Number of Distinct Observations					9
912							Number of Missing Observations					0
913	Minimum					499	Mean					935
914	Maximum					1200	Median					983
915	SD					194.9	Std. Error of Mean					64.95
916	Coefficient of Variation					0.208	Skewness					-1.383
917												
918	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
919	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
920	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
921	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
922												
923	**Normal GOF Test**											
924	Shapiro Wilk Test Statistic					0.88	**Shapiro Wilk GOF Test**					
925	5% Shapiro Wilk Critical Value					0.829	Data appear Normal at 5% Significance Level					
926	Lilliefors Test Statistic					0.218	**Lilliefors GOF Test**					
927	5% Lilliefors Critical Value					0.274	Data appear Normal at 5% Significance Level					
928	**Data appear Normal at 5% Significance Level**											
929												
930	**Assuming Normal Distribution**											
931	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
932	95% Student's-t UCL					1056	95% Adjusted-CLT UCL (Chen-1995)					1010
933							95% Modified-t UCL (Johnson-1978)					1051
934												
935	**Gamma GOF Test**											
936	A-D Test Statistic					0.749	**Anderson-Darling Gamma GOF Test**					
937	5% A-D Critical Value					0.721	Data Not Gamma Distributed at 5% Significance Level					
938	K-S Test Statistic					0.243	**Kolmogorov-Smirnov Gamma GOF Test**					
939	5% K-S Critical Value					0.279	Detected data appear Gamma Distributed at 5% Significance Level					
940	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
941												
942	**Gamma Statistics**											
943	k hat (MLE)					20.6	k star (bias corrected MLE)					13.8
944	Theta hat (MLE)					45.4	Theta star (bias corrected MLE)					67.73
945	nu hat (MLE)					370.7	nu star (bias corrected)					248.5
946	MLE Mean (bias corrected)					935	MLE Sd (bias corrected)					251.7
947							Approximate Chi Square Value (0.05)					213
948	Adjusted Level of Significance					0.0231	Adjusted Chi Square Value					206
949												
950	**Assuming Gamma Distribution**											
951	95% Approximate Gamma UCL (use when n>=50))					1091	95% Adjusted Gamma UCL (use when n<50)					1128
952												
953	**Lognormal GOF Test**											
954	Shapiro Wilk Test Statistic					0.789	**Shapiro Wilk Lognormal GOF Test**					
955	5% Shapiro Wilk Critical Value					0.829	Data Not Lognormal at 5% Significance Level					
956	Lilliefors Test Statistic					0.247	**Lilliefors Lognormal GOF Test**					
957	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
958	**Data appear Approximate Lognormal at 5% Significance Level**											
959												
960	**Lognormal Statistics**											
961	Minimum of Logged Data					6.213	Mean of logged Data					6.816
962	Maximum of Logged Data					7.09	SD of logged Data					0.25
963												
964	**Assuming Lognormal Distribution**											
965	95% H-UCL					1119	90% Chebyshev (MVUE) UCL					1174
966	95% Chebyshev (MVUE) UCL					1280	97.5% Chebyshev (MVUE) UCL					1429
967	99% Chebyshev (MVUE) UCL					1719						

	A	B	C	D	E	F	G	H	I	J	K	L
968												
969	**Nonparametric Distribution Free UCL Statistics**											
970	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
971												
972	**Nonparametric Distribution Free UCLs**											
973					95% CLT UCL	1042				95% Jackknife UCL	1056	
974					95% Standard Bootstrap UCL	1037				95% Bootstrap-t UCL	1030	
975					95% Hall's Bootstrap UCL	1025				95% Percentile Bootstrap UCL	1030	
976					95% BCA Bootstrap UCL	1018						
977					90% Chebyshev(Mean, Sd) UCL	1130				95% Chebyshev(Mean, Sd) UCL	1218	
978					97.5% Chebyshev(Mean, Sd) UCL	1341				99% Chebyshev(Mean, Sd) UCL	1581	
979												
980	**Suggested UCL to Use**											
981					95% Student's-t UCL	1056						
982												
983	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
984	Recommendations are based upon data size, data distribution, and skewness.											
985	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
986	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
987												
988	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
989	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
990												
991												
992	**Barium (nfmw4)**											
993												
994	**General Statistics**											
995					Total Number of Observations	9				Number of Distinct Observations	9	
996										Number of Missing Observations	0	
997					Minimum	76.9				Mean	113.9	
998					Maximum	183				Median	109	
999					SD	37.54				Std. Error of Mean	12.51	
1000					Coefficient of Variation	0.329				Skewness	1.029	
1001												
1002	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1003	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1004	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1005	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1006												
1007	**Normal GOF Test**											
1008					Shapiro Wilk Test Statistic	0.868				**Shapiro Wilk GOF Test**		
1009					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
1010					Lilliefors Test Statistic	0.213				**Lilliefors GOF Test**		
1011					5% Lilliefors Critical Value	0.274				Data appear Normal at 5% Significance Level		
1012	**Data appear Normal at 5% Significance Level**											
1013												
1014	**Assuming Normal Distribution**											
1015	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
1016					95% Student's-t UCL	137.2				95% Adjusted-CLT UCL (Chen-1995)	139.1	
1017										95% Modified-t UCL (Johnson-1978)	137.9	
1018												
1019	**Gamma GOF Test**											
1020					A-D Test Statistic	0.432				**Anderson-Darling Gamma GOF Test**		
1021					5% A-D Critical Value	0.722				Detected data appear Gamma Distributed at 5% Significance Level		
1022					K-S Test Statistic	0.169				**Kolmogorov-Smirnov Gamma GOF Test**		
1023					5% K-S Critical Value	0.279				Detected data appear Gamma Distributed at 5% Significance Level		
1024	**Detected data appear Gamma Distributed at 5% Significance Level**											

1025												
1026	**Gamma Statistics**											
1027						k hat (MLE)	11.52				k star (bias corrected MLE)	7.752
1028						Theta hat (MLE)	9.891				Theta star (bias corrected MLE)	14.7
1029						nu hat (MLE)	207.3				nu star (bias corrected)	139.5
1030						MLE Mean (bias corrected)	113.9				MLE Sd (bias corrected)	40.92
1031											Approximate Chi Square Value (0.05)	113.2
1032						Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	108.3
1033												
1034	**Assuming Gamma Distribution**											
1035						95% Approximate Gamma UCL (use when n>=50))	140.4				95% Adjusted Gamma UCL (use when n<50)	146.8
1036												
1037	**Lognormal GOF Test**											
1038						Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk Lognormal GOF Test**				
1039						5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level				
1040						Lilliefors Test Statistic	0.155	**Lilliefors Lognormal GOF Test**				
1041						5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level				
1042	**Data appear Lognormal at 5% Significance Level**											
1043												
1044	**Lognormal Statistics**											
1045						Minimum of Logged Data	4.343				Mean of logged Data	4.691
1046						Maximum of Logged Data	5.209				SD of logged Data	0.308
1047												
1048	**Assuming Lognormal Distribution**											
1049						95% H-UCL	142.4				90% Chebyshev (MVUE) UCL	148.9
1050						95% Chebyshev (MVUE) UCL	164.9				97.5% Chebyshev (MVUE) UCL	187
1051						99% Chebyshev (MVUE) UCL	230.5					
1052												
1053	**Nonparametric Distribution Free UCL Statistics**											
1054	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1055												
1056	**Nonparametric Distribution Free UCLs**											
1057						95% CLT UCL	134.5				95% Jackknife UCL	137.2
1058						95% Standard Bootstrap UCL	132.9				95% Bootstrap-t UCL	153.1
1059						95% Hall's Bootstrap UCL	176.6				95% Percentile Bootstrap UCL	134.1
1060						95% BCA Bootstrap UCL	138					
1061						90% Chebyshev(Mean, Sd) UCL	151.5				95% Chebyshev(Mean, Sd) UCL	168.5
1062						97.5% Chebyshev(Mean, Sd) UCL	192.1				99% Chebyshev(Mean, Sd) UCL	238.4
1063												
1064	**Suggested UCL to Use**											
1065						95% Student's-t UCL	137.2					
1066												
1067	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1068	Recommendations are based upon data size, data distribution, and skewness.											
1069	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1070	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1071												
1072												
1073	**Barium (nfmw7)**											
1074												
1075	**General Statistics**											
1076						Total Number of Observations	9				Number of Distinct Observations	7
1077											Number of Missing Observations	0
1078						Minimum	78.4				Mean	108
1079						Maximum	148				Median	111
1080						SD	18.79				Std. Error of Mean	6.263
1081						Coefficient of Variation	0.174				Skewness	0.826

1082												
1083	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1084	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1085	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1086	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1087												
1088	**Normal GOF Test**											
1089				Shapiro Wilk Test Statistic		0.882	**Shapiro Wilk GOF Test**					
1090				5% Shapiro Wilk Critical Value		0.829	Data appear Normal at 5% Significance Level					
1091				Lilliefors Test Statistic		0.306	**Lilliefors GOF Test**					
1092				5% Lilliefors Critical Value		0.274	Data Not Normal at 5% Significance Level					
1093	**Data appear Approximate Normal at 5% Significance Level**											
1094												
1095	**Assuming Normal Distribution**											
1096				**95% Normal UCL**			**95% UCLs (Adjusted for Skewness)**					
1097				95% Student's-t UCL		119.7	95% Adjusted-CLT UCL (Chen-1995)					120.2
1098							95% Modified-t UCL (Johnson-1978)					120
1099												
1100	**Gamma GOF Test**											
1101				A-D Test Statistic		0.562	**Anderson-Darling Gamma GOF Test**					
1102				5% A-D Critical Value		0.721	Detected data appear Gamma Distributed at 5% Significance Level					
1103				K-S Test Statistic		0.279	**Kolmogorov-Smirnov Gamma GOF Test**					
1104				5% K-S Critical Value		0.279	Data Not Gamma Distributed at 5% Significance Level					
1105	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
1106												
1107	**Gamma Statistics**											
1108				k hat (MLE)		38.47	k star (bias corrected MLE)					25.72
1109				Theta hat (MLE)		2.809	Theta star (bias corrected MLE)					4.201
1110				nu hat (MLE)		692.4	nu star (bias corrected)					462.9
1111				MLE Mean (bias corrected)		108	MLE Sd (bias corrected)					21.3
1112							Approximate Chi Square Value (0.05)					414.1
1113				Adjusted Level of Significance		0.0231	Adjusted Chi Square Value					404.3
1114												
1115	**Assuming Gamma Distribution**											
1116				95% Approximate Gamma UCL (use when n>=50))		120.8	95% Adjusted Gamma UCL (use when n<50)					123.7
1117												
1118	**Lognormal GOF Test**											
1119				Shapiro Wilk Test Statistic		0.907	**Shapiro Wilk Lognormal GOF Test**					
1120				5% Shapiro Wilk Critical Value		0.829	Data appear Lognormal at 5% Significance Level					
1121				Lilliefors Test Statistic		0.276	**Lilliefors Lognormal GOF Test**					
1122				5% Lilliefors Critical Value		0.274	Data Not Lognormal at 5% Significance Level					
1123	**Data appear Approximate Lognormal at 5% Significance Level**											
1124												
1125	**Lognormal Statistics**											
1126				Minimum of Logged Data		4.362	Mean of logged Data					4.669
1127				Maximum of Logged Data		4.997	SD of logged Data					0.171
1128												
1129	**Assuming Lognormal Distribution**											
1130				95% H-UCL		121.2	90% Chebyshev (MVUE) UCL					126.5
1131				95% Chebyshev (MVUE) UCL		134.9	97.5% Chebyshev (MVUE) UCL					146.5
1132				99% Chebyshev (MVUE) UCL		169.4						
1133												
1134	**Nonparametric Distribution Free UCL Statistics**											
1135	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1136												
1137	**Nonparametric Distribution Free UCLs**											
1138				95% CLT UCL		118.3	95% Jackknife UCL					119.7

1139					95% Standard Bootstrap UCL	117.9					95% Bootstrap-t UCL	121.3
1140					95% Hall's Bootstrap UCL	128.8					95% Percentile Bootstrap UCL	117.5
1141					95% BCA Bootstrap UCL	119.2						
1142					90% Chebyshev(Mean, Sd) UCL	126.8					95% Chebyshev(Mean, Sd) UCL	135.3
1143					97.5% Chebyshev(Mean, Sd) UCL	147.2					99% Chebyshev(Mean, Sd) UCL	170.4
1144												
1145					**Suggested UCL to Use**							
1146					95% Student's-t UCL	119.7						
1147												
1148	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
1149	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
1150												
1151	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1152	Recommendations are based upon data size, data distribution, and skewness.											
1153	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1154	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1155												
1156												
1157	**Barium (nfmw8)**											
1158												
1159					**General Statistics**							
1160					Total Number of Observations	8					Number of Distinct Observations	7
1161											Number of Missing Observations	0
1162					Minimum	841					Mean	1096
1163					Maximum	1200					Median	1125
1164					SD	115.3					Std. Error of Mean	40.77
1165					Coefficient of Variation	0.105					Skewness	-1.861
1166												
1167	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1168	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1169	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1170	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1171												
1172					**Normal GOF Test**							
1173					Shapiro Wilk Test Statistic	0.798					**Shapiro Wilk GOF Test**	
1174					5% Shapiro Wilk Critical Value	0.818					Data Not Normal at 5% Significance Level	
1175					Lilliefors Test Statistic	0.297					**Lilliefors GOF Test**	
1176					5% Lilliefors Critical Value	0.283					Data Not Normal at 5% Significance Level	
1177	**Data Not Normal at 5% Significance Level**											
1178												
1179					**Assuming Normal Distribution**							
1180					**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**	
1181					95% Student's-t UCL	1174					95% Adjusted-CLT UCL (Chen-1995)	1135
1182											95% Modified-t UCL (Johnson-1978)	1169
1183												
1184					**Gamma GOF Test**							
1185					A-D Test Statistic	0.825					**Anderson-Darling Gamma GOF Test**	
1186					5% A-D Critical Value	0.715					Data Not Gamma Distributed at 5% Significance Level	
1187					K-S Test Statistic	0.311					**Kolmogorov-Smirnov Gamma GOF Test**	
1188					5% K-S Critical Value	0.294					Data Not Gamma Distributed at 5% Significance Level	
1189	**Data Not Gamma Distributed at 5% Significance Level**											
1190												
1191					**Gamma Statistics**							
1192					k hat (MLE)	92.24					k star (bias corrected MLE)	57.73
1193					Theta hat (MLE)	11.89					Theta star (bias corrected MLE)	18.99
1194					nu hat (MLE)	1476					nu star (bias corrected)	923.7
1195					MLE Mean (bias corrected)	1096					MLE Sd (bias corrected)	144.3

1196											Approximate Chi Square Value (0.05)	854.2
1197					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	837.2
1198												
1199						**Assuming Gamma Distribution**						
1200					95% Approximate Gamma UCL (use when n>=50))	1186					95% Adjusted Gamma UCL (use when n<50)	1210
1201												
1202						**Lognormal GOF Test**						
1203					Shapiro Wilk Test Statistic	0.763					**Shapiro Wilk Lognormal GOF Test**	
1204					5% Shapiro Wilk Critical Value	0.818					Data Not Lognormal at 5% Significance Level	
1205					Lilliefors Test Statistic	0.312					**Lilliefors Lognormal GOF Test**	
1206					5% Lilliefors Critical Value	0.283					Data Not Lognormal at 5% Significance Level	
1207						**Data Not Lognormal at 5% Significance Level**						
1208												
1209						**Lognormal Statistics**						
1210					Minimum of Logged Data	6.735					Mean of logged Data	6.994
1211					Maximum of Logged Data	7.09					SD of logged Data	0.115
1212												
1213						**Assuming Lognormal Distribution**						
1214					95% H-UCL	1190					90% Chebyshev (MVUE) UCL	1230
1215					95% Chebyshev (MVUE) UCL	1291					97.5% Chebyshev (MVUE) UCL	1375
1216					99% Chebyshev (MVUE) UCL	1540						
1217												
1218						**Nonparametric Distribution Free UCL Statistics**						
1219						**Data do not follow a Discernible Distribution (0.05)**						
1220												
1221						**Nonparametric Distribution Free UCLs**						
1222					95% CLT UCL	1163					95% Jackknife UCL	1174
1223					95% Standard Bootstrap UCL	1159					95% Bootstrap-t UCL	1152
1224					95% Hall's Bootstrap UCL	1140					95% Percentile Bootstrap UCL	1153
1225					95% BCA Bootstrap UCL	1143						
1226					90% Chebyshev(Mean, Sd) UCL	1219					95% Chebyshev(Mean, Sd) UCL	1274
1227					97.5% Chebyshev(Mean, Sd) UCL	1351					99% Chebyshev(Mean, Sd) UCL	1502
1228												
1229						**Suggested UCL to Use**						
1230					95% Student's-t UCL	1174					or 95% Modified-t UCL	1169
1231												
1232						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1233						Recommendations are based upon data size, data distribution, and skewness.						
1234						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1235						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1236												
1237						**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**						
1238						**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**						
1239												
1240												
1241	**Barium (nfmw9)**											
1242												
1243						**General Statistics**						
1244					Total Number of Observations	8					Number of Distinct Observations	8
1245											Number of Missing Observations	0
1246					Minimum	55.6					Mean	369.8
1247					Maximum	804					Median	473.5
1248					SD	263.4					Std. Error of Mean	93.11
1249					Coefficient of Variation	0.712					Skewness	0.137
1250												
1251						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1252						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						

1253	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1254	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1255												
1256	**Normal GOF Test**											
1257					Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk GOF Test**					
1258					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1259					Lilliefors Test Statistic	0.27	**Lilliefors GOF Test**					
1260					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1261	**Data appear Normal at 5% Significance Level**											
1262												
1263	**Assuming Normal Distribution**											
1264				**95% Normal UCL**			**95% UCLs (Adjusted for Skewness)**					
1265					95% Student's-t UCL	546.2	95% Adjusted-CLT UCL (Chen-1995)	527.8				
1266							95% Modified-t UCL (Johnson-1978)	547				
1267												
1268	**Gamma GOF Test**											
1269					A-D Test Statistic	0.777	**Anderson-Darling Gamma GOF Test**					
1270					5% A-D Critical Value	0.728	Data Not Gamma Distributed at 5% Significance Level					
1271					K-S Test Statistic	0.341	**Kolmogorov-Smirnov Gamma GOF Test**					
1272					5% K-S Critical Value	0.299	Data Not Gamma Distributed at 5% Significance Level					
1273	**Data Not Gamma Distributed at 5% Significance Level**											
1274												
1275	**Gamma Statistics**											
1276					k hat (MLE)	1.523	k star (bias corrected MLE)	1.035				
1277					Theta hat (MLE)	242.8	Theta star (bias corrected MLE)	357.2				
1278					nu hat (MLE)	24.37	nu star (bias corrected)	16.57				
1279					MLE Mean (bias corrected)	369.8	MLE Sd (bias corrected)	363.4				
1280							Approximate Chi Square Value (0.05)	8.362				
1281					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	6.94				
1282												
1283	**Assuming Gamma Distribution**											
1284					95% Approximate Gamma UCL (use when n>=50))	732.6	95% Adjusted Gamma UCL (use when n<50)	882.7				
1285												
1286	**Lognormal GOF Test**											
1287					Shapiro Wilk Test Statistic	0.817	**Shapiro Wilk Lognormal GOF Test**					
1288					5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level					
1289					Lilliefors Test Statistic	0.343	**Lilliefors Lognormal GOF Test**					
1290					5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level					
1291	**Data Not Lognormal at 5% Significance Level**											
1292												
1293	**Lognormal Statistics**											
1294					Minimum of Logged Data	4.018	Mean of logged Data	5.55				
1295					Maximum of Logged Data	6.69	SD of logged Data	1.036				
1296												
1297	**Assuming Lognormal Distribution**											
1298					95% H-UCL	1744	90% Chebyshev (MVUE) UCL	854.4				
1299					95% Chebyshev (MVUE) UCL	1059	97.5% Chebyshev (MVUE) UCL	1343				
1300					99% Chebyshev (MVUE) UCL	1901						
1301												
1302	**Nonparametric Distribution Free UCL Statistics**											
1303	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1304												
1305	**Nonparametric Distribution Free UCLs**											
1306					95% CLT UCL	523	95% Jackknife UCL	546.2				
1307					95% Standard Bootstrap UCL	513.6	95% Bootstrap-t UCL	549.2				
1308					95% Hall's Bootstrap UCL	524.9	95% Percentile Bootstrap UCL	512.4				
1309					95% BCA Bootstrap UCL	512						

1310					90% Chebyshev(Mean, Sd) UCL	649.1				95% Chebyshev(Mean, Sd) UCL		775.7
1311					97.5% Chebyshev(Mean, Sd) UCL	951.3				99% Chebyshev(Mean, Sd) UCL		1296
1312												
1313					**Suggested UCL to Use**							
1314					95% Student's-t UCL	546.2						
1315												
1316					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1317					Recommendations are based upon data size, data distribution, and skewness.							
1318					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1319					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1320												
1321												
1322	**Barium (smw10)**											
1323												
1324					**General Statistics**							
1325					Total Number of Observations	8				Number of Distinct Observations		7
1326										Number of Missing Observations		0
1327					Minimum	70.5				Mean		90.36
1328					Maximum	129				Median		85.85
1329					SD	19.66				Std. Error of Mean		6.95
1330					Coefficient of Variation	0.218				Skewness		1.071
1331												
1332					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1333					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1334					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1335					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1336												
1337					**Normal GOF Test**							
1338					Shapiro Wilk Test Statistic	0.906				**Shapiro Wilk GOF Test**		
1339					5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level		
1340					Lilliefors Test Statistic	0.167				**Lilliefors GOF Test**		
1341					5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
1342					**Data appear Normal at 5% Significance Level**							
1343												
1344					**Assuming Normal Distribution**							
1345					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
1346					95% Student's-t UCL	103.5				95% Adjusted-CLT UCL (Chen-1995)		104.6
1347										95% Modified-t UCL (Johnson-1978)		104
1348												
1349					**Gamma GOF Test**							
1350					A-D Test Statistic	0.284				**Anderson-Darling Gamma GOF Test**		
1351					5% A-D Critical Value	0.716				Detected data appear Gamma Distributed at 5% Significance Level		
1352					K-S Test Statistic	0.166				**Kolmogorov-Smirnov Gamma GOF Test**		
1353					5% K-S Critical Value	0.294				Detected data appear Gamma Distributed at 5% Significance Level		
1354					**Detected data appear Gamma Distributed at 5% Significance Level**							
1355												
1356					**Gamma Statistics**							
1357					k hat (MLE)	26.11				k star (bias corrected MLE)		16.4
1358					Theta hat (MLE)	3.461				Theta star (bias corrected MLE)		5.51
1359					nu hat (MLE)	417.7				nu star (bias corrected)		262.4
1360					MLE Mean (bias corrected)	90.36				MLE Sd (bias corrected)		22.31
1361										Approximate Chi Square Value (0.05)		225.9
1362					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		217.3
1363												
1364					**Assuming Gamma Distribution**							
1365					95% Approximate Gamma UCL (use when n>=50))	105				95% Adjusted Gamma UCL (use when n<50)		109.1
1366												

	A	B	C	D	E	F	G	H	I	J	K	L
1367	**Lognormal GOF Test**											
1368					Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**					
1369					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1370					Lilliefors Test Statistic	0.149	**Lilliefors Lognormal GOF Test**					
1371					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1372	**Data appear Lognormal at 5% Significance Level**											
1373												
1374	**Lognormal Statistics**											
1375					Minimum of Logged Data	4.256	Mean of logged Data	4.485				
1376					Maximum of Logged Data	4.86	SD of logged Data	0.207				
1377												
1378	**Assuming Lognormal Distribution**											
1379					95% H-UCL	105.4	90% Chebyshev (MVUE) UCL	110.1				
1380					95% Chebyshev (MVUE) UCL	119.1	97.5% Chebyshev (MVUE) UCL	131.6				
1381					99% Chebyshev (MVUE) UCL	156						
1382												
1383	**Nonparametric Distribution Free UCL Statistics**											
1384	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1385												
1386	**Nonparametric Distribution Free UCLs**											
1387					95% CLT UCL	101.8	95% Jackknife UCL	103.5				
1388					95% Standard Bootstrap UCL	100.9	95% Bootstrap-t UCL	108.5				
1389					95% Hall's Bootstrap UCL	109.9	95% Percentile Bootstrap UCL	101.5				
1390					95% BCA Bootstrap UCL	103.6						
1391					90% Chebyshev(Mean, Sd) UCL	111.2	95% Chebyshev(Mean, Sd) UCL	120.7				
1392					97.5% Chebyshev(Mean, Sd) UCL	133.8	99% Chebyshev(Mean, Sd) UCL	159.5				
1393												
1394	**Suggested UCL to Use**											
1395					95% Student's-t UCL	103.5						
1396												
1397	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1398	Recommendations are based upon data size, data distribution, and skewness.											
1399	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1400	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1401												
1402												
1403	**Barium (smw11)**											
1404												
1405	**General Statistics**											
1406					Total Number of Observations	9	Number of Distinct Observations	8				
1407							Number of Missing Observations	0				
1408					Minimum	98.2	Mean	130				
1409					Maximum	200	Median	126				
1410					SD	33.7	Std. Error of Mean	11.23				
1411					Coefficient of Variation	0.259	Skewness	1.198				
1412												
1413	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1414	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1415	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1416	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1417												
1418	**Normal GOF Test**											
1419					Shapiro Wilk Test Statistic	0.871	**Shapiro Wilk GOF Test**					
1420					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
1421					Lilliefors Test Statistic	0.216	**Lilliefors GOF Test**					
1422					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
1423	**Data appear Normal at 5% Significance Level**											

1424												
1425	**Assuming Normal Distribution**											
1426	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1427	95% Student's-t UCL				150.9		95% Adjusted-CLT UCL (Chen-1995)					153.3
1428							95% Modified-t UCL (Johnson-1978)					151.7
1429												
1430	**Gamma GOF Test**											
1431	A-D Test Statistic				0.435		**Anderson-Darling Gamma GOF Test**					
1432	5% A-D Critical Value				0.721		Detected data appear Gamma Distributed at 5% Significance Level					
1433	K-S Test Statistic				0.236		**Kolmogorov-Smirnov Gamma GOF Test**					
1434	5% K-S Critical Value				0.279		Detected data appear Gamma Distributed at 5% Significance Level					
1435	**Detected data appear Gamma Distributed at 5% Significance Level**											
1436												
1437	**Gamma Statistics**											
1438	k hat (MLE)				18.64		k star (bias corrected MLE)					12.5
1439	Theta hat (MLE)				6.975		Theta star (bias corrected MLE)					10.4
1440	nu hat (MLE)				335.6		nu star (bias corrected)					225
1441	MLE Mean (bias corrected)				130		MLE Sd (bias corrected)					36.77
1442							Approximate Chi Square Value (0.05)					191.3
1443	Adjusted Level of Significance				0.0231		Adjusted Chi Square Value					184.7
1444												
1445	**Assuming Gamma Distribution**											
1446	95% Approximate Gamma UCL (use when n>=50))				152.9		95% Adjusted Gamma UCL (use when n<50)					158.4
1447												
1448	**Lognormal GOF Test**											
1449	Shapiro Wilk Test Statistic				0.906		**Shapiro Wilk Lognormal GOF Test**					
1450	5% Shapiro Wilk Critical Value				0.829		Data appear Lognormal at 5% Significance Level					
1451	Lilliefors Test Statistic				0.225		**Lilliefors Lognormal GOF Test**					
1452	5% Lilliefors Critical Value				0.274		Data appear Lognormal at 5% Significance Level					
1453	**Data appear Lognormal at 5% Significance Level**											
1454												
1455	**Lognormal Statistics**											
1456	Minimum of Logged Data				4.587		Mean of logged Data					4.841
1457	Maximum of Logged Data				5.298		SD of logged Data					0.241
1458												
1459	**Assuming Lognormal Distribution**											
1460	95% H-UCL				153.8		90% Chebyshev (MVUE) UCL					161.3
1461	95% Chebyshev (MVUE) UCL				175.5		97.5% Chebyshev (MVUE) UCL					195.3
1462	99% Chebyshev (MVUE) UCL				234.1							
1463												
1464	**Nonparametric Distribution Free UCL Statistics**											
1465	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1466												
1467	**Nonparametric Distribution Free UCLs**											
1468	95% CLT UCL				148.5		95% Jackknife UCL					150.9
1469	95% Standard Bootstrap UCL				147.1		95% Bootstrap-t UCL					161.3
1470	95% Hall's Bootstrap UCL				170.4		95% Percentile Bootstrap UCL					147.9
1471	95% BCA Bootstrap UCL				151.8							
1472	90% Chebyshev(Mean, Sd) UCL				163.7		95% Chebyshev(Mean, Sd) UCL					179
1473	97.5% Chebyshev(Mean, Sd) UCL				200.2		99% Chebyshev(Mean, Sd) UCL					241.8
1474												
1475	**Suggested UCL to Use**											
1476	95% Student's-t UCL				150.9							
1477												
1478	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1479	Recommendations are based upon data size, data distribution, and skewness.											
1480	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

1481	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1482												
1483												
1484	**Barium (smw12)**											
1485												
1486	**General Statistics**											
1487					Total Number of Observations	8			Number of Distinct Observations	8		
1488									Number of Missing Observations	0		
1489					Minimum	91.5			Mean	105.5		
1490					Maximum	115			Median	108.5		
1491					SD	7.78			Std. Error of Mean	2.751		
1492					Coefficient of Variation	0.0738			Skewness	-0.784		
1493												
1494	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1495	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1496	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1497	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1498												
1499	**Normal GOF Test**											
1500					Shapiro Wilk Test Statistic	0.914			**Shapiro Wilk GOF Test**			
1501					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
1502					Lilliefors Test Statistic	0.252			**Lilliefors GOF Test**			
1503					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
1504	**Data appear Normal at 5% Significance Level**											
1505												
1506	**Assuming Normal Distribution**											
1507	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
1508					95% Student's-t UCL	110.7			95% Adjusted-CLT UCL (Chen-1995)	109.2		
1509									95% Modified-t UCL (Johnson-1978)	110.6		
1510												
1511	**Gamma GOF Test**											
1512					A-D Test Statistic	0.462			**Anderson-Darling Gamma GOF Test**			
1513					5% A-D Critical Value	0.715			Detected data appear Gamma Distributed at 5% Significance Level			
1514					K-S Test Statistic	0.266			**Kolmogorov-Smirnov Gamma GOF Test**			
1515					5% K-S Critical Value	0.294			Detected data appear Gamma Distributed at 5% Significance Level			
1516	**Detected data appear Gamma Distributed at 5% Significance Level**											
1517												
1518	**Gamma Statistics**											
1519					k hat (MLE)	203.2			k star (bias corrected MLE)	127.1		
1520					Theta hat (MLE)	0.519			Theta star (bias corrected MLE)	0.83		
1521					nu hat (MLE)	3251			nu star (bias corrected)	2033		
1522					MLE Mean (bias corrected)	105.5			MLE Sd (bias corrected)	9.357		
1523									Approximate Chi Square Value (0.05)	1929		
1524					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	1904		
1525												
1526	**Assuming Gamma Distribution**											
1527					95% Approximate Gamma UCL (use when n>=50))	111.1			95% Adjusted Gamma UCL (use when n<50)	112.6		
1528												
1529	**Lognormal GOF Test**											
1530					Shapiro Wilk Test Statistic	0.903			**Shapiro Wilk Lognormal GOF Test**			
1531					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
1532					Lilliefors Test Statistic	0.26			**Lilliefors Lognormal GOF Test**			
1533					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
1534	**Data appear Lognormal at 5% Significance Level**											
1535												
1536	**Lognormal Statistics**											
1537					Minimum of Logged Data	4.516			Mean of logged Data	4.656		

1538					Maximum of Logged Data	4.745					SD of logged Data	0.0757
1539												
1540					**Assuming Lognormal Distribution**							
1541					95% H-UCL	N/A					90% Chebyshev (MVUE) UCL	113.9
1542					95% Chebyshev (MVUE) UCL	117.8					97.5% Chebyshev (MVUE) UCL	123.1
1543					99% Chebyshev (MVUE) UCL	133.6						
1544												
1545					**Nonparametric Distribution Free UCL Statistics**							
1546					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
1547												
1548					**Nonparametric Distribution Free UCLs**							
1549					95% CLT UCL	110					95% Jackknife UCL	110.7
1550					95% Standard Bootstrap UCL	109.7					95% Bootstrap-t UCL	110
1551					95% Hall's Bootstrap UCL	109.1					95% Percentile Bootstrap UCL	109.3
1552					95% BCA Bootstrap UCL	109.2						
1553					90% Chebyshev(Mean, Sd) UCL	113.7					95% Chebyshev(Mean, Sd) UCL	117.5
1554					97.5% Chebyshev(Mean, Sd) UCL	122.7					99% Chebyshev(Mean, Sd) UCL	132.8
1555												
1556					**Suggested UCL to Use**							
1557					95% Student's-t UCL	110.7						
1558												
1559					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1560					Recommendations are based upon data size, data distribution, and skewness.							
1561					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1562					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1563												
1564					**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**							
1565					**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**							
1566												
1567												
1568	**Barium (smw13)**											
1569												
1570					**General Statistics**							
1571					Total Number of Observations	8					Number of Distinct Observations	8
1572											Number of Missing Observations	0
1573					Minimum	46.8					Mean	108
1574					Maximum	203					Median	97.1
1575					SD	48.71					Std. Error of Mean	17.22
1576					Coefficient of Variation	0.451					Skewness	0.993
1577												
1578					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1579					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1580					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1581					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1582												
1583					**Normal GOF Test**							
1584					Shapiro Wilk Test Statistic	0.938					**Shapiro Wilk GOF Test**	
1585					5% Shapiro Wilk Critical Value	0.818					Data appear Normal at 5% Significance Level	
1586					Lilliefors Test Statistic	0.172					**Lilliefors GOF Test**	
1587					5% Lilliefors Critical Value	0.283					Data appear Normal at 5% Significance Level	
1588					**Data appear Normal at 5% Significance Level**							
1589												
1590					**Assuming Normal Distribution**							
1591					**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**	
1592					95% Student's-t UCL	140.6					95% Adjusted-CLT UCL (Chen-1995)	142.7
1593											95% Modified-t UCL (Johnson-1978)	141.6
1594												

	A	B	C	D	E	F	G	H	I	J	K	L
1595	**Gamma GOF Test**											
1596	A-D Test Statistic					0.181	**Anderson-Darling Gamma GOF Test**					
1597	5% A-D Critical Value					0.718	Detected data appear Gamma Distributed at 5% Significance Level					
1598	K-S Test Statistic					0.15	**Kolmogorov-Smirnov Gamma GOF Test**					
1599	5% K-S Critical Value					0.295	Detected data appear Gamma Distributed at 5% Significance Level					
1600	**Detected data appear Gamma Distributed at 5% Significance Level**											
1601												
1602	**Gamma Statistics**											
1603	k hat (MLE)					5.899	k star (bias corrected MLE)					3.77
1604	Theta hat (MLE)					18.3	Theta star (bias corrected MLE)					28.63
1605	nu hat (MLE)					94.38	nu star (bias corrected)					60.32
1606	MLE Mean (bias corrected)					108	MLE Sd (bias corrected)					55.6
1607							Approximate Chi Square Value (0.05)					43.46
1608	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					39.87
1609												
1610	**Assuming Gamma Distribution**											
1611	95% Approximate Gamma UCL (use when n>=50))					149.8	95% Adjusted Gamma UCL (use when n<50)					163.3
1612												
1613	**Lognormal GOF Test**											
1614	Shapiro Wilk Test Statistic					0.986	**Shapiro Wilk Lognormal GOF Test**					
1615	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1616	Lilliefors Test Statistic					0.15	**Lilliefors Lognormal GOF Test**					
1617	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
1618	**Data appear Lognormal at 5% Significance Level**											
1619												
1620	**Lognormal Statistics**											
1621	Minimum of Logged Data					3.846	Mean of logged Data					4.595
1622	Maximum of Logged Data					5.313	SD of logged Data					0.449
1623												
1624	**Assuming Lognormal Distribution**											
1625	95% H-UCL					161	90% Chebyshev (MVUE) UCL					159.9
1626	95% Chebyshev (MVUE) UCL					183.4	97.5% Chebyshev (MVUE) UCL					216.1
1627	99% Chebyshev (MVUE) UCL					280.2						
1628												
1629	**Nonparametric Distribution Free UCL Statistics**											
1630	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1631												
1632	**Nonparametric Distribution Free UCLs**											
1633	95% CLT UCL					136.3	95% Jackknife UCL					140.6
1634	95% Standard Bootstrap UCL					134.4	95% Bootstrap-t UCL					150.9
1635	95% Hall's Bootstrap UCL					166.8	95% Percentile Bootstrap UCL					136.8
1636	95% BCA Bootstrap UCL					140.5						
1637	90% Chebyshev(Mean, Sd) UCL					159.6	95% Chebyshev(Mean, Sd) UCL					183
1638	97.5% Chebyshev(Mean, Sd) UCL					215.5	99% Chebyshev(Mean, Sd) UCL					279.3
1639												
1640	**Suggested UCL to Use**											
1641	95% Student's-t UCL					140.6						
1642												
1643	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1644	Recommendations are based upon data size, data distribution, and skewness.											
1645	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1646	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1647												
1648												
1649	**Barium (smw14)**											
1650												
1651	**General Statistics**											

1652					Total Number of Observations	8					Number of Distinct Observations	8
1653											Number of Missing Observations	0
1654					Minimum	76.6					Mean	106.5
1655					Maximum	169					Median	97.1
1656					SD	28.47					Std. Error of Mean	10.06
1657					Coefficient of Variation	0.267					Skewness	1.734
1658												
1659	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1660	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1661	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1662	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1663												
1664	**Normal GOF Test**											
1665					Shapiro Wilk Test Statistic	0.836	**Shapiro Wilk GOF Test**					
1666					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1667					Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**					
1668					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1669	**Data appear Normal at 5% Significance Level**											
1670												
1671	**Assuming Normal Distribution**											
1672	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1673					95% Student's-t UCL	125.6					95% Adjusted-CLT UCL (Chen-1995)	129.6
1674											95% Modified-t UCL (Johnson-1978)	126.6
1675												
1676	**Gamma GOF Test**											
1677					A-D Test Statistic	0.466	**Anderson-Darling Gamma GOF Test**					
1678					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1679					K-S Test Statistic	0.247	**Kolmogorov-Smirnov Gamma GOF Test**					
1680					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1681	**Detected data appear Gamma Distributed at 5% Significance Level**											
1682												
1683	**Gamma Statistics**											
1684					k hat (MLE)	18.78					k star (bias corrected MLE)	11.82
1685					Theta hat (MLE)	5.67					Theta star (bias corrected MLE)	9.009
1686					nu hat (MLE)	300.5					nu star (bias corrected)	189.1
1687					MLE Mean (bias corrected)	106.5					MLE Sd (bias corrected)	30.97
1688											Approximate Chi Square Value (0.05)	158.3
1689					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	151.2
1690												
1691	**Assuming Gamma Distribution**											
1692					95% Approximate Gamma UCL (use when n>=50))	127.2					95% Adjusted Gamma UCL (use when n<50)	133.2
1693												
1694	**Lognormal GOF Test**											
1695					Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk Lognormal GOF Test**					
1696					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1697					Lilliefors Test Statistic	0.231	**Lilliefors Lognormal GOF Test**					
1698					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1699	**Data appear Lognormal at 5% Significance Level**											
1700												
1701	**Lognormal Statistics**											
1702					Minimum of Logged Data	4.339					Mean of logged Data	4.641
1703					Maximum of Logged Data	5.13					SD of logged Data	0.239
1704												
1705	**Assuming Lognormal Distribution**											
1706					95% H-UCL	127.7					90% Chebyshev (MVUE) UCL	133.3
1707					95% Chebyshev (MVUE) UCL	145.6					97.5% Chebyshev (MVUE) UCL	162.6
1708					99% Chebyshev (MVUE) UCL	196						

1709												
1710	**Nonparametric Distribution Free UCL Statistics**											
1711	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1712												
1713	**Nonparametric Distribution Free UCLs**											
1714				95% CLT UCL	123			95% Jackknife UCL	125.6			
1715				95% Standard Bootstrap UCL	122.1			95% Bootstrap-t UCL	143.2			
1716				95% Hall's Bootstrap UCL	203.6			95% Percentile Bootstrap UCL	123.4			
1717				95% BCA Bootstrap UCL	127							
1718				90% Chebyshev(Mean, Sd) UCL	136.7			95% Chebyshev(Mean, Sd) UCL	150.4			
1719				97.5% Chebyshev(Mean, Sd) UCL	169.3			99% Chebyshev(Mean, Sd) UCL	206.6			
1720												
1721	**Suggested UCL to Use**											
1722				95% Student's-t UCL	125.6							
1723												
1724	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1725	Recommendations are based upon data size, data distribution, and skewness.											
1726	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1727	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1728												
1729												
1730	**Barium (smw15)**											
1731												
1732	**General Statistics**											
1733				Total Number of Observations	9			Number of Distinct Observations	9			
1734								Number of Missing Observations	0			
1735				Minimum	17.7			Mean	30.34			
1736				Maximum	59.1			Median	24			
1737				SD	13.47			Std. Error of Mean	4.489			
1738				Coefficient of Variation	0.444			Skewness	1.277			
1739												
1740	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1741	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1742	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1743	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1744												
1745	**Normal GOF Test**											
1746				Shapiro Wilk Test Statistic	0.859			**Shapiro Wilk GOF Test**				
1747				5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level				
1748				Lilliefors Test Statistic	0.237			**Lilliefors GOF Test**				
1749				5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level				
1750	**Data appear Normal at 5% Significance Level**											
1751												
1752	**Assuming Normal Distribution**											
1753	**95% Normal UCL**							**95% UCLs (Adjusted for Skewness)**				
1754				95% Student's-t UCL	38.69			95% Adjusted-CLT UCL (Chen-1995)	39.77			
1755								95% Modified-t UCL (Johnson-1978)	39.01			
1756												
1757	**Gamma GOF Test**											
1758				A-D Test Statistic	0.422			**Anderson-Darling Gamma GOF Test**				
1759				5% A-D Critical Value	0.722			Detected data appear Gamma Distributed at 5% Significance Level				
1760				K-S Test Statistic	0.228			**Kolmogorov-Smirnov Gamma GOF Test**				
1761				5% K-S Critical Value	0.28			Detected data appear Gamma Distributed at 5% Significance Level				
1762	**Detected data appear Gamma Distributed at 5% Significance Level**											
1763												
1764	**Gamma Statistics**											
1765				k hat (MLE)	6.595			k star (bias corrected MLE)	4.471			

1766					Theta hat (MLE)	4.601					Theta star (bias corrected MLE)	6.788
1767					nu hat (MLE)	118.7					nu star (bias corrected)	80.47
1768					MLE Mean (bias corrected)	30.34					MLE Sd (bias corrected)	14.35
1769											Approximate Chi Square Value (0.05)	60.8
1770					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	57.21
1771												
1772					**Assuming Gamma Distribution**							
1773					95% Approximate Gamma UCL (use when n>=50))	40.16					95% Adjusted Gamma UCL (use when n<50)	42.68
1774												
1775					**Lognormal GOF Test**							
1776					Shapiro Wilk Test Statistic	0.92					**Shapiro Wilk Lognormal GOF Test**	
1777					5% Shapiro Wilk Critical Value	0.829					Data appear Lognormal at 5% Significance Level	
1778					Lilliefors Test Statistic	0.205					**Lilliefors Lognormal GOF Test**	
1779					5% Lilliefors Critical Value	0.274					Data appear Lognormal at 5% Significance Level	
1780					**Data appear Lognormal at 5% Significance Level**							
1781												
1782					**Lognormal Statistics**							
1783					Minimum of Logged Data	2.874					Mean of logged Data	3.335
1784					Maximum of Logged Data	4.079					SD of logged Data	0.408
1785												
1786					**Assuming Lognormal Distribution**							
1787					95% H-UCL	41.55					90% Chebyshev (MVUE) UCL	42.66
1788					95% Chebyshev (MVUE) UCL	48.29					97.5% Chebyshev (MVUE) UCL	56.12
1789					99% Chebyshev (MVUE) UCL	71.49						
1790												
1791					**Nonparametric Distribution Free UCL Statistics**							
1792					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
1793												
1794					**Nonparametric Distribution Free UCLs**							
1795					95% CLT UCL	37.73					95% Jackknife UCL	38.69
1796					95% Standard Bootstrap UCL	37.32					95% Bootstrap-t UCL	42.57
1797					95% Hall's Bootstrap UCL	41.13					95% Percentile Bootstrap UCL	37.9
1798					95% BCA Bootstrap UCL	38.62						
1799					90% Chebyshev(Mean, Sd) UCL	43.81					95% Chebyshev(Mean, Sd) UCL	49.91
1800					97.5% Chebyshev(Mean, Sd) UCL	58.38					99% Chebyshev(Mean, Sd) UCL	75.01
1801												
1802					**Suggested UCL to Use**							
1803					95% Student's-t UCL	38.69						
1804												
1805					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1806					Recommendations are based upon data size, data distribution, and skewness.							
1807					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1808					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1809												
1810												
1811	**Barium (smw16)**											
1812												
1813					**General Statistics**							
1814					Total Number of Observations	9					Number of Distinct Observations	9
1815											Number of Missing Observations	0
1816					Minimum	102					Mean	144.3
1817					Maximum	191					Median	143
1818					SD	23.23					Std. Error of Mean	7.742
1819					Coefficient of Variation	0.161					Skewness	0.358
1820												
1821					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1822					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							

	A	B	C	D	E	F	G	H	I	J	K	L
1823	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1824	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1825												
1826	**Normal GOF Test**											
1827					Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**					
1828					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
1829					Lilliefors Test Statistic	0.266	**Lilliefors GOF Test**					
1830					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
1831	**Data appear Normal at 5% Significance Level**											
1832												
1833	**Assuming Normal Distribution**											
1834	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1835					95% Student's-t UCL	158.7			95% Adjusted-CLT UCL (Chen-1995)			158.1
1836									95% Modified-t UCL (Johnson-1978)			158.9
1837												
1838	**Gamma GOF Test**											
1839					A-D Test Statistic	0.673	**Anderson-Darling Gamma GOF Test**					
1840					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
1841					K-S Test Statistic	0.258	**Kolmogorov-Smirnov Gamma GOF Test**					
1842					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
1843	**Detected data appear Gamma Distributed at 5% Significance Level**											
1844												
1845	**Gamma Statistics**											
1846					k hat (MLE)	42.97			k star (bias corrected MLE)			28.72
1847					Theta hat (MLE)	3.359			Theta star (bias corrected MLE)			5.025
1848					nu hat (MLE)	773.5			nu star (bias corrected)			517
1849					MLE Mean (bias corrected)	144.3			MLE Sd (bias corrected)			26.93
1850									Approximate Chi Square Value (0.05)			465.3
1851					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value			454.9
1852												
1853	**Assuming Gamma Distribution**											
1854					95% Approximate Gamma UCL (use when n>=50))	160.4			95% Adjusted Gamma UCL (use when n<50)			164
1855												
1856	**Lognormal GOF Test**											
1857					Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk Lognormal GOF Test**					
1858					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1859					Lilliefors Test Statistic	0.274	**Lilliefors Lognormal GOF Test**					
1860					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1861	**Data appear Lognormal at 5% Significance Level**											
1862												
1863	**Lognormal Statistics**											
1864					Minimum of Logged Data	4.625			Mean of logged Data			4.96
1865					Maximum of Logged Data	5.252			SD of logged Data			0.163
1866												
1867	**Assuming Lognormal Distribution**											
1868					95% H-UCL	161.1			90% Chebyshev (MVUE) UCL			168
1869					95% Chebyshev (MVUE) UCL	178.7			97.5% Chebyshev (MVUE) UCL			193.6
1870					99% Chebyshev (MVUE) UCL	222.8						
1871												
1872	**Nonparametric Distribution Free UCL Statistics**											
1873	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1874												
1875	**Nonparametric Distribution Free UCLs**											
1876					95% CLT UCL	157.1			95% Jackknife UCL			158.7
1877					95% Standard Bootstrap UCL	156.3			95% Bootstrap-t UCL			160.1
1878					95% Hall's Bootstrap UCL	170.9			95% Percentile Bootstrap UCL			156.3
1879					95% BCA Bootstrap UCL	157.8						

1880					90% Chebyshev(Mean, Sd) UCL	167.6				95% Chebyshev(Mean, Sd) UCL		178.1
1881					97.5% Chebyshev(Mean, Sd) UCL	192.7				99% Chebyshev(Mean, Sd) UCL		221.4
1882												
1883					**Suggested UCL to Use**							
1884					95% Student's-t UCL	158.7						
1885												
1886					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1887					Recommendations are based upon data size, data distribution, and skewness.							
1888					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1889					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1890												
1891												
1892	**Barium (smw16d)**											
1893												
1894					**General Statistics**							
1895					Total Number of Observations	8				Number of Distinct Observations		7
1896										Number of Missing Observations		0
1897					Minimum	38.9				Mean		44.09
1898					Maximum	62.3				Median		41.7
1899					SD	7.647				Std. Error of Mean		2.704
1900					Coefficient of Variation	0.173				Skewness		2.438
1901												
1902					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1903					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1904					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1905					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1906												
1907					**Normal GOF Test**							
1908					Shapiro Wilk Test Statistic	0.664				**Shapiro Wilk GOF Test**		
1909					5% Shapiro Wilk Critical Value	0.818				Data Not Normal at 5% Significance Level		
1910					Lilliefors Test Statistic	0.327				**Lilliefors GOF Test**		
1911					5% Lilliefors Critical Value	0.283				Data Not Normal at 5% Significance Level		
1912					**Data Not Normal at 5% Significance Level**							
1913												
1914					**Assuming Normal Distribution**							
1915					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
1916					95% Student's-t UCL	49.21				95% Adjusted-CLT UCL (Chen-1995)		51.03
1917										95% Modified-t UCL (Johnson-1978)		49.6
1918												
1919					**Gamma GOF Test**							
1920					A-D Test Statistic	1.105				**Anderson-Darling Gamma GOF Test**		
1921					5% A-D Critical Value	0.715				Data Not Gamma Distributed at 5% Significance Level		
1922					K-S Test Statistic	0.321				**Kolmogorov-Smirnov Gamma GOF Test**		
1923					5% K-S Critical Value	0.293				Data Not Gamma Distributed at 5% Significance Level		
1924					**Data Not Gamma Distributed at 5% Significance Level**							
1925												
1926					**Gamma Statistics**							
1927					k hat (MLE)	45.3				k star (bias corrected MLE)		28.4
1928					Theta hat (MLE)	0.973				Theta star (bias corrected MLE)		1.552
1929					nu hat (MLE)	724.9				nu star (bias corrected)		454.4
1930					MLE Mean (bias corrected)	44.09				MLE Sd (bias corrected)		8.273
1931										Approximate Chi Square Value (0.05)		405.9
1932					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		394.3
1933												
1934					**Assuming Gamma Distribution**							
1935					95% Approximate Gamma UCL (use when n>=50))	49.35				95% Adjusted Gamma UCL (use when n<50)		50.8
1936												

	A	B	C	D	E	F	G	H	I	J	K	L
1937	**Lognormal GOF Test**											
1938					Shapiro Wilk Test Statistic	0.711	**Shapiro Wilk Lognormal GOF Test**					
1939					5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level					
1940					Lilliefors Test Statistic	0.311	**Lilliefors Lognormal GOF Test**					
1941					5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level					
1942	**Data Not Lognormal at 5% Significance Level**											
1943												
1944	**Lognormal Statistics**											
1945					Minimum of Logged Data	3.661			Mean of logged Data	3.775		
1946					Maximum of Logged Data	4.132			SD of logged Data	0.152		
1947												
1948	**Assuming Lognormal Distribution**											
1949					95% H-UCL	49.2			90% Chebyshev (MVUE) UCL	51.17		
1950					95% Chebyshev (MVUE) UCL	54.4			97.5% Chebyshev (MVUE) UCL	58.89		
1951					99% Chebyshev (MVUE) UCL	67.69						
1952												
1953	**Nonparametric Distribution Free UCL Statistics**											
1954	**Data do not follow a Discernible Distribution (0.05)**											
1955												
1956	**Nonparametric Distribution Free UCLs**											
1957					95% CLT UCL	48.53			95% Jackknife UCL	49.21		
1958					95% Standard Bootstrap UCL	48.22			95% Bootstrap-t UCL	62.64		
1959					95% Hall's Bootstrap UCL	67.88			95% Percentile Bootstrap UCL	48.71		
1960					95% BCA Bootstrap UCL	50.71						
1961					90% Chebyshev(Mean, Sd) UCL	52.2			95% Chebyshev(Mean, Sd) UCL	55.87		
1962					97.5% Chebyshev(Mean, Sd) UCL	60.97			99% Chebyshev(Mean, Sd) UCL	70.99		
1963												
1964	**Suggested UCL to Use**											
1965					95% Student's-t UCL	49.21			or 95% Modified-t UCL	49.6		
1966												
1967	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1968	Recommendations are based upon data size, data distribution, and skewness.											
1969	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1970	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1971												
1972												
1973	**Barium (smw17)**											
1974												
1975	**General Statistics**											
1976					Total Number of Observations	8			Number of Distinct Observations	8		
1977									Number of Missing Observations	0		
1978					Minimum	54.1			Mean	113.8		
1979					Maximum	168			Median	120.5		
1980					SD	39.5			Std. Error of Mean	13.97		
1981					Coefficient of Variation	0.347			Skewness	-0.245		
1982												
1983	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1984	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1985	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1986	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1987												
1988	**Normal GOF Test**											
1989					Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**					
1990					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1991					Lilliefors Test Statistic	0.159	**Lilliefors GOF Test**					
1992					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1993	**Data appear Normal at 5% Significance Level**											

1994												
1995	**Assuming Normal Distribution**											
1996	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1997	95% Student's-t UCL				140.2		95% Adjusted-CLT UCL (Chen-1995)					135.4
1998							95% Modified-t UCL (Johnson-1978)					140
1999												
2000	**Gamma GOF Test**											
2001	A-D Test Statistic				0.262		**Anderson-Darling Gamma GOF Test**					
2002	5% A-D Critical Value				0.716		Detected data appear Gamma Distributed at 5% Significance Level					
2003	K-S Test Statistic				0.194		**Kolmogorov-Smirnov Gamma GOF Test**					
2004	5% K-S Critical Value				0.295		Detected data appear Gamma Distributed at 5% Significance Level					
2005	**Detected data appear Gamma Distributed at 5% Significance Level**											
2006												
2007	**Gamma Statistics**											
2008	k hat (MLE)				8.277		k star (bias corrected MLE)					5.256
2009	Theta hat (MLE)				13.75		Theta star (bias corrected MLE)					21.64
2010	nu hat (MLE)				132.4		nu star (bias corrected)					84.1
2011	MLE Mean (bias corrected)				113.8		MLE Sd (bias corrected)					49.62
2012							Approximate Chi Square Value (0.05)					63.96
2013	Adjusted Level of Significance				0.0195		Adjusted Chi Square Value					59.54
2014												
2015	**Assuming Gamma Distribution**											
2016	95% Approximate Gamma UCL (use when n>=50))				149.6		95% Adjusted Gamma UCL (use when n<50)					160.7
2017												
2018	**Lognormal GOF Test**											
2019	Shapiro Wilk Test Statistic				0.934		**Shapiro Wilk Lognormal GOF Test**					
2020	5% Shapiro Wilk Critical Value				0.818		Data appear Lognormal at 5% Significance Level					
2021	Lilliefors Test Statistic				0.191		**Lilliefors Lognormal GOF Test**					
2022	5% Lilliefors Critical Value				0.283		Data appear Lognormal at 5% Significance Level					
2023	**Data appear Lognormal at 5% Significance Level**											
2024												
2025	**Lognormal Statistics**											
2026	Minimum of Logged Data				3.991		Mean of logged Data					4.672
2027	Maximum of Logged Data				5.124		SD of logged Data					0.392
2028												
2029	**Assuming Lognormal Distribution**											
2030	95% H-UCL				159.5		90% Chebyshev (MVUE) UCL					162.1
2031	95% Chebyshev (MVUE) UCL				183.8		97.5% Chebyshev (MVUE) UCL					213.8
2032	99% Chebyshev (MVUE) UCL				272.9							
2033												
2034	**Nonparametric Distribution Free UCL Statistics**											
2035	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2036												
2037	**Nonparametric Distribution Free UCLs**											
2038	95% CLT UCL				136.7		95% Jackknife UCL					140.2
2039	95% Standard Bootstrap UCL				135.5		95% Bootstrap-t UCL					137.7
2040	95% Hall's Bootstrap UCL				134.9		95% Percentile Bootstrap UCL					135.5
2041	95% BCA Bootstrap UCL				134.1							
2042	90% Chebyshev(Mean, Sd) UCL				155.7		95% Chebyshev(Mean, Sd) UCL					174.6
2043	97.5% Chebyshev(Mean, Sd) UCL				201		99% Chebyshev(Mean, Sd) UCL					252.7
2044												
2045	**Suggested UCL to Use**											
2046	95% Student's-t UCL				140.2							
2047												
2048	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2049	Recommendations are based upon data size, data distribution, and skewness.											
2050	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

	A	B	C	D	E	F	G	H	I	J	K	L
2051	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2052												
2053	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
2054	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
2055												
2056												
2057	**Barium (smw17d)**											
2058												
2059	**General Statistics**											
2060					Total Number of Observations	8			Number of Distinct Observations	8		
2061									Number of Missing Observations	0		
2062					Minimum	58.1			Mean	61.03		
2063					Maximum	65.5			Median	60.15		
2064					SD	2.84			Std. Error of Mean	1.004		
2065					Coefficient of Variation	0.0465			Skewness	0.695		
2066												
2067	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2068	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2069	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2070	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2071												
2072	**Normal GOF Test**											
2073					Shapiro Wilk Test Statistic	0.886			**Shapiro Wilk GOF Test**			
2074					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
2075					Lilliefors Test Statistic	0.184			**Lilliefors GOF Test**			
2076					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
2077	**Data appear Normal at 5% Significance Level**											
2078												
2079	**Assuming Normal Distribution**											
2080	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
2081					95% Student's-t UCL	62.93			95% Adjusted-CLT UCL (Chen-1995)	62.94		
2082									95% Modified-t UCL (Johnson-1978)	62.97		
2083												
2084	**Gamma GOF Test**											
2085					A-D Test Statistic	0.456			**Anderson-Darling Gamma GOF Test**			
2086					5% A-D Critical Value	0.715			Detected data appear Gamma Distributed at 5% Significance Level			
2087					K-S Test Statistic	0.189			**Kolmogorov-Smirnov Gamma GOF Test**			
2088					5% K-S Critical Value	0.294			Detected data appear Gamma Distributed at 5% Significance Level			
2089	**Detected data appear Gamma Distributed at 5% Significance Level**											
2090												
2091	**Gamma Statistics**											
2092					k hat (MLE)	535.5			k star (bias corrected MLE)	334.8		
2093					Theta hat (MLE)	0.114			Theta star (bias corrected MLE)	0.182		
2094					nu hat (MLE)	8568			nu star (bias corrected)	5356		
2095					MLE Mean (bias corrected)	61.03			MLE Sd (bias corrected)	3.335		
2096									Approximate Chi Square Value (0.05)	5187		
2097					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	5145		
2098												
2099	**Assuming Gamma Distribution**											
2100					95% Approximate Gamma UCL (use when n>=50))	63.01			95% Adjusted Gamma UCL (use when n<50)	63.53		
2101												
2102	**Lognormal GOF Test**											
2103					Shapiro Wilk Test Statistic	0.89			**Shapiro Wilk Lognormal GOF Test**			
2104					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
2105					Lilliefors Test Statistic	0.177			**Lilliefors Lognormal GOF Test**			
2106					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
2107	**Data appear Lognormal at 5% Significance Level**											

2108												
2109						**Lognormal Statistics**							
2110						Minimum of Logged Data	4.062				Mean of logged Data	4.11
2111						Maximum of Logged Data	4.182				SD of logged Data	0.046
2112												
2113						**Assuming Lognormal Distribution**							
2114						95% H-UCL	N/A				90% Chebyshev (MVUE) UCL	64
2115						95% Chebyshev (MVUE) UCL	65.35				97.5% Chebyshev (MVUE) UCL	67.23
2116						99% Chebyshev (MVUE) UCL	70.91					
2117												
2118						**Nonparametric Distribution Free UCL Statistics**							
2119						**Data appear to follow a Discernible Distribution at 5% Significance Level**						
2120												
2121						**Nonparametric Distribution Free UCLs**							
2122						95% CLT UCL	62.68				95% Jackknife UCL	62.93
2123						95% Standard Bootstrap UCL	62.55				95% Bootstrap-t UCL	63.83
2124						95% Hall's Bootstrap UCL	62.92				95% Percentile Bootstrap UCL	62.7
2125						95% BCA Bootstrap UCL	62.69					
2126						90% Chebyshev(Mean, Sd) UCL	64.04				95% Chebyshev(Mean, Sd) UCL	65.4
2127						97.5% Chebyshev(Mean, Sd) UCL	67.3				99% Chebyshev(Mean, Sd) UCL	71.02
2128												
2129						**Suggested UCL to Use**							
2130						95% Student's-t UCL	62.93					
2131												
2132						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2133						Recommendations are based upon data size, data distribution, and skewness.						
2134						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
2135						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
2136												
2137												
2138	**Barium (smw18)**											
2139												
2140						**General Statistics**							
2141						Total Number of Observations	8				Number of Distinct Observations	8
2142											Number of Missing Observations	0
2143						Minimum	33.4				Mean	62.16
2144						Maximum	119				Median	62.45
2145						SD	26.27				Std. Error of Mean	9.287
2146						Coefficient of Variation	0.423				Skewness	1.538
2147												
2148						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2149						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2150						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2151						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2152												
2153						**Normal GOF Test**							
2154						Shapiro Wilk Test Statistic	0.843				**Shapiro Wilk GOF Test**	
2155						5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level	
2156						Lilliefors Test Statistic	0.275				**Lilliefors GOF Test**	
2157						5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level	
2158						**Data appear Normal at 5% Significance Level**							
2159												
2160						**Assuming Normal Distribution**							
2161						**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**	
2162						95% Student's-t UCL	79.76				95% Adjusted-CLT UCL (Chen-1995)	82.84
2163											95% Modified-t UCL (Johnson-1978)	80.6
2164												

	A	B	C	D	E	F	G	H	I	J	K	L
2165	**Gamma GOF Test**											
2166	A-D Test Statistic					0.415	**Anderson-Darling Gamma GOF Test**					
2167	5% A-D Critical Value					0.717	Detected data appear Gamma Distributed at 5% Significance Level					
2168	K-S Test Statistic					0.218	**Kolmogorov-Smirnov Gamma GOF Test**					
2169	5% K-S Critical Value					0.295	Detected data appear Gamma Distributed at 5% Significance Level					
2170	**Detected data appear Gamma Distributed at 5% Significance Level**											
2171												
2172	**Gamma Statistics**											
2173	k hat (MLE)					7.463	k star (bias corrected MLE)					4.747
2174	Theta hat (MLE)					8.33	Theta star (bias corrected MLE)					13.09
2175	nu hat (MLE)					119.4	nu star (bias corrected)					75.96
2176	MLE Mean (bias corrected)					62.16	MLE Sd (bias corrected)					28.53
2177							Approximate Chi Square Value (0.05)					56.88
2178	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					52.73
2179												
2180	**Assuming Gamma Distribution**											
2181	95% Approximate Gamma UCL (use when n>=50))					83.01	95% Adjusted Gamma UCL (use when n<50)					89.55
2182												
2183	**Lognormal GOF Test**											
2184	Shapiro Wilk Test Statistic					0.936	**Shapiro Wilk Lognormal GOF Test**					
2185	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
2186	Lilliefors Test Statistic					0.205	**Lilliefors Lognormal GOF Test**					
2187	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
2188	**Data appear Lognormal at 5% Significance Level**											
2189												
2190	**Lognormal Statistics**											
2191	Minimum of Logged Data					3.509	Mean of logged Data					4.061
2192	Maximum of Logged Data					4.779	SD of logged Data					0.387
2193												
2194	**Assuming Lognormal Distribution**											
2195	95% H-UCL					86.01	90% Chebyshev (MVUE) UCL					87.54
2196	95% Chebyshev (MVUE) UCL					99.14	97.5% Chebyshev (MVUE) UCL					115.2
2197	99% Chebyshev (MVUE) UCL					146.8						
2198												
2199	**Nonparametric Distribution Free UCL Statistics**											
2200	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2201												
2202	**Nonparametric Distribution Free UCLs**											
2203	95% CLT UCL					77.44	95% Jackknife UCL					79.76
2204	95% Standard Bootstrap UCL					76.55	95% Bootstrap-t UCL					87.58
2205	95% Hall's Bootstrap UCL					149.5	95% Percentile Bootstrap UCL					77.09
2206	95% BCA Bootstrap UCL					81.58						
2207	90% Chebyshev(Mean, Sd) UCL					90.02	95% Chebyshev(Mean, Sd) UCL					102.6
2208	97.5% Chebyshev(Mean, Sd) UCL					120.2	99% Chebyshev(Mean, Sd) UCL					154.6
2209												
2210	**Suggested UCL to Use**											
2211	95% Student's-t UCL					79.76						
2212												
2213	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2214	Recommendations are based upon data size, data distribution, and skewness.											
2215	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2216	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2217												
2218												
2219	**Barium (smw18d)**											
2220												
2221	**General Statistics**											

2222	Total Number of Observations					8	Number of Distinct Observations					8
2223							Number of Missing Observations					0
2224	Minimum					39.7	Mean					47.23
2225	Maximum					58.5	Median					47
2226	SD					5.737	Std. Error of Mean					2.028
2227	Coefficient of Variation					0.121	Skewness					0.902
2228												
2229	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2230	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2231	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2232	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2233												
2234	**Normal GOF Test**											
2235	Shapiro Wilk Test Statistic					0.942	**Shapiro Wilk GOF Test**					
2236	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					
2237	Lilliefors Test Statistic					0.189	**Lilliefors GOF Test**					
2238	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
2239	**Data appear Normal at 5% Significance Level**											
2240												
2241	**Assuming Normal Distribution**											
2242	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2243	95% Student's-t UCL					51.07	95% Adjusted-CLT UCL (Chen-1995)					51.25
2244							95% Modified-t UCL (Johnson-1978)					51.18
2245												
2246	**Gamma GOF Test**											
2247	A-D Test Statistic					0.244	**Anderson-Darling Gamma GOF Test**					
2248	5% A-D Critical Value					0.715	Detected data appear Gamma Distributed at 5% Significance Level					
2249	K-S Test Statistic					0.165	**Kolmogorov-Smirnov Gamma GOF Test**					
2250	5% K-S Critical Value					0.294	Detected data appear Gamma Distributed at 5% Significance Level					
2251	**Detected data appear Gamma Distributed at 5% Significance Level**											
2252												
2253	**Gamma Statistics**											
2254	k hat (MLE)					80.6	k star (bias corrected MLE)					50.46
2255	Theta hat (MLE)					0.586	Theta star (bias corrected MLE)					0.936
2256	nu hat (MLE)					1290	nu star (bias corrected)					807.3
2257	MLE Mean (bias corrected)					47.23	MLE Sd (bias corrected)					6.648
2258							Approximate Chi Square Value (0.05)					742.4
2259	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					726.5
2260												
2261	**Assuming Gamma Distribution**											
2262	95% Approximate Gamma UCL (use when n>=50))					51.36	95% Adjusted Gamma UCL (use when n<50)					52.48
2263												
2264	**Lognormal GOF Test**											
2265	Shapiro Wilk Test Statistic					0.964	**Shapiro Wilk Lognormal GOF Test**					
2266	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
2267	Lilliefors Test Statistic					0.171	**Lilliefors Lognormal GOF Test**					
2268	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
2269	**Data appear Lognormal at 5% Significance Level**											
2270												
2271	**Lognormal Statistics**											
2272	Minimum of Logged Data					3.681	Mean of logged Data					3.849
2273	Maximum of Logged Data					4.069	SD of logged Data					0.118
2274												
2275	**Assuming Lognormal Distribution**											
2276	95% H-UCL					51.37	90% Chebyshev (MVUE) UCL					53.14
2277	95% Chebyshev (MVUE) UCL					55.83	97.5% Chebyshev (MVUE) UCL					59.55
2278	99% Chebyshev (MVUE) UCL					66.87						

2279												
2280						**Nonparametric Distribution Free UCL Statistics**							
2281						**Data appear to follow a Discernible Distribution at 5% Significance Level**							
2282												
2283						**Nonparametric Distribution Free UCLs**							
2284					95% CLT UCL	50.56			95% Jackknife UCL	51.07		
2285					95% Standard Bootstrap UCL	50.33			95% Bootstrap-t UCL	51.97		
2286					95% Hall's Bootstrap UCL	53.07			95% Percentile Bootstrap UCL	50.64		
2287					95% BCA Bootstrap UCL	51.04						
2288					90% Chebyshev(Mean, Sd) UCL	53.31			95% Chebyshev(Mean, Sd) UCL	56.07		
2289					97.5% Chebyshev(Mean, Sd) UCL	59.89			99% Chebyshev(Mean, Sd) UCL	67.41		
2290												
2291						**Suggested UCL to Use**							
2292					95% Student's-t UCL	51.07						
2293												
2294						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2295						Recommendations are based upon data size, data distribution, and skewness.							
2296						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2297						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2298												
2299												
2300	**Barium (smw19)**											
2301												
2302						**General Statistics**							
2303					Total Number of Observations	8			Number of Distinct Observations	7		
2304									Number of Missing Observations	0		
2305					Minimum	99.9			Mean	147.4		
2306					Maximum	194			Median	130.5		
2307					SD	37.3			Std. Error of Mean	13.19		
2308					Coefficient of Variation	0.253			Skewness	0.382		
2309												
2310						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2311						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2312						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2313						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2314												
2315						**Normal GOF Test**							
2316					Shapiro Wilk Test Statistic	0.846			**Shapiro Wilk GOF Test**			
2317					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
2318					Lilliefors Test Statistic	0.285			**Lilliefors GOF Test**			
2319					5% Lilliefors Critical Value	0.283			Data Not Normal at 5% Significance Level			
2320						**Data appear Approximate Normal at 5% Significance Level**							
2321												
2322						**Assuming Normal Distribution**							
2323						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
2324					95% Student's-t UCL	172.3			95% Adjusted-CLT UCL (Chen-1995)	171		
2325									95% Modified-t UCL (Johnson-1978)	172.6		
2326												
2327						**Gamma GOF Test**							
2328					A-D Test Statistic	0.618			**Anderson-Darling Gamma GOF Test**			
2329					5% A-D Critical Value	0.716			Detected data appear Gamma Distributed at 5% Significance Level			
2330					K-S Test Statistic	0.274			**Kolmogorov-Smirnov Gamma GOF Test**			
2331					5% K-S Critical Value	0.294			Detected data appear Gamma Distributed at 5% Significance Level			
2332						**Detected data appear Gamma Distributed at 5% Significance Level**							
2333												
2334						**Gamma Statistics**							
2335					k hat (MLE)	18.15			k star (bias corrected MLE)	11.43		

2336					Theta hat (MLE)	8.119					Theta star (bias corrected MLE)	12.9
2337					nu hat (MLE)	290.4					nu star (bias corrected)	182.8
2338					MLE Mean (bias corrected)	147.4					MLE Sd (bias corrected)	43.59
2339											Approximate Chi Square Value (0.05)	152.6
2340					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	145.5
2341												
2342					**Assuming Gamma Distribution**							
2343					95% Approximate Gamma UCL (use when n>=50))	176.6					95% Adjusted Gamma UCL (use when n<50)	185.1
2344												
2345					**Lognormal GOF Test**							
2346					Shapiro Wilk Test Statistic	0.874					**Shapiro Wilk Lognormal GOF Test**	
2347					5% Shapiro Wilk Critical Value	0.818					Data appear Lognormal at 5% Significance Level	
2348					Lilliefors Test Statistic	0.253					**Lilliefors Lognormal GOF Test**	
2349					5% Lilliefors Critical Value	0.283					Data appear Lognormal at 5% Significance Level	
2350					**Data appear Lognormal at 5% Significance Level**							
2351												
2352					**Lognormal Statistics**							
2353					Minimum of Logged Data	4.604					Mean of logged Data	4.965
2354					Maximum of Logged Data	5.268					SD of logged Data	0.252
2355												
2356					**Assuming Lognormal Distribution**							
2357					95% H-UCL	178.9					90% Chebyshev (MVUE) UCL	186.8
2358					95% Chebyshev (MVUE) UCL	204.6					97.5% Chebyshev (MVUE) UCL	229.4
2359					99% Chebyshev (MVUE) UCL	278.1						
2360												
2361					**Nonparametric Distribution Free UCL Statistics**							
2362					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
2363												
2364					**Nonparametric Distribution Free UCLs**							
2365					95% CLT UCL	169.1					95% Jackknife UCL	172.3
2366					95% Standard Bootstrap UCL	167.7					95% Bootstrap-t UCL	174.4
2367					95% Hall's Bootstrap UCL	164.7					95% Percentile Bootstrap UCL	167.9
2368					95% BCA Bootstrap UCL	167.9						
2369					90% Chebyshev(Mean, Sd) UCL	186.9					95% Chebyshev(Mean, Sd) UCL	204.8
2370					97.5% Chebyshev(Mean, Sd) UCL	229.7					99% Chebyshev(Mean, Sd) UCL	278.6
2371												
2372					**Suggested UCL to Use**							
2373					95% Student's-t UCL	172.3						
2374												
2375					When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test							
2376					When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL							
2377												
2378					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2379					Recommendations are based upon data size, data distribution, and skewness.							
2380					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2381					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2382												
2383												
2384	**Barium (smw7)**											
2385												
2386					**General Statistics**							
2387					Total Number of Observations	8					Number of Distinct Observations	8
2388											Number of Missing Observations	0
2389					Minimum	88.3					Mean	104.2
2390					Maximum	133					Median	102
2391					SD	14.13					Std. Error of Mean	4.995
2392					Coefficient of Variation	0.136					Skewness	1.213

2393												
2394	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2395	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2396	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2397	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2398												
2399	**Normal GOF Test**											
2400					Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk GOF Test**					
2401					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
2402					Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**					
2403					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
2404	**Data appear Normal at 5% Significance Level**											
2405												
2406	**Assuming Normal Distribution**											
2407				**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**				
2408					95% Student's-t UCL	113.7			95% Adjusted-CLT UCL (Chen-1995)	114.7		
2409									95% Modified-t UCL (Johnson-1978)	114		
2410												
2411	**Gamma GOF Test**											
2412					A-D Test Statistic	0.316	**Anderson-Darling Gamma GOF Test**					
2413					5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level					
2414					K-S Test Statistic	0.178	**Kolmogorov-Smirnov Gamma GOF Test**					
2415					5% K-S Critical Value	0.293	Detected data appear Gamma Distributed at 5% Significance Level					
2416	**Detected data appear Gamma Distributed at 5% Significance Level**											
2417												
2418	**Gamma Statistics**											
2419					k hat (MLE)	66.32			k star (bias corrected MLE)	41.53		
2420					Theta hat (MLE)	1.571			Theta star (bias corrected MLE)	2.509		
2421					nu hat (MLE)	1061			nu star (bias corrected)	664.5		
2422					MLE Mean (bias corrected)	104.2			MLE Sd (bias corrected)	16.17		
2423									Approximate Chi Square Value (0.05)	605.7		
2424					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	591.4		
2425												
2426	**Assuming Gamma Distribution**											
2427					95% Approximate Gamma UCL (use when n>=50))	114.3			95% Adjusted Gamma UCL (use when n<50)	117.1		
2428												
2429	**Lognormal GOF Test**											
2430					Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**					
2431					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
2432					Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**					
2433					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
2434	**Data appear Lognormal at 5% Significance Level**											
2435												
2436	**Lognormal Statistics**											
2437					Minimum of Logged Data	4.481			Mean of logged Data	4.639		
2438					Maximum of Logged Data	4.89			SD of logged Data	0.13		
2439												
2440	**Assuming Lognormal Distribution**											
2441					95% H-UCL	114.3			90% Chebyshev (MVUE) UCL	118.5		
2442					95% Chebyshev (MVUE) UCL	125			97.5% Chebyshev (MVUE) UCL	134		
2443					99% Chebyshev (MVUE) UCL	151.7						
2444												
2445	**Nonparametric Distribution Free UCL Statistics**											
2446	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2447												
2448	**Nonparametric Distribution Free UCLs**											
2449					95% CLT UCL	112.4			95% Jackknife UCL	113.7		

2450					95% Standard Bootstrap UCL	112					95% Bootstrap-t UCL	117
2451					95% Hall's Bootstrap UCL	121.1					95% Percentile Bootstrap UCL	112.5
2452					95% BCA Bootstrap UCL	114.4						
2453					90% Chebyshev(Mean, Sd) UCL	119.2					95% Chebyshev(Mean, Sd) UCL	126
2454					97.5% Chebyshev(Mean, Sd) UCL	135.4					99% Chebyshev(Mean, Sd) UCL	153.9
2455												
2456						**Suggested UCL to Use**						
2457					95% Student's-t UCL	113.7						
2458												
2459	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2460	Recommendations are based upon data size, data distribution, and skewness.											
2461	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2462	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2463												
2464												
2465	**Barium (smw8)**											
2466												
2467						**General Statistics**						
2468					Total Number of Observations	8					Number of Distinct Observations	7
2469											Number of Missing Observations	0
2470					Minimum	67					Mean	93.51
2471					Maximum	108					Median	95.85
2472					SD	13.76					Std. Error of Mean	4.864
2473					Coefficient of Variation	0.147					Skewness	-1.065
2474												
2475	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2476	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2477	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2478	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2479												
2480						**Normal GOF Test**						
2481					Shapiro Wilk Test Statistic	0.883					**Shapiro Wilk GOF Test**	
2482					5% Shapiro Wilk Critical Value	0.818					Data appear Normal at 5% Significance Level	
2483					Lilliefors Test Statistic	0.276					**Lilliefors GOF Test**	
2484					5% Lilliefors Critical Value	0.283					Data appear Normal at 5% Significance Level	
2485	**Data appear Normal at 5% Significance Level**											
2486												
2487						**Assuming Normal Distribution**						
2488						**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**
2489					95% Student's-t UCL	102.7					95% Adjusted-CLT UCL (Chen-1995)	99.56
2490											95% Modified-t UCL (Johnson-1978)	102.4
2491												
2492						**Gamma GOF Test**						
2493					A-D Test Statistic	0.563					**Anderson-Darling Gamma GOF Test**	
2494					5% A-D Critical Value	0.715					Detected data appear Gamma Distributed at 5% Significance Level	
2495					K-S Test Statistic	0.295					**Kolmogorov-Smirnov Gamma GOF Test**	
2496					5% K-S Critical Value	0.293					Data Not Gamma Distributed at 5% Significance Level	
2497	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
2498												
2499						**Gamma Statistics**						
2500					k hat (MLE)	47.7					k star (bias corrected MLE)	29.89
2501					Theta hat (MLE)	1.961					Theta star (bias corrected MLE)	3.128
2502					nu hat (MLE)	763.1					nu star (bias corrected)	478.3
2503					MLE Mean (bias corrected)	93.51					MLE Sd (bias corrected)	17.1
2504											Approximate Chi Square Value (0.05)	428.6
2505					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	416.6
2506												

2507	**Assuming Gamma Distribution**											
2508	95% Approximate Gamma UCL (use when n>=50))				104.4	95% Adjusted Gamma UCL (use when n<50)					107.4	
2509												
2510	**Lognormal GOF Test**											
2511	Shapiro Wilk Test Statistic				0.851	**Shapiro Wilk Lognormal GOF Test**						
2512	5% Shapiro Wilk Critical Value				0.818	Data appear Lognormal at 5% Significance Level						
2513	Lilliefors Test Statistic				0.3	**Lilliefors Lognormal GOF Test**						
2514	5% Lilliefors Critical Value				0.283	Data Not Lognormal at 5% Significance Level						
2515	**Data appear Approximate Lognormal at 5% Significance Level**											
2516												
2517	**Lognormal Statistics**											
2518	Minimum of Logged Data				4.205	Mean of logged Data					4.528	
2519	Maximum of Logged Data				4.682	SD of logged Data					0.159	
2520												
2521	**Assuming Lognormal Distribution**											
2522	95% H-UCL				105.1	90% Chebyshev (MVUE) UCL					109.4	
2523	95% Chebyshev (MVUE) UCL				116.6	97.5% Chebyshev (MVUE) UCL					126.5	
2524	99% Chebyshev (MVUE) UCL				146.1							
2525												
2526	**Nonparametric Distribution Free UCL Statistics**											
2527	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2528												
2529	**Nonparametric Distribution Free UCLs**											
2530	95% CLT UCL				101.5	95% Jackknife UCL					102.7	
2531	95% Standard Bootstrap UCL				101	95% Bootstrap-t UCL					100.8	
2532	95% Hall's Bootstrap UCL				99.86	95% Percentile Bootstrap UCL					100.6	
2533	95% BCA Bootstrap UCL				99.79							
2534	90% Chebyshev(Mean, Sd) UCL				108.1	95% Chebyshev(Mean, Sd) UCL					114.7	
2535	97.5% Chebyshev(Mean, Sd) UCL				123.9	99% Chebyshev(Mean, Sd) UCL					141.9	
2536												
2537	**Suggested UCL to Use**											
2538	95% Student's-t UCL				102.7							
2539												
2540	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2541	Recommendations are based upon data size, data distribution, and skewness.											
2542	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2543	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2544												
2545	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
2546	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
2547												
2548												
2549	**Barium (smw9)**											
2550												
2551	**General Statistics**											
2552	Total Number of Observations				9	Number of Distinct Observations					8	
2553						Number of Missing Observations					0	
2554	Minimum				37.4	Mean					47.02	
2555	Maximum				71.2	Median					44.6	
2556	SD				10.34	Std. Error of Mean					3.448	
2557	Coefficient of Variation				0.22	Skewness					1.816	
2558												
2559	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2560	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2561	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2562	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2563												

2564	**Normal GOF Test**											
2565					Shapiro Wilk Test Statistic	0.815	**Shapiro Wilk GOF Test**					
2566					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
2567					Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**					
2568					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
2569	**Data appear Approximate Normal at 5% Significance Level**											
2570												
2571	**Assuming Normal Distribution**											
2572				**95% Normal UCL**			**95% UCLs (Adjusted for Skewness)**					
2573					95% Student's-t UCL	53.43				95% Adjusted-CLT UCL (Chen-1995)	54.92	
2574										95% Modified-t UCL (Johnson-1978)	53.78	
2575												
2576	**Gamma GOF Test**											
2577					A-D Test Statistic	0.541	**Anderson-Darling Gamma GOF Test**					
2578					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
2579					K-S Test Statistic	0.227	**Kolmogorov-Smirnov Gamma GOF Test**					
2580					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
2581	**Detected data appear Gamma Distributed at 5% Significance Level**											
2582												
2583	**Gamma Statistics**											
2584					k hat (MLE)	27.12				k star (bias corrected MLE)	18.16	
2585					Theta hat (MLE)	1.734				Theta star (bias corrected MLE)	2.59	
2586					nu hat (MLE)	488.2				nu star (bias corrected)	326.8	
2587					MLE Mean (bias corrected)	47.02				MLE Sd (bias corrected)	11.04	
2588										Approximate Chi Square Value (0.05)	285.9	
2589					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	277.8	
2590												
2591	**Assuming Gamma Distribution**											
2592					95% Approximate Gamma UCL (use when n>=50))	53.75				95% Adjusted Gamma UCL (use when n<50)	55.31	
2593												
2594	**Lognormal GOF Test**											
2595					Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk Lognormal GOF Test**					
2596					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
2597					Lilliefors Test Statistic	0.216	**Lilliefors Lognormal GOF Test**					
2598					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
2599	**Data appear Lognormal at 5% Significance Level**											
2600												
2601	**Lognormal Statistics**											
2602					Minimum of Logged Data	3.622				Mean of logged Data	3.832	
2603					Maximum of Logged Data	4.265				SD of logged Data	0.197	
2604												
2605	**Assuming Lognormal Distribution**											
2606					95% H-UCL	53.76				90% Chebyshev (MVUE) UCL	56.25	
2607					95% Chebyshev (MVUE) UCL	60.46				97.5% Chebyshev (MVUE) UCL	66.3	
2608					99% Chebyshev (MVUE) UCL	77.77						
2609												
2610	**Nonparametric Distribution Free UCL Statistics**											
2611	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2612												
2613	**Nonparametric Distribution Free UCLs**											
2614					95% CLT UCL	52.69				95% Jackknife UCL	53.43	
2615					95% Standard Bootstrap UCL	52.43				95% Bootstrap-t UCL	59.33	
2616					95% Hall's Bootstrap UCL	82.92				95% Percentile Bootstrap UCL	52.78	
2617					95% BCA Bootstrap UCL	54.73						
2618					90% Chebyshev(Mean, Sd) UCL	57.37				95% Chebyshev(Mean, Sd) UCL	62.05	
2619					97.5% Chebyshev(Mean, Sd) UCL	68.55				99% Chebyshev(Mean, Sd) UCL	81.33	
2620												

	A	B	C	D	E	F	G	H	I	J	K	L
2621	**Suggested UCL to Use**											
2622					95% Student's-t UCL	53.43						
2623												
2624	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2625	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2626												
2627	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2628	Recommendations are based upon data size, data distribution, and skewness.											
2629	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2630	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2631												
2632												
2633	**Barium (tw2r)**											
2634												
2635	**General Statistics**											
2636					Total Number of Observations	9			Number of Distinct Observations	9		
2637									Number of Missing Observations	0		
2638					Minimum	15.6			Mean	47.39		
2639					Maximum	98.6			Median	35.5		
2640					SD	32.01			Std. Error of Mean	10.67		
2641					Coefficient of Variation	0.675			Skewness	0.461		
2642												
2643	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2644	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2645	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2646	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2647												
2648	**Normal GOF Test**											
2649					Shapiro Wilk Test Statistic	0.86			**Shapiro Wilk GOF Test**			
2650					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
2651					Lilliefors Test Statistic	0.23			**Lilliefors GOF Test**			
2652					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
2653	**Data appear Normal at 5% Significance Level**											
2654												
2655	**Assuming Normal Distribution**											
2656					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
2657					95% Student's-t UCL	67.23			95% Adjusted-CLT UCL (Chen-1995)	66.69		
2658									95% Modified-t UCL (Johnson-1978)	67.5		
2659												
2660	**Gamma GOF Test**											
2661					A-D Test Statistic	0.602			**Anderson-Darling Gamma GOF Test**			
2662					5% A-D Critical Value	0.729			Detected data appear Gamma Distributed at 5% Significance Level			
2663					K-S Test Statistic	0.233			**Kolmogorov-Smirnov Gamma GOF Test**			
2664					5% K-S Critical Value	0.282			Detected data appear Gamma Distributed at 5% Significance Level			
2665	**Detected data appear Gamma Distributed at 5% Significance Level**											
2666												
2667	**Gamma Statistics**											
2668					k hat (MLE)	2.325			k star (bias corrected MLE)	1.624		
2669					Theta hat (MLE)	20.38			Theta star (bias corrected MLE)	29.18		
2670					nu hat (MLE)	41.85			nu star (bias corrected)	29.23		
2671					MLE Mean (bias corrected)	47.39			MLE Sd (bias corrected)	37.19		
2672									Approximate Chi Square Value (0.05)	17.89		
2673					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	16.05		
2674												
2675	**Assuming Gamma Distribution**											
2676					95% Approximate Gamma UCL (use when n>=50))	77.43			95% Adjusted Gamma UCL (use when n<50)	86.33		
2677												

	A	B	C	D	E	F	G	H	I	J	K	L
2678	**Lognormal GOF Test**											
2679					Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk Lognormal GOF Test**					
2680					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
2681					Lilliefors Test Statistic	0.209	**Lilliefors Lognormal GOF Test**					
2682					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
2683	**Data appear Lognormal at 5% Significance Level**											
2684												
2685	**Lognormal Statistics**											
2686					Minimum of Logged Data	2.747			Mean of logged Data	3.628		
2687					Maximum of Logged Data	4.591			SD of logged Data	0.738		
2688												
2689	**Assuming Lognormal Distribution**											
2690					95% H-UCL	99.79			90% Chebyshev (MVUE) UCL	83.83		
2691					95% Chebyshev (MVUE) UCL	100.2			97.5% Chebyshev (MVUE) UCL	122.9		
2692					99% Chebyshev (MVUE) UCL	167.5						
2693												
2694	**Nonparametric Distribution Free UCL Statistics**											
2695	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2696												
2697	**Nonparametric Distribution Free UCLs**											
2698					95% CLT UCL	64.94			95% Jackknife UCL	67.23		
2699					95% Standard Bootstrap UCL	63.88			95% Bootstrap-t UCL	69.37		
2700					95% Hall's Bootstrap UCL	62.06			95% Percentile Bootstrap UCL	64.71		
2701					95% BCA Bootstrap UCL	65.38						
2702					90% Chebyshev(Mean, Sd) UCL	79.4			95% Chebyshev(Mean, Sd) UCL	93.89		
2703					97.5% Chebyshev(Mean, Sd) UCL	114			99% Chebyshev(Mean, Sd) UCL	153.5		
2704												
2705	**Suggested UCL to Use**											
2706					95% Student's-t UCL	67.23						
2707												
2708	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2709	Recommendations are based upon data size, data distribution, and skewness.											
2710	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2711	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2712												
2713												
2714	**Barium (tw5r)**											
2715												
2716	**General Statistics**											
2717					Total Number of Observations	8			Number of Distinct Observations	8		
2718									Number of Missing Observations	0		
2719					Minimum	19.4			Mean	68.5		
2720					Maximum	153			Median	50.35		
2721					SD	53.42			Std. Error of Mean	18.89		
2722					Coefficient of Variation	0.78			Skewness	0.596		
2723												
2724	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2725	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2726	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2727	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2728												
2729	**Normal GOF Test**											
2730					Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk GOF Test**					
2731					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
2732					Lilliefors Test Statistic	0.284	**Lilliefors GOF Test**					
2733					5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level					
2734	**Data appear Approximate Normal at 5% Significance Level**											

	A	B	C	D	E	F	G	H	I	J	K	L
2735												
2736	**Assuming Normal Distribution**											
2737	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2738	95% Student's-t UCL					104.3	95% Adjusted-CLT UCL (Chen-1995)					103.8
2739							95% Modified-t UCL (Johnson-1978)					104.9
2740												
2741	**Gamma GOF Test**											
2742	A-D Test Statistic					0.605	**Anderson-Darling Gamma GOF Test**					
2743	5% A-D Critical Value					0.726	Detected data appear Gamma Distributed at 5% Significance Level					
2744	K-S Test Statistic					0.294	**Kolmogorov-Smirnov Gamma GOF Test**					
2745	5% K-S Critical Value					0.298	Detected data appear Gamma Distributed at 5% Significance Level					
2746	**Detected data appear Gamma Distributed at 5% Significance Level**											
2747												
2748	**Gamma Statistics**											
2749	k hat (MLE)					1.765	k star (bias corrected MLE)					1.186
2750	Theta hat (MLE)					38.82	Theta star (bias corrected MLE)					57.75
2751	nu hat (MLE)					28.23	nu star (bias corrected)					18.98
2752	MLE Mean (bias corrected)					68.5	MLE Sd (bias corrected)					62.89
2753							Approximate Chi Square Value (0.05)					10.1
2754	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					8.514
2755												
2756	**Assuming Gamma Distribution**											

2757	95% Approximate Gamma UCL (use when n>=50))					128.7	95% Adjusted Gamma UCL (use when n<50)					152.7
2758												
2759	**Lognormal GOF Test**											
2760	Shapiro Wilk Test Statistic					0.852	**Shapiro Wilk Lognormal GOF Test**					
2761	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
2762	Lilliefors Test Statistic					0.27	**Lilliefors Lognormal GOF Test**					
2763	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
2764	**Data appear Lognormal at 5% Significance Level**											
2765												
2766	**Lognormal Statistics**											
2767	Minimum of Logged Data					2.965	Mean of logged Data					3.917
2768	Maximum of Logged Data					5.03	SD of logged Data					0.865
2769												
2770	**Assuming Lognormal Distribution**											
2771	95% H-UCL					201.5	90% Chebyshev (MVUE) UCL					133.6
2772	95% Chebyshev (MVUE) UCL					162.8	97.5% Chebyshev (MVUE) UCL					203.4
2773	99% Chebyshev (MVUE) UCL					283.1						
2774												
2775	**Nonparametric Distribution Free UCL Statistics**											
2776	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2777												
2778	**Nonparametric Distribution Free UCLs**											
2779	95% CLT UCL					99.57	95% Jackknife UCL					104.3
2780	95% Standard Bootstrap UCL					98.44	95% Bootstrap-t UCL					114
2781	95% Hall's Bootstrap UCL					99.25	95% Percentile Bootstrap UCL					97.73
2782	95% BCA Bootstrap UCL					101						
2783	90% Chebyshev(Mean, Sd) UCL					125.2	95% Chebyshev(Mean, Sd) UCL					150.8
2784	97.5% Chebyshev(Mean, Sd) UCL					186.5	99% Chebyshev(Mean, Sd) UCL					256.4
2785												
2786	**Suggested UCL to Use**											
2787	95% Student's-t UCL					104.3						
2788												
2789	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2790	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2791												
2792	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2793	Recommendations are based upon data size, data distribution, and skewness.											
2794	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2795	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2796												
2797												
2798	**Barium (waste water clarifier well)**											
2799												
2800	**General Statistics**											
2801	Total Number of Observations					1	Number of Distinct Observations					1
2802							Number of Missing Observations					0
2803	Minimum					291	Mean					291
2804	Maximum					291	Median					291
2805												
2806	**Warning: This data set only has 1 observations!**											
2807	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
2808	**The data set for variable Barium (waste water clarifier well) was not processed!**											
2809												
2810	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
2811	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											

	A	B	C	D	E	F	G	H	I	J	K	L	M
1				General Statistics on Uncensored Data									
2			Date/Time of Computation	ProUCL 5.15/10/2021 11:30:24 AM									
3			User Selected Options										
4			From File	OU3 ProUCL Input 05.07.2021.xls									
5			Full Precision	OFF									
6													
7	From File: OU3 ProUCL Input 05.07.2021.xls												
8													
9				General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method									
10													
11		Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
12		Beryllium (atmw6)	8	0	0	8	100.00%	0.054	0.27	N/A	N/A	N/A	N/A
13		Beryllium (nfmw10)	7	0	1	6	85.71%	0.054	1.1	0.073	0.00108	0.0329	0.451
14		Beryllium (nfmw11)	7	0	0	7	100.00%	0.054	2.7	N/A	N/A	N/A	N/A
15		Beryllium (nfmw12)	7	0	1	6	85.71%	0.05	0.27	0.0516	1.0240E-5	0.0032	0.062
16		Beryllium (nfmw19)	7	0	6	1	14.29%	1.1	1.1	1.742	2.605	1.614	0.927
17		Beryllium (nfmw1d)	8	0	5	3	37.50%	0.13	1.1	0.0906	4.7664E-4	0.0218	0.241
18		Beryllium (nfmw1s)	7	0	1	6	85.71%	0.054	1.1	0.0603	8.0222E-5	0.00896	0.148
19		Beryllium (nfmw2)	8	0	1	7	87.50%	0.054	1.1	0.0575	6.1250E-5	0.00783	0.136
20		Beryllium (nfmw20)	7	0	0	7	100.00%	0.054	1.1	N/A	N/A	N/A	N/A
21		Beryllium (nfmw22)	4	0	2	2	50.00%	0.27	0.27	0.0965	1.8225E-4	0.0135	0.14
22		Beryllium (nfmw23)	4	0	2	2	50.00%	0.27	0.27	0.062	1.0000E-6	0.001	0.0161
23		Beryllium (nfmw3)	8	0	5	3	37.50%	0.27	1.1	0.101	7.3336E-4	0.0271	0.269
24		Beryllium (nfmw4)	8	0	1	7	87.50%	0.05	1.1	0.0538	7.3472E-5	0.00857	0.159
25		Beryllium (nfmw7)	8	0	2	6	75.00%	0.054	0.27	0.0578	4.2639E-5	0.00653	0.113
26		Beryllium (nfmw8)	7	0	4	3	42.86%	0.054	1.1	0.071	1.5680E-4	0.0125	0.176
27		Beryllium (nfmw9)	7	0	3	4	57.14%	0.12	1.1	0.217	0.0079	0.0889	0.41
28		Beryllium (smw10)	7	0	0	7	100.00%	0.05	1.1	N/A	N/A	N/A	N/A
29		Beryllium (smw11)	8	0	2	6	75.00%	0.054	1.1	0.0783	6.1619E-4	0.0248	0.317
30		Beryllium (smw12)	7	0	1	6	85.71%	0.054	1.1	0.056	8.0000E-6	0.00283	0.0505
31		Beryllium (smw13)	7	0	0	7	100.00%	0.054	1.1	N/A	N/A	N/A	N/A
32		Beryllium (smw14)	7	0	0	7	100.00%	0.054	1.1	N/A	N/A	N/A	N/A
33		Beryllium (smw15)	8	0	8	0	0.00%	N/A	N/A	1.998	1.447	1.203	0.602
34		Beryllium (smw16)	8	0	2	6	75.00%	0.2	1.1	0.16	1.0000E-4	0.01	0.0625
35		Beryllium (smw16d)	7	0	0	7	100.00%	0.05	1.1	N/A	N/A	N/A	N/A
36		Beryllium (smw17)	7	0	3	4	57.14%	0.27	1.1	0.287	0.139	0.373	1.298
37		Beryllium (smw17d)	7	0	0	7	100.00%	0.05	1.1	N/A	N/A	N/A	N/A
38		Beryllium (smw18)	7	0	2	5	71.43%	0.075	1.1	0.0677	8.8889E-5	0.00943	0.139
39		Beryllium (smw18d)	7	0	0	7	100.00%	0.05	1.1	N/A	N/A	N/A	N/A
40		Beryllium (smw19)	7	0	0	7	100.00%	0.054	2.7	N/A	N/A	N/A	N/A
41		Beryllium (smw7)	7	0	0	7	100.00%	0.05	1.1	N/A	N/A	N/A	N/A
42		Beryllium (smw8)	7	0	0	7	100.00%	0.05	1.1	N/A	N/A	N/A	N/A
43		Beryllium (smw9)	8	0	0	8	100.00%	0.054	1.1	N/A	N/A	N/A	N/A
44		Beryllium (tw2r)	8	0	0	8	100.00%	0.05	0.27	N/A	N/A	N/A	N/A
45		Beryllium (tw5r)	7	0	1	6	85.71%	0.05	1.1	0.0516	1.0240E-5	0.0032	0.062
46		Beryllium (waste water clarifier well)	1	0	0	1	100.00%	0.054	0.054	N/A	N/A	N/A	N/A
47													
48				General Statistics for Raw Data Sets using Detected Data Only									
49													
50		Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
51		Beryllium (atmw6)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
52		Beryllium (nfmw10)	1	0	0.13	0.13	0.13	0.13	N/A	N/A	0	N/A	N/A
53		Beryllium (nfmw11)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
54		Beryllium (nfmw12)	1	0	0.058	0.058	0.058	0.058	N/A	N/A	0	N/A	N/A
55		Beryllium (nfmw19)	6	0	0.32	4.7	1.937	1.11	3.322	1.823	0.904	0.916	0.941
56		Beryllium (nfmw1d)	5	0	0.057	0.12	0.0906	0.1	5.9580E-4	0.0244	0.0297	-0.4	0.269
57		Beryllium (nfmw1s)	1	0	0.073	0.073	0.073	0.073	N/A	N/A	0	N/A	N/A
58		Beryllium (nfmw2)	1	0	0.075	0.075	0.075	0.075	N/A	N/A	0	N/A	N/A
59		Beryllium (nfmw20)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
60		Beryllium (nfmw22)	2	0	0.083	0.11	0.0965	0.0965	3.6450E-4	0.0191	0.02	N/A	0.198
61		Beryllium (nfmw23)	2	0	0.061	0.063	0.062	0.062	2.0000E-6	0.00141	0.00148	N/A	0.0228
62		Beryllium (nfmw3)	5	0	0.078	0.15	0.101	0.085	9.1670E-4	0.0303	0.0104	1.446	0.3

	A	B	C	D	E	F	G	H	I	J	K	L	M
63		Beryllium (nfmw4)	1	0	0.073	0.073	0.073	0.073	N/A	N/A	0	N/A	N/A
64		Beryllium (nfmw7)	2	0	0.058	0.072	0.065	0.065	9.8000E-5	0.0099	0.0104	N/A	0.152
65		Beryllium (nfmw8)	4	0	0.061	0.09	0.0753	0.075	1.4092E-4	0.0119	0.0111	0.125	0.158
66		Beryllium (nfmw9)	3	0	0.19	0.37	0.28	0.28	0.0081	0.09	0.133	-2.68E-15	0.321
67		Beryllium (smw10)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
68		Beryllium (smw11)	2	0	0.095	0.11	0.103	0.103	1.1250E-4	0.0106	0.0111	N/A	0.103
69		Beryllium (smw12)	1	0	0.06	0.06	0.06	0.06	N/A	N/A	0	N/A	N/A
70		Beryllium (smw13)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
71		Beryllium (smw14)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
72		Beryllium (smw15)	8	0	0.24	3.5	1.998	2.15	1.447	1.203	1.26	-0.351	0.602
73		Beryllium (smw16)	2	0	0.15	0.17	0.16	0.16	2.0000E-4	0.0141	0.0148	N/A	0.0884
74		Beryllium (smw16d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
75		Beryllium (smw17)	3	0	0.13	1.2	0.49	0.14	0.378	0.615	0.0148	1.732	1.255
76		Beryllium (smw17d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
77		Beryllium (smw18)	2	0	0.061	0.081	0.071	0.071	2.0000E-4	0.0141	0.0148	N/A	0.199
78		Beryllium (smw18d)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
79		Beryllium (smw19)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
80		Beryllium (smw7)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
81		Beryllium (smw8)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
82		Beryllium (smw9)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
83		Beryllium (tw2r)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
84		Beryllium (tw5r)	1	0	0.058	0.058	0.058	0.058	N/A	N/A	0	N/A	N/A
85		Beryllium (waste water clarifier well)	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
86													
87		**Percentiles using all Detects (Ds) and Non-Detects (NDs)**											
88													
89		**Variable**	**NumObs**	**# Missing**	**10%ile**	**20%ile**	**25%ile(Q1)**	**50%ile(Q2)**	**75%ile(Q3)**	**80%ile**	**90%ile**	**95%ile**	**99%ile**
90		Beryllium (atmw6)	8	0	0.054	0.054	0.054	0.059	0.117	0.188	0.27	0.27	0.27
91		Beryllium (nfmw10)	7	0	0.054	0.054	0.054	0.13	0.295	0.31	0.632	0.866	1.053
92		Beryllium (nfmw11)	7	0	0.054	0.054	0.054	0.064	0.685	0.934	1.74	2.22	2.604
93		Beryllium (nfmw12)	7	0	0.0524	0.054	0.054	0.054	0.061	0.0628	0.146	0.208	0.258
94		Beryllium (nfmw19)	7	0	0.536	0.688	0.7	1.1	2.6	3.26	4.1	4.4	4.64
95		Beryllium (nfmw1d)	8	0	0.0703	0.0856	0.094	0.11	0.373	0.712	1.1	1.1	1.1
96		Beryllium (nfmw1s)	7	0	0.0612	0.0674	0.0695	0.11	0.27	0.27	0.602	0.851	1.05
97		Beryllium (nfmw2)	8	0	0.054	0.054	0.054	0.059	0.331	0.69	1.1	1.1	1.1
98		Beryllium (nfmw20)	7	0	0.054	0.056	0.059	0.27	0.27	0.27	0.602	0.851	1.05
99		Beryllium (nfmw22)	4	0	0.0911	0.0992	0.103	0.19	0.27	0.27	0.27	0.27	0.27
100		Beryllium (nfmw23)	4	0	0.0616	0.0622	0.0625	0.167	0.27	0.27	0.27	0.27	0.27
101		Beryllium (nfmw3)	8	0	0.0801	0.0826	0.084	0.13	0.283	0.3	0.554	0.827	1.045
102		Beryllium (nfmw4)	8	0	0.0528	0.054	0.054	0.065	0.0793	0.088	0.399	0.749	1.03
103		Beryllium (nfmw7)	8	0	0.054	0.054	0.054	0.061	0.122	0.191	0.27	0.27	0.27
104		Beryllium (nfmw8)	7	0	0.0582	0.0636	0.0675	0.076	0.595	0.898	1.1	1.1	1.1
105		Beryllium (nfmw9)	7	0	0.162	0.206	0.23	0.28	0.345	0.36	0.662	0.881	1.056
106		Beryllium (smw10)	7	0	0.0524	0.054	0.054	0.054	0.132	0.173	0.56	0.83	1.046
107		Beryllium (smw11)	8	0	0.054	0.0704	0.0848	0.19	0.283	0.3	0.554	0.827	1.045
108		Beryllium (smw12)	7	0	0.054	0.0552	0.057	0.063	0.295	0.31	0.632	0.866	1.053
109		Beryllium (smw13)	7	0	0.054	0.054	0.054	0.27	0.295	0.31	0.632	0.866	1.053
110		Beryllium (smw14)	7	0	0.054	0.054	0.054	0.064	0.27	0.27	0.602	0.851	1.05
111		Beryllium (smw15)	8	0	0.45	0.884	1.185	2.15	3	3	3.15	3.325	3.465
112		Beryllium (smw16)	8	0	0.164	0.182	0.193	0.295	0.383	0.456	0.708	0.904	1.061
113		Beryllium (smw16d)	7	0	0.0524	0.054	0.054	0.054	0.059	0.062	0.478	0.789	1.038
114		Beryllium (smw17)	7	0	0.136	0.166	0.205	0.27	0.71	0.944	1.14	1.17	1.194
115		Beryllium (smw17d)	7	0	0.0524	0.054	0.054	0.054	0.059	0.062	0.478	0.789	1.038
116		Beryllium (smw18)	7	0	0.0694	0.0762	0.078	0.27	0.71	0.944	1.1	1.1	1.1
117		Beryllium (smw18d)	7	0	0.0524	0.054	0.054	0.054	0.059	0.062	0.478	0.789	1.038
118		Beryllium (smw19)	7	0	0.06	0.105	0.167	0.27	0.685	0.934	1.74	2.22	2.604
119		Beryllium (smw7)	7	0	0.0524	0.054	0.054	0.054	0.059	0.062	0.478	0.789	1.038
120		Beryllium (smw8)	7	0	0.0524	0.054	0.054	0.054	0.059	0.062	0.478	0.789	1.038
121		Beryllium (smw9)	8	0	0.054	0.054	0.054	0.059	0.117	0.188	0.519	0.81	1.042
122		Beryllium (tw2r)	8	0	0.0528	0.054	0.054	0.059	0.117	0.188	0.27	0.27	0.27
123		Beryllium (tw5r)	7	0	0.0524	0.054	0.054	0.054	0.061	0.0628	0.478	0.789	1.038
124		Beryllium (waste water clarifier well)	1	0	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:10:39 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Beryllium (atmw6)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	4
Number of Detects	0	Number of Non-Detects	8
Number of Distinct Detects	0	Number of Distinct Non-Detects	4

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium (atmw6) was not processed!

Beryllium (nfmw10)

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	1	Number of Non-Detects	6
Number of Distinct Detects	1	Number of Distinct Non-Detects	4

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium (nfmw10) was not processed!

Beryllium (nfmw11)

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	7
Number of Distinct Detects	0	Number of Distinct Non-Detects	5

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium (nfmw11) was not processed!

Beryllium (nfmw12)

53	**General Statistics**											
54					Total Number of Observations	7			Number of Distinct Observations	5		
55					Number of Detects	1			Number of Non-Detects	6		
56					Number of Distinct Detects	1			Number of Distinct Non-Detects	4		
57												
58	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
59	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
60												
61	**The data set for variable Beryllium (nfmw12) was not processed!**											
62												
63												
64	**Beryllium (nfmw19)**											
65												
66	**General Statistics**											
67					Total Number of Observations	7			Number of Distinct Observations	7		
68					Number of Detects	6			Number of Non-Detects	1		
69					Number of Distinct Detects	6			Number of Distinct Non-Detects	1		
70					Minimum Detect	0.32			Minimum Non-Detect	1.1		
71					Maximum Detect	4.7			Maximum Non-Detect	1.1		
72					Variance Detects	3.322			Percent Non-Detects	14.29%		
73					Mean Detects	1.937			SD Detects	1.823		
74					Median Detects	1.11			CV Detects	0.941		
75					Skewness Detects	0.916			Kurtosis Detects	-1.205		
76					Mean of Logged Detects	0.235			SD of Logged Detects	1.048		
77												
78	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
79	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
80	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
81	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
82												
83	**Normal GOF Test on Detects Only**											
84					Shapiro Wilk Test Statistic	0.839			**Shapiro Wilk GOF Test**			
85					5% Shapiro Wilk Critical Value	0.788			Detected Data appear Normal at 5% Significance Level			
86					Lilliefors Test Statistic	0.261			**Lilliefors GOF Test**			
87					5% Lilliefors Critical Value	0.325			Detected Data appear Normal at 5% Significance Level			
88	**Detected Data appear Normal at 5% Significance Level**											
89												
90	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
91					KM Mean	1.742			KM Standard Error of Mean	0.669		
92					KM SD	1.614			95% KM (BCA) UCL	2.809		
93					95% KM (t) UCL	3.042			95% KM (Percentile Bootstrap) UCL	2.814		
94					95% KM (z) UCL	2.842			95% KM Bootstrap t UCL	5.971		
95					90% KM Chebyshev UCL	3.749			95% KM Chebyshev UCL	4.658		
96					97.5% KM Chebyshev UCL	5.92			99% KM Chebyshev UCL	8.399		
97												
98	**Gamma GOF Tests on Detected Observations Only**											
99					A-D Test Statistic	0.366			**Anderson-Darling GOF Test**			
100					5% A-D Critical Value	0.711			Detected data appear Gamma Distributed at 5% Significance Level			
101					K-S Test Statistic	0.247			**Kolmogorov-Smirnov GOF**			
102					5% K-S Critical Value	0.339			Detected data appear Gamma Distributed at 5% Significance Level			
103	**Detected data appear Gamma Distributed at 5% Significance Level**											
104												

105	**Gamma Statistics on Detected Data Only**											
106					k hat (MLE)	1.314			k star (bias corrected MLE)			0.768
107					Theta hat (MLE)	1.473			Theta star (bias corrected MLE)			2.521
108					nu hat (MLE)	15.77			nu star (bias corrected)			9.22
109					Mean (detects)	1.937						
110												
111	**Gamma ROS Statistics using Imputed Non-Detects**											
112	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
113	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
114	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
115	This is especially true when the sample size is small.											
116	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
117					Minimum	0.32			Mean			1.73
118					Maximum	4.7			Median			0.72
119					SD	1.751			CV			1.012
120					k hat (MLE)	1.254			k star (bias corrected MLE)			0.812
121					Theta hat (MLE)	1.379			Theta star (bias corrected MLE)			2.131
122					nu hat (MLE)	17.56			nu star (bias corrected)			11.37
123					Adjusted Level of Significance (β)	0.0158						
124					Approximate Chi Square Value (11.37, α)	4.814			Adjusted Chi Square Value (11.37, β)			3.611
125					95% Gamma Approximate UCL (use when n>=50)	4.086			95% Gamma Adjusted UCL (use when n<50)			5.446
126												
127	**Estimates of Gamma Parameters using KM Estimates**											
128					Mean (KM)	1.742			SD (KM)			1.614
129					Variance (KM)	2.605			SE of Mean (KM)			0.669
130					k hat (KM)	1.165			k star (KM)			0.761
131					nu hat (KM)	16.31			nu star (KM)			10.65
132					theta hat (KM)	1.495			theta star (KM)			2.289
133					80% gamma percentile (KM)	2.854			90% gamma percentile (KM)			4.287
134					95% gamma percentile (KM)	5.754			99% gamma percentile (KM)			9.231
135												
136	**Gamma Kaplan-Meier (KM) Statistics**											
137					Approximate Chi Square Value (10.65, α)	4.353			Adjusted Chi Square Value (10.65, β)			3.224
138					95% Gamma Approximate KM-UCL (use when n>=50)	4.262			95% Gamma Adjusted KM-UCL (use when n<50)			5.756
139												
140	**Lognormal GOF Test on Detected Observations Only**											
141					Shapiro Wilk Test Statistic	0.936			**Shapiro Wilk GOF Test**			
142					5% Shapiro Wilk Critical Value	0.788			Detected Data appear Lognormal at 5% Significance Level			
143					Lilliefors Test Statistic	0.204			**Lilliefors GOF Test**			
144					5% Lilliefors Critical Value	0.325			Detected Data appear Lognormal at 5% Significance Level			
145	**Detected Data appear Lognormal at 5% Significance Level**											
146												
147	**Lognormal ROS Statistics Using Imputed Non-Detects**											
148					Mean in Original Scale	1.741			Mean in Log Scale			0.12
149					SD in Original Scale	1.742			SD in Log Scale			1.004
150					95% t UCL (assumes normality of ROS data)	3.021			95% Percentile Bootstrap UCL			2.789
151					95% BCA Bootstrap UCL	2.906			95% Bootstrap t UCL			6.353
152					95% H-UCL (Log ROS)	8.534						
153												
154	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
155					KM Mean (logged)	0.113			KM Geo Mean			1.119
156					KM SD (logged)	0.945			95% Critical H Value (KM-Log)			3.544

157	KM Standard Error of Mean (logged)					0.397				95% H-UCL (KM -Log)		6.872
158	KM SD (logged)					0.945				95% Critical H Value (KM-Log)		3.544
159	KM Standard Error of Mean (logged)					0.397						
160												
161	**DL/2 Statistics**											
162	**DL/2 Normal**						**DL/2 Log-Transformed**					
163	Mean in Original Scale					1.739	Mean in Log Scale					0.116
164	SD in Original Scale					1.744	SD in Log Scale					1.007
165	95% t UCL (Assumes normality)					3.02	95% H-Stat UCL					8.609
166	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
167												
168	**Nonparametric Distribution Free UCL Statistics**											
169	**Detected Data appear Normal Distributed at 5% Significance Level**											
170												
171	**Suggested UCL to Use**											
172	95% KM (t) UCL					3.042						
173												
174	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
175	Recommendations are based upon data size, data distribution, and skewness.											
176	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
177	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
178												
179	**Beryllium (nfmw1d)**											
180												
181	**General Statistics**											
182	Total Number of Observations					8	Number of Distinct Observations					6
183	Number of Detects					5	Number of Non-Detects					3
184	Number of Distinct Detects					4	Number of Distinct Non-Detects					2
185	Minimum Detect					0.057	Minimum Non-Detect					0.13
186	Maximum Detect					0.12	Maximum Non-Detect					1.1
187	Variance Detects					5.9580E-4	Percent Non-Detects					37.5%
188	Mean Detects					0.0906	SD Detects					0.0244
189	Median Detects					0.1	CV Detects					0.269
190	Skewness Detects					-0.4	Kurtosis Detects					-0.666
191	Mean of Logged Detects					-2.433	SD of Logged Detects					0.291
192												
193	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
194	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
195	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
196	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
197												
198	**Normal GOF Test on Detects Only**											
199	Shapiro Wilk Test Statistic					0.953	**Shapiro Wilk GOF Test**					
200	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Normal at 5% Significance Level					
201	Lilliefors Test Statistic					0.25	**Lilliefors GOF Test**					
202	5% Lilliefors Critical Value					0.343	Detected Data appear Normal at 5% Significance Level					
203	**Detected Data appear Normal at 5% Significance Level**											
204												
205	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
206	KM Mean					0.0906	KM Standard Error of Mean					0.0109
207	KM SD					0.0218	95% KM (BCA) UCL					N/A
208	95% KM (t) UCL					0.111	95% KM (Percentile Bootstrap) UCL					N/A

209				95% KM (z) UCL	0.109					95% KM Bootstrap t UCL		N/A
210				90% KM Chebyshev UCL	0.123					95% KM Chebyshev UCL		0.138
211				97.5% KM Chebyshev UCL	0.159					99% KM Chebyshev UCL		0.199
212												
213				**Gamma GOF Tests on Detected Observations Only**								
214				A-D Test Statistic	0.317	**Anderson-Darling GOF Test**						
215				5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level						
216				K-S Test Statistic	0.285	**Kolmogorov-Smirnov GOF**						
217				5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level						
218				**Detected data appear Gamma Distributed at 5% Significance Level**								
219												
220				**Gamma Statistics on Detected Data Only**								
221				k hat (MLE)	15.73	k star (bias corrected MLE)	6.424					
222				Theta hat (MLE)	0.00576	Theta star (bias corrected MLE)	0.0141					
223				nu hat (MLE)	157.3	nu star (bias corrected)	64.24					
224				Mean (detects)	0.0906							
225												
226				**Gamma ROS Statistics using Imputed Non-Detects**								
227				GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs								
228				GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)								
229				For such situations, GROS method may yield incorrect values of UCLs and BTVs								
230				This is especially true when the sample size is small.								
231				For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates								
232				Minimum	0.057	Mean	0.0903					
233				Maximum	0.12	Median	0.0947					
234				SD	0.0198	CV	0.22					
235				k hat (MLE)	21.93	k star (bias corrected MLE)	13.79					
236				Theta hat (MLE)	0.00412	Theta star (bias corrected MLE)	0.00655					
237				nu hat (MLE)	350.9	nu star (bias corrected)	220.7					
238				Adjusted Level of Significance (β)	0.0195							
239				Approximate Chi Square Value (220.66, α)	187.3	Adjusted Chi Square Value (220.66, β)	179.5					
240				95% Gamma Approximate UCL (use when n>=50)	0.106	95% Gamma Adjusted UCL (use when n<50)	0.111					
241												
242				**Estimates of Gamma Parameters using KM Estimates**								
243				Mean (KM)	0.0906	SD (KM)	0.0218					
244				Variance (KM)	4.7664E-4	SE of Mean (KM)	0.0109					
245				k hat (KM)	17.22	k star (KM)	10.85					
246				nu hat (KM)	275.5	nu star (KM)	173.5					
247				theta hat (KM)	0.00526	theta star (KM)	0.00835					
248				80% gamma percentile (KM)	0.113	90% gamma percentile (KM)	0.127					
249				95% gamma percentile (KM)	0.14	99% gamma percentile (KM)	0.167					
250												
251				**Gamma Kaplan-Meier (KM) Statistics**								
252				Approximate Chi Square Value (173.55, α)	144.1	Adjusted Chi Square Value (173.55, β)	137.3					
253				95% Gamma Approximate KM-UCL (use when n>=50)	0.109	95% Gamma Adjusted KM-UCL (use when n<50)	0.115					
254												
255				**Lognormal GOF Test on Detected Observations Only**								
256				Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**						
257				5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level						
258				Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**						
259				5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level						
260				**Detected Data appear Lognormal at 5% Significance Level**								

261												
262	**Lognormal ROS Statistics Using Imputed Non-Detects**											
263					Mean in Original Scale	0.0898			Mean in Log Scale	-2.433		
264					SD in Original Scale	0.02			SD in Log Scale	0.236		
265					95% t UCL (assumes normality of ROS data)	0.103			95% Percentile Bootstrap UCL	0.1		
266					95% BCA Bootstrap UCL	0.0999			95% Bootstrap t UCL	0.102		
267					95% H-UCL (Log ROS)	0.108						
268												
269	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
270					KM Mean (logged)	-2.433			KM Geo Mean	0.0877		
271					KM SD (logged)	0.26			95% Critical H Value (KM-Log)	2.01		
272					KM Standard Error of Mean (logged)	0.13			95% H-UCL (KM -Log)	0.111		
273					KM SD (logged)	0.26			95% Critical H Value (KM-Log)	2.01		
274					KM Standard Error of Mean (logged)	0.13						
275												
276	**DL/2 Statistics**											
277					**DL/2 Normal**				**DL/2 Log-Transformed**			
278					Mean in Original Scale	0.202			Mean in Log Scale	-2.012		
279					SD in Original Scale	0.216			SD in Log Scale	0.906		
280					95% t UCL (Assumes normality)	0.347			95% H-Stat UCL	0.603		
281	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
282												
283	**Nonparametric Distribution Free UCL Statistics**											
284	**Detected Data appear Normal Distributed at 5% Significance Level**											
285												
286	**Suggested UCL to Use**											
287					95% KM (t) UCL	0.111						
288												
289	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
290	Recommendations are based upon data size, data distribution, and skewness.											
291	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
292	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
293												
294	**Beryllium (nfmw1s)**											
295												
296	**General Statistics**											
297					Total Number of Observations	7			Number of Distinct Observations	6		
298					Number of Detects	1			Number of Non-Detects	6		
299					Number of Distinct Detects	1			Number of Distinct Non-Detects	5		
300												
301	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
302	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
303												
304	**The data set for variable Beryllium (nfmw1s) was not processed!**											
305												
306												
307	**Beryllium (nfmw2)**											
308												
309	**General Statistics**											
310					Total Number of Observations	8			Number of Distinct Observations	4		
311					Number of Detects	1			Number of Non-Detects	7		
312					Number of Distinct Detects	1			Number of Distinct Non-Detects	3		

	A	B	C	D	E	F	G	H	I	J	K	L
313												
314	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
315	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
316												
317	**The data set for variable Beryllium (nfmw2) was not processed!**											
318												
319												
320	**Beryllium (nfmw20)**											
321												
322	**General Statistics**											
323					Total Number of Observations	7			Number of Distinct Observations	4		
324					Number of Detects	0			Number of Non-Detects	7		
325					Number of Distinct Detects	0			Number of Distinct Non-Detects	4		
326												
327	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
328	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
329	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
330												
331	**The data set for variable Beryllium (nfmw20) was not processed!**											
332												
333												
334	**Beryllium (nfmw22)**											
335												
336	**General Statistics**											
337					Total Number of Observations	4			Number of Distinct Observations	3		
338					Number of Detects	2			Number of Non-Detects	2		
339					Number of Distinct Detects	2			Number of Distinct Non-Detects	1		
340					Minimum Detect	0.083			Minimum Non-Detect	0.27		
341					Maximum Detect	0.11			Maximum Non-Detect	0.27		
342					Variance Detects	3.6450E-4			Percent Non-Detects	50%		
343					Mean Detects	0.0965			SD Detects	0.0191		
344					Median Detects	0.0965			CV Detects	0.198		
345					Skewness Detects	N/A			Kurtosis Detects	N/A		
346					Mean of Logged Detects	-2.348			SD of Logged Detects	0.199		
347												
348	**Warning: Data set has only 2 Detected Values.**											
349	**This is not enough to compute meaningful or reliable statistics and estimates.**											
350												
351												
352	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
353	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
354	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
355	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
356												
357	**Normal GOF Test on Detects Only**											
358	**Not Enough Data to Perform GOF Test**											
359												
360	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
361					KM Mean	0.0965			KM Standard Error of Mean	0.0135		
362					KM SD	0.0135			95% KM (BCA) UCL	N/A		
363					95% KM (t) UCL	0.128			95% KM (Percentile Bootstrap) UCL	N/A		
364					95% KM (z) UCL	0.119			95% KM Bootstrap t UCL	N/A		

	A	B	C	D	E	F	G	H	I	J	K	L
365					90% KM Chebyshev UCL	0.137				95% KM Chebyshev UCL		0.155
366					97.5% KM Chebyshev UCL	0.181				99% KM Chebyshev UCL		0.231
367												
368	**Gamma GOF Tests on Detected Observations Only**											
369	**Not Enough Data to Perform GOF Test**											
370												
371	**Gamma Statistics on Detected Data Only**											
372					k hat (MLE)	50.76				k star (bias corrected MLE)		N/A
373					Theta hat (MLE)	0.0019				Theta star (bias corrected MLE)		N/A
374					nu hat (MLE)	203				nu star (bias corrected)		N/A
375					Mean (detects)	0.0965						
376												
377	**Estimates of Gamma Parameters using KM Estimates**											
378					Mean (KM)	0.0965				SD (KM)		0.0135
379					Variance (KM)	1.8225E-4				SE of Mean (KM)		0.0135
380					k hat (KM)	51.1				k star (KM)		12.94
381					nu hat (KM)	408.8				nu star (KM)		103.5
382					theta hat (KM)	0.00189				theta star (KM)		0.00746
383					80% gamma percentile (KM)	0.118				90% gamma percentile (KM)		0.132
384					95% gamma percentile (KM)	0.144				99% gamma percentile (KM)		0.17
385												
386	**Gamma Kaplan-Meier (KM) Statistics**											
387										Adjusted Level of Significance (β)		0.00498
388					Approximate Chi Square Value (103.53, α)	81.05				Adjusted Chi Square Value (103.53, β)		70.2
389					95% Gamma Approximate KM-UCL (use when n>=50)	0.123				95% Gamma Adjusted KM-UCL (use when n<50)		0.142
390												
391	**Lognormal GOF Test on Detected Observations Only**											
392	**Not Enough Data to Perform GOF Test**											
393												
394	**Lognormal ROS Statistics Using Imputed Non-Detects**											
395					Mean in Original Scale	0.0965				Mean in Log Scale		-2.348
396					SD in Original Scale	0.0156				SD in Log Scale		0.163
397					95% t UCL (assumes normality of ROS data)	0.115				95% Percentile Bootstrap UCL		N/A
398					95% BCA Bootstrap UCL	N/A				95% Bootstrap t UCL		N/A
399					95% H-UCL (Log ROS)	0.121						
400												
401	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
402					KM Mean (logged)	-2.348				KM Geo Mean		0.0956
403					KM SD (logged)	0.141				95% Critical H Value (KM-Log)		2.312
404					KM Standard Error of Mean (logged)	0.141				95% H-UCL (KM -Log)		0.116
405					KM SD (logged)	0.141				95% Critical H Value (KM-Log)		2.312
406					KM Standard Error of Mean (logged)	0.141						
407												
408	**DL/2 Statistics**											
409	**DL/2 Normal**						**DL/2 Log-Transformed**					
410					Mean in Original Scale	0.116				Mean in Log Scale		-2.175
411					SD in Original Scale	0.0248				SD in Log Scale		0.23
412					95% t UCL (Assumes normality)	0.145				95% H-Stat UCL		0.164
413	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
414												
415	**Nonparametric Distribution Free UCL Statistics**											
416	**Data do not follow a Discernible Distribution at 5% Significance Level**											

417												
418	**Suggested UCL to Use**											
419				95% KM (t) UCL	0.128				KM H-UCL	0.116		
420				95% KM (BCA) UCL	N/A							
421	**Warning: One or more Recommended UCL(s) not available!**											
422	**Warning: Recommended UCL exceeds the maximum observation**											
423												
424	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
425	Recommendations are based upon data size, data distribution, and skewness.											
426	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
427	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
428												
429	**Beryllium (nfmw23)**											
430												
431	**General Statistics**											
432				Total Number of Observations	4				Number of Distinct Observations	3		
433				Number of Detects	2				Number of Non-Detects	2		
434				Number of Distinct Detects	2				Number of Distinct Non-Detects	1		
435				Minimum Detect	0.061				Minimum Non-Detect	0.27		
436				Maximum Detect	0.063				Maximum Non-Detect	0.27		
437				Variance Detects	2.0000E-6				Percent Non-Detects	50%		
438				Mean Detects	0.062				SD Detects	0.00141		
439				Median Detects	0.062				CV Detects	0.0228		
440				Skewness Detects	N/A				Kurtosis Detects	N/A		
441				Mean of Logged Detects	-2.781				SD of Logged Detects	0.0228		
442												
443	**Warning: Data set has only 2 Detected Values.**											
444	**This is not enough to compute meaningful or reliable statistics and estimates.**											
445												
446												
447	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
448	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
449	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
450	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
451												
452	**Normal GOF Test on Detects Only**											
453	**Not Enough Data to Perform GOF Test**											
454												
455	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
456				KM Mean	0.062				KM Standard Error of Mean	0.001		
457				KM SD	0.001				95% KM (BCA) UCL	N/A		
458				95% KM (t) UCL	0.0644				95% KM (Percentile Bootstrap) UCL	N/A		
459				95% KM (z) UCL	0.0636				95% KM Bootstrap t UCL	N/A		
460				90% KM Chebyshev UCL	0.065				95% KM Chebyshev UCL	0.0664		
461				97.5% KM Chebyshev UCL	0.0682				99% KM Chebyshev UCL	0.0719		
462												
463	**Gamma GOF Tests on Detected Observations Only**											
464	**Not Enough Data to Perform GOF Test**											
465												
466	**Gamma Statistics on Detected Data Only**											
467				k hat (MLE)	3844				k star (bias corrected MLE)	N/A		
468				Theta hat (MLE)	1.6130E-5				Theta star (bias corrected MLE)	N/A		

469					nu hat (MLE)	15375				nu star (bias corrected)		N/A
470					Mean (detects)	0.062						
471												
472	**Estimates of Gamma Parameters using KM Estimates**											
473					Mean (KM)	0.062				SD (KM)		0.001
474					Variance (KM)	1.0000E-6				SE of Mean (KM)		0.001
475					k hat (KM)	3844				k star (KM)		961.2
476					nu hat (KM)	30752				nu star (KM)		7689
477					theta hat (KM)	1.6129E-5				theta star (KM)		6.4505E-5
478					80% gamma percentile (KM)	0.0637				90% gamma percentile (KM)		0.0646
479					95% gamma percentile (KM)	0.0653				99% gamma percentile (KM)		0.0667
480												
481	**Gamma Kaplan-Meier (KM) Statistics**											
482										Adjusted Level of Significance (β)		0.00498
483					Approximate Chi Square Value (N/A, α)	7486				Adjusted Chi Square Value (N/A, β)		7373
484					95% Gamma Approximate KM-UCL (use when n>=50)	0.0637				95% Gamma Adjusted KM-UCL (use when n<50)		0.0647
485												
486	**Lognormal GOF Test on Detected Observations Only**											
487	**Not Enough Data to Perform GOF Test**											
488												
489	**Lognormal ROS Statistics Using Imputed Non-Detects**											
490					Mean in Original Scale	0.062				Mean in Log Scale		-2.781
491					SD in Original Scale	0.00115				SD in Log Scale		0.0186
492					95% t UCL (assumes normality of ROS data)	0.0634				95% Percentile Bootstrap UCL		N/A
493					95% BCA Bootstrap UCL	N/A				95% Bootstrap t UCL		N/A
494					95% H-UCL (Log ROS)	N/A						
495												
496	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
497					KM Mean (logged)	-2.781				KM Geo Mean		0.062
498					KM SD (logged)	0.0161				95% Critical H Value (KM-Log)		N/A
499					KM Standard Error of Mean (logged)	0.0161				95% H-UCL (KM -Log)		N/A
500					KM SD (logged)	0.0161				95% Critical H Value (KM-Log)		N/A
501					KM Standard Error of Mean (logged)	0.0161						
502												
503	**DL/2 Statistics**											
504	**DL/2 Normal**									**DL/2 Log-Transformed**		
505					Mean in Original Scale	0.0985				Mean in Log Scale		-2.392
506					SD in Original Scale	0.0422				SD in Log Scale		0.45
507					95% t UCL (Assumes normality)	0.148				95% H-Stat UCL		0.245
508	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
509												
510	**Nonparametric Distribution Free UCL Statistics**											
511	**Data do not follow a Discernible Distribution at 5% Significance Level**											
512												
513	**Suggested UCL to Use**											
514					95% KM (t) UCL	0.0644				KM H-UCL		N/A
515					95% KM (BCA) UCL	N/A						
516	**Warning: One or more Recommended UCL(s) not available!**											
517	**Warning: Recommended UCL exceeds the maximum observation**											
518												
519	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
520	Recommendations are based upon data size, data distribution, and skewness.											

521	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
522	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
523												
524	**Beryllium (nfmw3)**											
525												
526	**General Statistics**											
527						Total Number of Observations	8				Number of Distinct Observations	8	
528						Number of Detects	5				Number of Non-Detects	3	
529						Number of Distinct Detects	5				Number of Distinct Non-Detects	3	
530						Minimum Detect	0.078				Minimum Non-Detect	0.27	
531						Maximum Detect	0.15				Maximum Non-Detect	1.1	
532						Variance Detects	9.1670E-4				Percent Non-Detects	37.5%	
533						Mean Detects	0.101				SD Detects	0.0303	
534						Median Detects	0.085				CV Detects	0.3	
535						Skewness Detects	1.446				Kurtosis Detects	1.45	
536						Mean of Logged Detects	-2.327				SD of Logged Detects	0.275	
537													
538	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
539	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
540	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
541	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
542												
543	**Normal GOF Test on Detects Only**											
544						Shapiro Wilk Test Statistic	0.82				**Shapiro Wilk GOF Test**		
545						5% Shapiro Wilk Critical Value	0.762				Detected Data appear Normal at 5% Significance Level		
546						Lilliefors Test Statistic	0.299				**Lilliefors GOF Test**		
547						5% Lilliefors Critical Value	0.343				Detected Data appear Normal at 5% Significance Level		
548	**Detected Data appear Normal at 5% Significance Level**											
549													
550	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
551						KM Mean	0.101				KM Standard Error of Mean	0.0135	
552						KM SD	0.0271				95% KM (BCA) UCL	0.121	
553						95% KM (t) UCL	0.126				95% KM (Percentile Bootstrap) UCL	0.123	
554						95% KM (z) UCL	0.123				95% KM Bootstrap t UCL	0.291	
555						90% KM Chebyshev UCL	0.141				95% KM Chebyshev UCL	0.16	
556						97.5% KM Chebyshev UCL	0.185				99% KM Chebyshev UCL	0.236	
557													
558	**Gamma GOF Tests on Detected Observations Only**											
559						A-D Test Statistic	0.501				**Anderson-Darling GOF Test**		
560						5% A-D Critical Value	0.679				Detected data appear Gamma Distributed at 5% Significance Level		
561						K-S Test Statistic	0.316				**Kolmogorov-Smirnov GOF**		
562						5% K-S Critical Value	0.357				Detected data appear Gamma Distributed at 5% Significance Level		
563	**Detected data appear Gamma Distributed at 5% Significance Level**											
564													
565	**Gamma Statistics on Detected Data Only**											
566						k hat (MLE)	15.72				k star (bias corrected MLE)	6.419	
567						Theta hat (MLE)	0.00641				Theta star (bias corrected MLE)	0.0157	
568						nu hat (MLE)	157.2				nu star (bias corrected)	64.19	
569						Mean (detects)	0.101						
570													
571	**Gamma ROS Statistics using Imputed Non-Detects**											
572	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											

	A	B	C	D	E	F	G	H	I	J	K	L
573	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
574	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
575	This is especially true when the sample size is small.											
576	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
577					Minimum	0.078				Mean	0.1	
578					Maximum	0.15				Median	0.0994	
579					SD	0.0229				CV	0.228	
580					k hat (MLE)	25.02				k star (bias corrected MLE)	15.72	
581					Theta hat (MLE)	0.00401				Theta star (bias corrected MLE)	0.00638	
582					nu hat (MLE)	400.3				nu star (bias corrected)	251.5	
583					Adjusted Level of Significance (β)	0.0195						
584					Approximate Chi Square Value (251.50, α)	215.8				Adjusted Chi Square Value (251.50, β)	207.4	
585					95% Gamma Approximate UCL (use when n>=50)	0.117				95% Gamma Adjusted UCL (use when n<50)	0.122	
586												
587	**Estimates of Gamma Parameters using KM Estimates**											
588					Mean (KM)	0.101				SD (KM)	0.0271	
589					Variance (KM)	7.3336E-4				SE of Mean (KM)	0.0135	
590					k hat (KM)	13.85				k star (KM)	8.743	
591					nu hat (KM)	221.7				nu star (KM)	139.9	
592					theta hat (KM)	0.00728				theta star (KM)	0.0115	
593					80% gamma percentile (KM)	0.128				90% gamma percentile (KM)	0.146	
594					95% gamma percentile (KM)	0.163				99% gamma percentile (KM)	0.197	
595												
596	**Gamma Kaplan-Meier (KM) Statistics**											
597					Approximate Chi Square Value (139.88, α)	113.6				Adjusted Chi Square Value (139.88, β)	107.6	
598					95% Gamma Approximate KM-UCL (use when n>=50)	0.124				95% Gamma Adjusted KM-UCL (use when n<50)	0.131	
599												
600	**Lognormal GOF Test on Detected Observations Only**											
601					Shapiro Wilk Test Statistic	0.853				**Shapiro Wilk GOF Test**		
602					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
603					Lilliefors Test Statistic	0.292				**Lilliefors GOF Test**		
604					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
605	**Detected Data appear Lognormal at 5% Significance Level**											
606												
607	**Lognormal ROS Statistics Using Imputed Non-Detects**											
608					Mean in Original Scale	0.0996				Mean in Log Scale	-2.327	
609					SD in Original Scale	0.0229				SD in Log Scale	0.208	
610					95% t UCL (assumes normality of ROS data)	0.115				95% Percentile Bootstrap UCL	0.114	
611					95% BCA Bootstrap UCL	0.117				95% Bootstrap t UCL	0.126	
612					95% H-UCL (Log ROS)	0.116						
613												
614	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
615					KM Mean (logged)	-2.327				KM Geo Mean	0.0976	
616					KM SD (logged)	0.246				95% Critical H Value (KM-Log)	1.994	
617					KM Standard Error of Mean (logged)	0.123				95% H-UCL (KM -Log)	0.121	
618					KM SD (logged)	0.246				95% Critical H Value (KM-Log)	1.994	
619					KM Standard Error of Mean (logged)	0.123						
620												
621	**DL/2 Statistics**											
622					**DL/2 Normal**					**DL/2 Log-Transformed**		
623					Mean in Original Scale	0.169				Mean in Log Scale	-2.008	
624					SD in Original Scale	0.157				SD in Log Scale	0.636	

625			95% t UCL (Assumes normality)			0.274					95% H-Stat UCL	0.307
626	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
627												
628	**Nonparametric Distribution Free UCL Statistics**											
629	**Detected Data appear Normal Distributed at 5% Significance Level**											
630												
631	**Suggested UCL to Use**											
632			95% KM (t) UCL			0.126						
633												
634	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
635	Recommendations are based upon data size, data distribution, and skewness.											
636	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
637	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
638												
639	**Beryllium (nfmw4)**											
640												
641	**General Statistics**											
642			Total Number of Observations			8					Number of Distinct Observations	7
643			Number of Detects			1					Number of Non-Detects	7
644			Number of Distinct Detects			1					Number of Distinct Non-Detects	6
645												
646	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
647	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
648												
649	**The data set for variable Beryllium (nfmw4) was not processed!**											
650												
651												
652	**Beryllium (nfmw7)**											
653												
654	**General Statistics**											
655			Total Number of Observations			8					Number of Distinct Observations	5
656			Number of Detects			2					Number of Non-Detects	6
657			Number of Distinct Detects			2					Number of Distinct Non-Detects	3
658			Minimum Detect			0.058					Minimum Non-Detect	0.054
659			Maximum Detect			0.072					Maximum Non-Detect	0.27
660			Variance Detects			9.8000E-5					Percent Non-Detects	75%
661			Mean Detects			0.065					SD Detects	0.0099
662			Median Detects			0.065					CV Detects	0.152
663			Skewness Detects			N/A					Kurtosis Detects	N/A
664			Mean of Logged Detects			-2.739					SD of Logged Detects	0.153
665												
666	**Warning: Data set has only 2 Detected Values.**											
667	**This is not enough to compute meaningful or reliable statistics and estimates.**											
668												
669												
670	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
671	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
672	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
673	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
674												
675	**Normal GOF Test on Detects Only**											
676	**Not Enough Data to Perform GOF Test**											

677												
678	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
679					KM Mean	0.0578			KM Standard Error of Mean	0.0038		
680					KM SD	0.00653			95% KM (BCA) UCL	N/A		
681					95% KM (t) UCL	0.065			95% KM (Percentile Bootstrap) UCL	N/A		
682					95% KM (z) UCL	0.0641			95% KM Bootstrap t UCL	N/A		
683					90% KM Chebyshev UCL	0.0692			95% KM Chebyshev UCL	0.0744		
684					97.5% KM Chebyshev UCL	0.0815			99% KM Chebyshev UCL	0.0956		
685												
686	**Gamma GOF Tests on Detected Observations Only**											
687	**Not Enough Data to Perform GOF Test**											
688												
689	**Gamma Statistics on Detected Data Only**											
690					k hat (MLE)	85.89			k star (bias corrected MLE)	N/A		
691					Theta hat (MLE)	7.5678E-4			Theta star (bias corrected MLE)	N/A		
692					nu hat (MLE)	343.6			nu star (bias corrected)	N/A		
693					Mean (detects)	0.065						
694												
695	**Estimates of Gamma Parameters using KM Estimates**											
696					Mean (KM)	0.0578			SD (KM)	0.00653		
697					Variance (KM)	4.2639E-5			SE of Mean (KM)	0.0038		
698					k hat (KM)	78.44			k star (KM)	49.11		
699					nu hat (KM)	1255			nu star (KM)	785.8		
700					theta hat (KM)	7.3727E-4			theta star (KM)	0.00118		
701					80% gamma percentile (KM)	0.0646			90% gamma percentile (KM)	0.0686		
702					95% gamma percentile (KM)	0.072			99% gamma percentile (KM)	0.0787		
703												
704	**Gamma Kaplan-Meier (KM) Statistics**											
705									Adjusted Level of Significance (β)	0.0195		
706					Approximate Chi Square Value (785.76, α)	721.7			Adjusted Chi Square Value (785.76, β)	706.1		
707					95% Gamma Approximate KM-UCL (use when n>=50)	0.063			95% Gamma Adjusted KM-UCL (use when n<50)	0.0644		
708												
709	**Lognormal GOF Test on Detected Observations Only**											
710	**Not Enough Data to Perform GOF Test**											
711												
712	**Lognormal ROS Statistics Using Imputed Non-Detects**											
713					Mean in Original Scale	0.0502			Mean in Log Scale	-3.011		
714					SD in Original Scale	0.0111			SD in Log Scale	0.21		
715					95% t UCL (assumes normality of ROS data)	0.0577			95% Percentile Bootstrap UCL	0.0566		
716					95% BCA Bootstrap UCL	0.0579			95% Bootstrap t UCL	0.0605		
717					95% H-UCL (Log ROS)	0.0588						
718												
719	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
720					KM Mean (logged)	-2.856			KM Geo Mean	0.0575		
721					KM SD (logged)	0.104			95% Critical H Value (KM-Log)	1.853		
722					KM Standard Error of Mean (logged)	0.0609			95% H-UCL (KM -Log)	0.0622		
723					KM SD (logged)	0.104			95% Critical H Value (KM-Log)	1.853		
724					KM Standard Error of Mean (logged)	0.0609						
725												
726	**DL/2 Statistics**											
727	**DL/2 Normal**								**DL/2 Log-Transformed**			
728					Mean in Original Scale	0.0641			Mean in Log Scale	-2.97		

729				SD in Original Scale		0.0468				SD in Log Scale		0.703
730				95% t UCL (Assumes normality)		0.0955				95% H-Stat UCL		0.136
731	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
732												
733	**Nonparametric Distribution Free UCL Statistics**											
734	**Data do not follow a Discernible Distribution at 5% Significance Level**											
735												
736	**Suggested UCL to Use**											
737				95% KM (t) UCL		0.065				KM H-UCL		0.0622
738				95% KM (BCA) UCL		N/A						
739	**Warning: One or more Recommended UCL(s) not available!**											
740												
741	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
742	Recommendations are based upon data size, data distribution, and skewness.											
743	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
744	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
745												
746	**Beryllium (nfmw8)**											
747												
748	**General Statistics**											
749				Total Number of Observations		7				Number of Distinct Observations		6
750				Number of Detects		4				Number of Non-Detects		3
751				Number of Distinct Detects		4				Number of Distinct Non-Detects		2
752				Minimum Detect		0.061				Minimum Non-Detect		0.054
753				Maximum Detect		0.09				Maximum Non-Detect		1.1
754				Variance Detects		1.4092E-4				Percent Non-Detects		42.86%
755				Mean Detects		0.0753				SD Detects		0.0119
756				Median Detects		0.075				CV Detects		0.158
757				Skewness Detects		0.125				Kurtosis Detects		1.368
758				Mean of Logged Detects		-2.596				SD of Logged Detects		0.159
759												
760	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
761	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
762	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
763	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
764												
765	**Normal GOF Test on Detects Only**											
766				Shapiro Wilk Test Statistic		0.971				**Shapiro Wilk GOF Test**		
767				5% Shapiro Wilk Critical Value		0.748				Detected Data appear Normal at 5% Significance Level		
768				Lilliefors Test Statistic		0.225				**Lilliefors GOF Test**		
769				5% Lilliefors Critical Value		0.375				Detected Data appear Normal at 5% Significance Level		
770	**Detected Data appear Normal at 5% Significance Level**											
771												
772	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
773				KM Mean		0.071				KM Standard Error of Mean		0.00647
774				KM SD		0.0125				95% KM (BCA) UCL		N/A
775				95% KM (t) UCL		0.0836				95% KM (Percentile Bootstrap) UCL		N/A
776				95% KM (z) UCL		0.0816				95% KM Bootstrap t UCL		N/A
777				90% KM Chebyshev UCL		0.0904				95% KM Chebyshev UCL		0.0992
778				97.5% KM Chebyshev UCL		0.111				99% KM Chebyshev UCL		0.135
779												
780	**Gamma GOF Tests on Detected Observations Only**											

781				A-D Test Statistic		0.265	**Anderson-Darling GOF Test**					
782				5% A-D Critical Value		0.656	Detected data appear Gamma Distributed at 5% Significance Level					
783				K-S Test Statistic		0.22	**Kolmogorov-Smirnov GOF**					
784				5% K-S Critical Value		0.394	Detected data appear Gamma Distributed at 5% Significance Level					
785	**Detected data appear Gamma Distributed at 5% Significance Level**											
786												
787	**Gamma Statistics on Detected Data Only**											
788				k hat (MLE)		53.1	k star (bias corrected MLE)					13.44
789				Theta hat (MLE)		0.00142	Theta star (bias corrected MLE)					0.0056
790				nu hat (MLE)		424.8	nu star (bias corrected)					107.5
791				Mean (detects)		0.0753						
792												
793	**Gamma ROS Statistics using Imputed Non-Detects**											
794	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
795	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
796	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
797	This is especially true when the sample size is small.											
798	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
799				Minimum		0.046	Mean					0.0694
800				Maximum		0.09	Median					0.074
801				SD		0.0144	CV					0.208
802				k hat (MLE)		25.21	k star (bias corrected MLE)					14.5
803				Theta hat (MLE)		0.00275	Theta star (bias corrected MLE)					0.00479
804				nu hat (MLE)		352.9	nu star (bias corrected)					203
805				Adjusted Level of Significance (β)		0.0158						
806				Approximate Chi Square Value (203.01, α)		171	Adjusted Chi Square Value (203.01, β)					162.2
807				95% Gamma Approximate UCL (use when n>=50)		0.0824	95% Gamma Adjusted UCL (use when n<50)					N/A
808												
809	**Estimates of Gamma Parameters using KM Estimates**											
810				Mean (KM)		0.071	SD (KM)					0.0125
811				Variance (KM)		1.5680E-4	SE of Mean (KM)					0.00647
812				k hat (KM)		32.15	k star (KM)					18.47
813				nu hat (KM)		450.1	nu star (KM)					258.5
814				theta hat (KM)		0.00221	theta star (KM)					0.00384
815				80% gamma percentile (KM)		0.0844	90% gamma percentile (KM)					0.0928
816				95% gamma percentile (KM)		0.1	99% gamma percentile (KM)					0.115
817												
818	**Gamma Kaplan-Meier (KM) Statistics**											
819				Approximate Chi Square Value (258.53, α)		222.3	Adjusted Chi Square Value (258.53, β)					212.1
820				95% Gamma Approximate KM-UCL (use when n>=50)		0.0826	95% Gamma Adjusted KM-UCL (use when n<50)					0.0865
821												
822	**Lognormal GOF Test on Detected Observations Only**											
823				Shapiro Wilk Test Statistic		0.97	**Shapiro Wilk GOF Test**					
824				5% Shapiro Wilk Critical Value		0.748	Detected Data appear Lognormal at 5% Significance Level					
825				Lilliefors Test Statistic		0.232	**Lilliefors GOF Test**					
826				5% Lilliefors Critical Value		0.375	Detected Data appear Lognormal at 5% Significance Level					
827	**Detected Data appear Lognormal at 5% Significance Level**											
828												
829	**Lognormal ROS Statistics Using Imputed Non-Detects**											
830				Mean in Original Scale		0.0699	Mean in Log Scale					-2.678
831				SD in Original Scale		0.0135	SD in Log Scale					0.201
832				95% t UCL (assumes normality of ROS data)		0.0798	95% Percentile Bootstrap UCL					0.0778

833				95% BCA Bootstrap UCL		0.0779				95% Bootstrap t UCL		0.0801
834				95% H-UCL (Log ROS)		0.0826						
835												
836	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
837				KM Mean (logged)		-2.661				KM Geo Mean		0.0699
838				KM SD (logged)		0.178				95% Critical H Value (KM-Log)		1.959
839				KM Standard Error of Mean (logged)		0.0922				95% H-UCL (KM -Log)		0.0819
840				KM SD (logged)		0.178				95% Critical H Value (KM-Log)		1.959
841				KM Standard Error of Mean (logged)		0.0922						
842												
843	**DL/2 Statistics**											
844	**DL/2 Normal**									**DL/2 Log-Transformed**		
845				Mean in Original Scale		0.204				Mean in Log Scale		-2.17
846				SD in Original Scale		0.237				SD in Log Scale		1.142
847				95% t UCL (Assumes normality)		0.378				95% H-Stat UCL		1.486
848	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
849												
850	**Nonparametric Distribution Free UCL Statistics**											
851	**Detected Data appear Normal Distributed at 5% Significance Level**											
852												
853	**Suggested UCL to Use**											
854				95% KM (t) UCL		0.0836						
855												
856	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
857	Recommendations are based upon data size, data distribution, and skewness.											
858	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
859	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
860												
861	**Beryllium (nfmw9)**											
862												
863	**General Statistics**											
864				Total Number of Observations		7				Number of Distinct Observations		7
865				Number of Detects		3				Number of Non-Detects		4
866				Number of Distinct Detects		3				Number of Distinct Non-Detects		4
867				Minimum Detect		0.19				Minimum Non-Detect		0.12
868				Maximum Detect		0.37				Maximum Non-Detect		1.1
869				Variance Detects		0.0081				Percent Non-Detects		57.14%
870				Mean Detects		0.28				SD Detects		0.09
871				Median Detects		0.28				CV Detects		0.321
872				Skewness Detects		-2.68E-15				Kurtosis Detects		N/A
873				Mean of Logged Detects		-1.309				SD of Logged Detects		0.335
874												
875	**Warning: Data set has only 3 Detected Values.**											
876	**This is not enough to compute meaningful or reliable statistics and estimates.**											
877												
878												
879	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
880	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
881	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
882	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
883												
884	**Normal GOF Test on Detects Only**											

885	Shapiro Wilk Test Statistic					1	**Shapiro Wilk GOF Test**					
886	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Normal at 5% Significance Level					
887	Lilliefors Test Statistic					0.175	**Lilliefors GOF Test**					
888	5% Lilliefors Critical Value					0.425	Detected Data appear Normal at 5% Significance Level					
889	**Detected Data appear Normal at 5% Significance Level**											
890												
891	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
892	KM Mean					0.217	KM Standard Error of Mean					0.0479
893	KM SD					0.0889	95% KM (BCA) UCL					N/A
894	95% KM (t) UCL					0.31	95% KM (Percentile Bootstrap) UCL					N/A
895	95% KM (z) UCL					0.296	95% KM Bootstrap t UCL					N/A
896	90% KM Chebyshev UCL					0.361	95% KM Chebyshev UCL					0.426
897	97.5% KM Chebyshev UCL					0.516	99% KM Chebyshev UCL					0.693
898												
899	**Gamma GOF Tests on Detected Observations Only**											
900	**Not Enough Data to Perform GOF Test**											
901												
902	**Gamma Statistics on Detected Data Only**											
903	k hat (MLE)					13.92	k star (bias corrected MLE)					N/A
904	Theta hat (MLE)					0.0201	Theta star (bias corrected MLE)					N/A
905	nu hat (MLE)					83.52	nu star (bias corrected)					N/A
906	Mean (detects)					0.28						
907												
908	**Gamma ROS Statistics using Imputed Non-Detects**											
909	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
910	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
911	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
912	This is especially true when the sample size is small.											
913	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
914	Minimum					0.102	Mean					0.211
915	Maximum					0.37	Median					0.19
916	SD					0.0885	CV					0.42
917	k hat (MLE)					6.966	k star (bias corrected MLE)					4.076
918	Theta hat (MLE)					0.0303	Theta star (bias corrected MLE)					0.0517
919	nu hat (MLE)					97.53	nu star (bias corrected)					57.06
920	Adjusted Level of Significance (β)					0.0158						
921	Approximate Chi Square Value (57.06, α)					40.7	Adjusted Chi Square Value (57.06, β)					36.57
922	95% Gamma Approximate UCL (use when n>=50)					0.296	95% Gamma Adjusted UCL (use when n<50)					N/A
923												
924	**Estimates of Gamma Parameters using KM Estimates**											
925	Mean (KM)					0.217	SD (KM)					0.0889
926	Variance (KM)					0.0079	SE of Mean (KM)					0.0479
927	k hat (KM)					5.956	k star (KM)					3.499
928	nu hat (KM)					83.39	nu star (KM)					48.98
929	theta hat (KM)					0.0364	theta star (KM)					0.062
930	80% gamma percentile (KM)					0.304	90% gamma percentile (KM)					0.372
931	95% gamma percentile (KM)					0.436	99% gamma percentile (KM)					0.572
932												
933	**Gamma Kaplan-Meier (KM) Statistics**											
934	Approximate Chi Square Value (48.98, α)					33.92	Adjusted Chi Square Value (48.98, β)					30.18
935	95% Gamma Approximate KM-UCL (use when n>=50)					0.313	95% Gamma Adjusted KM-UCL (use when n<50)					0.352
936												

937	**Lognormal GOF Test on Detected Observations Only**											
938					Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk GOF Test**					
939					5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level					
940					Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**					
941					5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level					
942	**Detected Data appear Lognormal at 5% Significance Level**											
943												
944	**Lognormal ROS Statistics Using Imputed Non-Detects**											
945					Mean in Original Scale	0.216	Mean in Log Scale	-1.586				
946					SD in Original Scale	0.0821	SD in Log Scale	0.352				
947					95% t UCL (assumes normality of ROS data)	0.277	95% Percentile Bootstrap UCL	0.266				
948					95% BCA Bootstrap UCL	0.279	95% Bootstrap t UCL	0.346				
949					95% H-UCL (Log ROS)	0.302						
950												
951	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
952					KM Mean (logged)	-1.612	KM Geo Mean	0.199				
953					KM SD (logged)	0.411	95% Critical H Value (KM-Log)	2.297				
954					KM Standard Error of Mean (logged)	0.231	95% H-UCL (KM -Log)	0.319				
955					KM SD (logged)	0.411	95% Critical H Value (KM-Log)	2.297				
956					KM Standard Error of Mean (logged)	0.231						
957												
958	**DL/2 Statistics**											
959	**DL/2 Normal**						**DL/2 Log-Transformed**					
960					Mean in Original Scale	0.249	Mean in Log Scale	-1.596				
961					SD in Original Scale	0.166	SD in Log Scale	0.727				
962					95% t UCL (Assumes normality)	0.372	95% H-Stat UCL	0.637				
963	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
964												
965	**Nonparametric Distribution Free UCL Statistics**											
966	**Detected Data appear Normal Distributed at 5% Significance Level**											
967												
968	**Suggested UCL to Use**											
969					95% KM (t) UCL	0.31						
970												
971	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
972	Recommendations are based upon data size, data distribution, and skewness.											
973	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
974	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
975												
976	**Beryllium (smw10)**											
977												
978	**General Statistics**											
979					Total Number of Observations	7	Number of Distinct Observations	5				
980					Number of Detects	0	Number of Non-Detects	7				
981					Number of Distinct Detects	0	Number of Distinct Non-Detects	5				
982												
983	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
984	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
985	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
986												
987	**The data set for variable Beryllium (smw10) was not processed!**											
988												

	A	B	C	D	E	F	G	H	I	J	K	L
989												
990	**Beryllium (smw11)**											
991												
992	**General Statistics**											
993	Total Number of Observations					8	Number of Distinct Observations					6
994	Number of Detects					2	Number of Non-Detects					6
995	Number of Distinct Detects					2	Number of Distinct Non-Detects					4
996	Minimum Detect					0.095	Minimum Non-Detect					0.054
997	Maximum Detect					0.11	Maximum Non-Detect					1.1
998	Variance Detects					1.1250E-4	Percent Non-Detects					75%
999	Mean Detects					0.103	SD Detects					0.0106
1000	Median Detects					0.103	CV Detects					0.103
1001	Skewness Detects					N/A	Kurtosis Detects					N/A
1002	Mean of Logged Detects					-2.281	SD of Logged Detects					0.104
1003												
1004	**Warning: Data set has only 2 Detected Values.**											
1005	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1006												
1007												
1008	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1009	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1010	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1011	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1012												
1013	**Normal GOF Test on Detects Only**											
1014	**Not Enough Data to Perform GOF Test**											
1015												
1016	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1017	KM Mean					0.0783	KM Standard Error of Mean					0.0176
1018	KM SD					0.0248	95% KM (BCA) UCL					N/A
1019	95% KM (t) UCL					0.112	95% KM (Percentile Bootstrap) UCL					N/A
1020	95% KM (z) UCL					0.107	95% KM Bootstrap t UCL					N/A
1021	90% KM Chebyshev UCL					0.131	95% KM Chebyshev UCL					0.155
1022	97.5% KM Chebyshev UCL					0.188	99% KM Chebyshev UCL					0.253
1023												
1024	**Gamma GOF Tests on Detected Observations Only**											
1025	**Not Enough Data to Perform GOF Test**											
1026												
1027	**Gamma Statistics on Detected Data Only**											
1028	k hat (MLE)					186.4	k star (bias corrected MLE)					N/A
1029	Theta hat (MLE)					5.4976E-4	Theta star (bias corrected MLE)					N/A
1030	nu hat (MLE)					745.8	nu star (bias corrected)					N/A
1031	Mean (detects)					0.103						
1032												
1033	**Estimates of Gamma Parameters using KM Estimates**											
1034	Mean (KM)					0.0783	SD (KM)					0.0248
1035	Variance (KM)					6.1619E-4	SE of Mean (KM)					0.0176
1036	k hat (KM)					9.937	k star (KM)					6.294
1037	nu hat (KM)					159	nu star (KM)					100.7
1038	theta hat (KM)					0.00787	theta star (KM)					0.0124
1039	80% gamma percentile (KM)					0.103	90% gamma percentile (KM)					0.12
1040	95% gamma percentile (KM)					0.136	99% gamma percentile (KM)					0.168

1041												
1042	**Gamma Kaplan-Meier (KM) Statistics**											
1043										Adjusted Level of Significance (β)		0.0195
1044				Approximate Chi Square Value (100.70, α)		78.55				Adjusted Chi Square Value (100.70, β)		73.61
1045				95% Gamma Approximate KM-UCL (use when n>=50)		0.1				95% Gamma Adjusted KM-UCL (use when n<50)		0.107
1046												
1047	**Lognormal GOF Test on Detected Observations Only**											
1048	**Not Enough Data to Perform GOF Test**											
1049												
1050	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1051				Mean in Original Scale		0.0855				Mean in Log Scale		-2.472
1052				SD in Original Scale		0.0143				SD in Log Scale		0.167
1053				95% t UCL (assumes normality of ROS data)		0.0951				95% Percentile Bootstrap UCL		0.0936
1054				95% BCA Bootstrap UCL		0.0936				95% Bootstrap t UCL		0.0962
1055				95% H-UCL (Log ROS)		0.0966						
1056												
1057	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1058				KM Mean (logged)		-2.6				KM Geo Mean		0.0743
1059				KM SD (logged)		0.323				95% Critical H Value (KM-Log)		2.088
1060				KM Standard Error of Mean (logged)		0.229				95% H-UCL (KM -Log)		0.101
1061				KM SD (logged)		0.323				95% Critical H Value (KM-Log)		2.088
1062				KM Standard Error of Mean (logged)		0.229						
1063												
1064	**DL/2 Statistics**											
1065	**DL/2 Normal**									**DL/2 Log-Transformed**		
1066				Mean in Original Scale		0.155				Mean in Log Scale		-2.278
1067				SD in Original Scale		0.167				SD in Log Scale		0.981
1068				95% t UCL (Assumes normality)		0.267				95% H-Stat UCL		0.582
1069	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1070												
1071	**Nonparametric Distribution Free UCL Statistics**											
1072	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1073												
1074	**Suggested UCL to Use**											
1075				95% KM (t) UCL		0.112				KM H-UCL		0.101
1076				95% KM (BCA) UCL		N/A						
1077	**Warning: One or more Recommended UCL(s) not available!**											
1078	**Warning: Recommended UCL exceeds the maximum observation**											
1079												
1080	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1081	Recommendations are based upon data size, data distribution, and skewness.											
1082	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1083	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1084												
1085	**Beryllium (smw12)**											
1086												
1087	**General Statistics**											
1088				Total Number of Observations		7				Number of Distinct Observations		6
1089				Number of Detects		1				Number of Non-Detects		6
1090				Number of Distinct Detects		1				Number of Distinct Non-Detects		5
1091												
1092	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											

	A	B	C	D	E	F	G	H	I	J	K	L
1093	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
1094												
1095	The data set for variable Beryllium (smw12) was not processed!											
1096												
1097												
1098	Beryllium (smw13)											
1099												
1100	General Statistics											
1101					Total Number of Observations	7			Number of Distinct Observations	4		
1102					Number of Detects	0			Number of Non-Detects	7		
1103					Number of Distinct Detects	0			Number of Distinct Non-Detects	4		
1104												
1105	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
1106	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
1107	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
1108												
1109	The data set for variable Beryllium (smw13) was not processed!											
1110												
1111												
1112	Beryllium (smw14)											
1113												
1114	General Statistics											
1115					Total Number of Observations	7			Number of Distinct Observations	4		
1116					Number of Detects	0			Number of Non-Detects	7		
1117					Number of Distinct Detects	0			Number of Distinct Non-Detects	4		
1118												
1119	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
1120	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
1121	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
1122												
1123	The data set for variable Beryllium (smw14) was not processed!											
1124												
1125												
1126												
1127	Beryllium (smw15)											
1128												
1129	General Statistics											
1130					Total Number of Observations	8			Number of Distinct Observations	7		
1131									Number of Missing Observations	0		
1132					Minimum	0.24			Mean	1.998		
1133					Maximum	3.5			Median	2.15		
1134					SD	1.203			Std. Error of Mean	0.425		
1135					Coefficient of Variation	0.602			Skewness	-0.351		
1136												
1137	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1138	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1139	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1140	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1141												
1142	Normal GOF Test											
1143					Shapiro Wilk Test Statistic	0.93			Shapiro Wilk GOF Test			
1144					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			

1145					Lilliefors Test Statistic	0.173	**Lilliefors GOF Test**					
1146					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1147	**Data appear Normal at 5% Significance Level**											
1148												
1149	**Assuming Normal Distribution**											
1150	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1151					95% Student's-t UCL	2.803	95% Adjusted-CLT UCL (Chen-1995)					2.641
1152							95% Modified-t UCL (Johnson-1978)					2.794
1153												
1154	**Gamma GOF Test**											
1155					A-D Test Statistic	0.493	**Anderson-Darling Gamma GOF Test**					
1156					5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level					
1157					K-S Test Statistic	0.213	**Kolmogorov-Smirnov Gamma GOF Test**					
1158					5% K-S Critical Value	0.298	Detected data appear Gamma Distributed at 5% Significance Level					
1159	**Detected data appear Gamma Distributed at 5% Significance Level**											
1160												
1161	**Gamma Statistics**											
1162					k hat (MLE)	1.898	k star (bias corrected MLE)					1.27
1163					Theta hat (MLE)	1.052	Theta star (bias corrected MLE)					1.573
1164					nu hat (MLE)	30.37	nu star (bias corrected)					20.31
1165					MLE Mean (bias corrected)	1.998	MLE Sd (bias corrected)					1.773
1166							Approximate Chi Square Value (0.05)					11.08
1167					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value					9.406
1168												
1169	**Assuming Gamma Distribution**											
1170					95% Approximate Gamma UCL (use when n>=50))	3.661	95% Adjusted Gamma UCL (use when n<50)					4.314
1171												
1172	**Lognormal GOF Test**											
1173					Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk Lognormal GOF Test**					
1174					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1175					Lilliefors Test Statistic	0.221	**Lilliefors Lognormal GOF Test**					
1176					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1177	**Data appear Lognormal at 5% Significance Level**											
1178												
1179	**Lognormal Statistics**											
1180					Minimum of Logged Data	-1.427	Mean of logged Data					0.406
1181					Maximum of Logged Data	1.253	SD of logged Data					0.955
1182												
1183	**Assuming Lognormal Distribution**											
1184					95% H-UCL	7.829	90% Chebyshev (MVUE) UCL					4.475
1185					95% Chebyshev (MVUE) UCL	5.505	97.5% Chebyshev (MVUE) UCL					6.935
1186					99% Chebyshev (MVUE) UCL	9.744						
1187												
1188	**Nonparametric Distribution Free UCL Statistics**											
1189	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1190												
1191	**Nonparametric Distribution Free UCLs**											
1192					95% CLT UCL	2.697	95% Jackknife UCL					2.803
1193					95% Standard Bootstrap UCL	2.654	95% Bootstrap-t UCL					2.752
1194					95% Hall's Bootstrap UCL	2.559	95% Percentile Bootstrap UCL					2.638
1195					95% BCA Bootstrap UCL	2.6						
1196					90% Chebyshev(Mean, Sd) UCL	3.273	95% Chebyshev(Mean, Sd) UCL					3.851

1197				97.5% Chebyshev(Mean, Sd) UCL		4.653				99% Chebyshev(Mean, Sd) UCL		6.229
1198												
1199	**Suggested UCL to Use**											
1200				95% Student's-t UCL		2.803						
1201												
1202	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1203	Recommendations are based upon data size, data distribution, and skewness.											
1204	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1205	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1206												
1207	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1208	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1209												
1210	**Beryllium (smw16)**											
1211												
1212	**General Statistics**											
1213				Total Number of Observations		8				Number of Distinct Observations		8
1214				Number of Detects		2				Number of Non-Detects		6
1215				Number of Distinct Detects		2				Number of Distinct Non-Detects		6
1216				Minimum Detect		0.15				Minimum Non-Detect		0.2
1217				Maximum Detect		0.17				Maximum Non-Detect		1.1
1218				Variance Detects		2.0000E-4				Percent Non-Detects		75%
1219				Mean Detects		0.16				SD Detects		0.0141
1220				Median Detects		0.16				CV Detects		0.0884
1221				Skewness Detects		N/A				Kurtosis Detects		N/A
1222				Mean of Logged Detects		-1.835				SD of Logged Detects		0.0885
1223												
1224	**Warning: Data set has only 2 Detected Values.**											
1225	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1226												
1227												
1228	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1229	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1230	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1231	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1232												
1233	**Normal GOF Test on Detects Only**											
1234	**Not Enough Data to Perform GOF Test**											
1235												
1236	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1237				KM Mean		0.16				KM Standard Error of Mean		0.01
1238				KM SD		0.01				95% KM (BCA) UCL		N/A
1239				95% KM (t) UCL		0.179				95% KM (Percentile Bootstrap) UCL		N/A
1240				95% KM (z) UCL		0.176				95% KM Bootstrap t UCL		N/A
1241				90% KM Chebyshev UCL		0.19				95% KM Chebyshev UCL		0.204
1242				97.5% KM Chebyshev UCL		0.222				99% KM Chebyshev UCL		0.259
1243												
1244	**Gamma GOF Tests on Detected Observations Only**											
1245	**Not Enough Data to Perform GOF Test**											
1246												
1247	**Gamma Statistics on Detected Data Only**											
1248				k hat (MLE)		255.7				k star (bias corrected MLE)		N/A

1249					Theta hat (MLE)	6.2582E-4				Theta star (bias corrected MLE)		N/A
1250					nu hat (MLE)	1023				nu star (bias corrected)		N/A
1251					Mean (detects)	0.16						
1252												
1253	**Estimates of Gamma Parameters using KM Estimates**											
1254					Mean (KM)	0.16				SD (KM)		0.01
1255					Variance (KM)	1.0000E-4				SE of Mean (KM)		0.01
1256					k hat (KM)	256				k star (KM)		160.1
1257					nu hat (KM)	4096				nu star (KM)		2561
1258					theta hat (KM)	6.2500E-4				theta star (KM)		9.9948E-4
1259					80% gamma percentile (KM)	0.171				90% gamma percentile (KM)		0.176
1260					95% gamma percentile (KM)	0.181				99% gamma percentile (KM)		0.191
1261												
1262	**Gamma Kaplan-Meier (KM) Statistics**											
1263										Adjusted Level of Significance (β)		0.0195
1264					Approximate Chi Square Value (N/A, α)	2445				Adjusted Chi Square Value (N/A, β)		2416
1265					95% Gamma Approximate KM-UCL (use when n>=50)	0.168				95% Gamma Adjusted KM-UCL (use when n<50)		0.17
1266												
1267	**Lognormal GOF Test on Detected Observations Only**											
1268	**Not Enough Data to Perform GOF Test**											
1269												
1270	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1271					Mean in Original Scale	0.16				Mean in Log Scale		-1.835
1272					SD in Original Scale	0.00535				SD in Log Scale		0.0335
1273					95% t UCL (assumes normality of ROS data)	0.163				95% Percentile Bootstrap UCL		N/A
1274					95% BCA Bootstrap UCL	N/A				95% Bootstrap t UCL		N/A
1275					95% H-UCL (Log ROS)	N/A						
1276												
1277	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1278					KM Mean (logged)	-1.835				KM Geo Mean		0.16
1279					KM SD (logged)	0.0626				95% Critical H Value (KM-Log)		N/A
1280					KM Standard Error of Mean (logged)	0.0626				95% H-UCL (KM -Log)		N/A
1281					KM SD (logged)	0.0626				95% Critical H Value (KM-Log)		N/A
1282					KM Standard Error of Mean (logged)	0.0626						
1283												
1284	**DL/2 Statistics**											
1285	**DL/2 Normal**									**DL/2 Log-Transformed**		
1286					Mean in Original Scale	0.213				Mean in Log Scale		-1.689
1287					SD in Original Scale	0.145				SD in Log Scale		0.52
1288					95% t UCL (Assumes normality)	0.309				95% H-Stat UCL		0.338
1289	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1290												
1291	**Nonparametric Distribution Free UCL Statistics**											
1292	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1293												
1294	**Suggested UCL to Use**											
1295					95% KM (t) UCL	0.179				KM H-UCL		N/A
1296					95% KM (BCA) UCL	N/A						
1297	**Warning: One or more Recommended UCL(s) not available!**											
1298	**Warning: Recommended UCL exceeds the maximum observation**											
1299												
1300	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

1301	Recommendations are based upon data size, data distribution, and skewness.											
1302	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1303	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1304												
1305	**Beryllium (smw16d)**											
1306												
1307	**General Statistics**											
1308						Total Number of Observations	7			Number of Distinct Observations	4	
1309						Number of Detects	0			Number of Non-Detects	7	
1310						Number of Distinct Detects	0			Number of Distinct Non-Detects	4	
1311												
1312	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
1313	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
1314	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
1315												
1316	**The data set for variable Beryllium (smw16d) was not processed!**											
1317												
1318												
1319	**Beryllium (smw17)**											
1320												
1321	**General Statistics**											
1322						Total Number of Observations	7			Number of Distinct Observations	6	
1323						Number of Detects	3			Number of Non-Detects	4	
1324						Number of Distinct Detects	3			Number of Distinct Non-Detects	3	
1325						Minimum Detect	0.13			Minimum Non-Detect	0.27	
1326						Maximum Detect	1.2			Maximum Non-Detect	1.1	
1327						Variance Detects	0.378			Percent Non-Detects	57.14%	
1328						Mean Detects	0.49			SD Detects	0.615	
1329						Median Detects	0.14			CV Detects	1.255	
1330						Skewness Detects	1.732			Kurtosis Detects	N/A	
1331						Mean of Logged Detects	-1.275			SD of Logged Detects	1.262	
1332												
1333	**Warning: Data set has only 3 Detected Values.**											
1334	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1335												
1336												
1337	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1338	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1339	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1340	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1341												
1342	**Normal GOF Test on Detects Only**											
1343						Shapiro Wilk Test Statistic	0.757			**Shapiro Wilk GOF Test**		
1344						5% Shapiro Wilk Critical Value	0.767			Detected Data Not Normal at 5% Significance Level		
1345						Lilliefors Test Statistic	0.382			**Lilliefors GOF Test**		
1346						5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level		
1347	**Detected Data appear Approximate Normal at 5% Significance Level**											
1348												
1349	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1350						KM Mean	0.287			KM Standard Error of Mean	0.173	
1351						KM SD	0.373			95% KM (BCA) UCL	N/A	
1352						95% KM (t) UCL	0.622			95% KM (Percentile Bootstrap) UCL	N/A	

	A	B	C	D	E	F	G	H	I	J	K	L
1353					95% KM (z) UCL	0.571				95% KM Bootstrap t UCL		N/A
1354					90% KM Chebyshev UCL	0.805				95% KM Chebyshev UCL		1.039
1355					97.5% KM Chebyshev UCL	1.365				99% KM Chebyshev UCL		2.004
1356												
1357					**Gamma GOF Tests on Detected Observations Only**							
1358					**Not Enough Data to Perform GOF Test**							
1359												
1360					**Gamma Statistics on Detected Data Only**							
1361					k hat (MLE)	1.025				k star (bias corrected MLE)		N/A
1362					Theta hat (MLE)	0.478				Theta star (bias corrected MLE)		N/A
1363					nu hat (MLE)	6.152				nu star (bias corrected)		N/A
1364					Mean (detects)	0.49						
1365												
1366					**Gamma ROS Statistics using Imputed Non-Detects**							
1367					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1368					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1369					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1370					This is especially true when the sample size is small.							
1371					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1372					Minimum	0.0223				Mean		0.291
1373					Maximum	1.2				Median		0.135
1374					SD	0.407				CV		1.398
1375					k hat (MLE)	0.949				k star (bias corrected MLE)		0.637
1376					Theta hat (MLE)	0.307				Theta star (bias corrected MLE)		0.457
1377					nu hat (MLE)	13.28				nu star (bias corrected)		8.922
1378					Adjusted Level of Significance (β)	0.0158						
1379					Approximate Chi Square Value (8.92, α)	3.28				Adjusted Chi Square Value (8.92, β)		2.336
1380					95% Gamma Approximate UCL (use when n>=50)	0.793				95% Gamma Adjusted UCL (use when n<50)		N/A
1381												
1382					**Estimates of Gamma Parameters using KM Estimates**							
1383					Mean (KM)	0.287				SD (KM)		0.373
1384					Variance (KM)	0.139				SE of Mean (KM)		0.173
1385					k hat (KM)	0.594				k star (KM)		0.434
1386					nu hat (KM)	8.31				nu star (KM)		6.082
1387					theta hat (KM)	0.484				theta star (KM)		0.661
1388					80% gamma percentile (KM)	0.467				90% gamma percentile (KM)		0.799
1389					95% gamma percentile (KM)	1.159				99% gamma percentile (KM)		2.058
1390												
1391					**Gamma Kaplan-Meier (KM) Statistics**							
1392					Approximate Chi Square Value (6.08, α)	1.682				Adjusted Chi Square Value (6.08, β)		1.078
1393					95% Gamma Approximate KM-UCL (use when n>=50)	1.038				95% Gamma Adjusted KM-UCL (use when n<50)		1.62
1394												
1395					**Lognormal GOF Test on Detected Observations Only**							
1396					Shapiro Wilk Test Statistic	0.775				**Shapiro Wilk GOF Test**		
1397					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
1398					Lilliefors Test Statistic	0.375				**Lilliefors GOF Test**		
1399					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
1400					**Detected Data appear Lognormal at 5% Significance Level**							
1401												
1402					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1403					Mean in Original Scale	0.299				Mean in Log Scale		-1.636
1404					SD in Original Scale	0.399				SD in Log Scale		0.841

1405	95% t UCL (assumes normality of ROS data)					0.592	95% Percentile Bootstrap UCL					0.591
1406	95% BCA Bootstrap UCL					0.741	95% Bootstrap t UCL					3.445
1407	95% H-UCL (Log ROS)					0.851						
1408												
1409	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1410	KM Mean (logged)					-1.691	KM Geo Mean					0.184
1411	KM SD (logged)					0.766	95% Critical H Value (KM-Log)					3.066
1412	KM Standard Error of Mean (logged)					0.355	95% H-UCL (KM -Log)					0.644
1413	KM SD (logged)					0.766	95% Critical H Value (KM-Log)					3.066
1414	KM Standard Error of Mean (logged)					0.355						
1415												
1416	**DL/2 Statistics**											
1417	**DL/2 Normal**						**DL/2 Log-Transformed**					
1418	Mean in Original Scale					0.35	Mean in Log Scale					-1.466
1419	SD in Original Scale					0.405	SD in Log Scale					0.891
1420	95% t UCL (Assumes normality)					0.647	95% H-Stat UCL					1.18
1421	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1422												
1423	**Nonparametric Distribution Free UCL Statistics**											
1424	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
1425												
1426	**Suggested UCL to Use**											
1427	95% KM (t) UCL					0.622						
1428												
1429	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
1430	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
1431												
1432	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1433	Recommendations are based upon data size, data distribution, and skewness.											
1434	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1435	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1436												
1437	**Beryllium (smw17d)**											
1438												
1439	**General Statistics**											
1440	Total Number of Observations					7	Number of Distinct Observations					4
1441	Number of Detects					0	Number of Non-Detects					7
1442	Number of Distinct Detects					0	Number of Distinct Non-Detects					4
1443												
1444	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
1445	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
1446	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
1447												
1448	**The data set for variable Beryllium (smw17d) was not processed!**											
1449												
1450												
1451	**Beryllium (smw18)**											
1452												
1453	**General Statistics**											
1454	Total Number of Observations					7	Number of Distinct Observations					6
1455	Number of Detects					2	Number of Non-Detects					5
1456	Number of Distinct Detects					2	Number of Distinct Non-Detects					4

1457					Minimum Detect	0.061					Minimum Non-Detect	0.075
1458					Maximum Detect	0.081					Maximum Non-Detect	1.1
1459					Variance Detects	2.0000E-4					Percent Non-Detects	71.43%
1460					Mean Detects	0.071					SD Detects	0.0141
1461					Median Detects	0.071					CV Detects	0.199
1462					Skewness Detects	N/A					Kurtosis Detects	N/A
1463					Mean of Logged Detects	-2.655					SD of Logged Detects	0.201
1464												
1465						**Warning: Data set has only 2 Detected Values.**							
1466						**This is not enough to compute meaningful or reliable statistics and estimates.**						
1467												
1468												
1469						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1470						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
1471						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
1472						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
1473												
1474						**Normal GOF Test on Detects Only**						
1475						**Not Enough Data to Perform GOF Test**						
1476												
1477						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
1478					KM Mean	0.0677					KM Standard Error of Mean	0.0077
1479					KM SD	0.00943					95% KM (BCA) UCL	N/A
1480					95% KM (t) UCL	0.0826					95% KM (Percentile Bootstrap) UCL	N/A
1481					95% KM (z) UCL	0.0803					95% KM Bootstrap t UCL	N/A
1482					90% KM Chebyshev UCL	0.0908					95% KM Chebyshev UCL	0.101
1483					97.5% KM Chebyshev UCL	0.116					99% KM Chebyshev UCL	0.144
1484												
1485						**Gamma GOF Tests on Detected Observations Only**						
1486						**Not Enough Data to Perform GOF Test**						
1487												
1488						**Gamma Statistics on Detected Data Only**						
1489					k hat (MLE)	50.07					k star (bias corrected MLE)	N/A
1490					Theta hat (MLE)	0.00142					Theta star (bias corrected MLE)	N/A
1491					nu hat (MLE)	200.3					nu star (bias corrected)	N/A
1492					Mean (detects)	0.071						
1493												
1494						**Estimates of Gamma Parameters using KM Estimates**						
1495					Mean (KM)	0.0677					SD (KM)	0.00943
1496					Variance (KM)	8.8889E-5					SE of Mean (KM)	0.0077
1497					k hat (KM)	51.51					k star (KM)	29.53
1498					nu hat (KM)	721.2					nu star (KM)	413.4
1499					theta hat (KM)	0.00131					theta star (KM)	0.00229
1500					80% gamma percentile (KM)	0.0779					90% gamma percentile (KM)	0.084
1501					95% gamma percentile (KM)	0.0894					99% gamma percentile (KM)	0.1
1502												
1503						**Gamma Kaplan-Meier (KM) Statistics**						
1504											Adjusted Level of Significance (β)	0.0158
1505					Approximate Chi Square Value (413.42, α)	367.3					Adjusted Chi Square Value (413.42, β)	354.1
1506					95% Gamma Approximate KM-UCL (use when n>=50)	0.0762					95% Gamma Adjusted KM-UCL (use when n<50)	0.079
1507												
1508						**Lognormal GOF Test on Detected Observations Only**						

	A	B	C	D	E	F	G	H	I	J	K	L
1509	**Not Enough Data to Perform GOF Test**											
1510												
1511	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1512					Mean in Original Scale	0.0671				Mean in Log Scale	-2.706	
1513					SD in Original Scale	0.00749				SD in Log Scale	0.107	
1514				95% t UCL (assumes normality of ROS data)		0.0726				95% Percentile Bootstrap UCL	0.0717	
1515					95% BCA Bootstrap UCL	0.072				95% Bootstrap t UCL	0.0765	
1516					95% H-UCL (Log ROS)	0.0729						
1517												
1518	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1519					KM Mean (logged)	-2.702				KM Geo Mean	0.067	
1520					KM SD (logged)	0.134				95% Critical H Value (KM-Log)	1.909	
1521					KM Standard Error of Mean (logged)	0.109				95% H-UCL (KM -Log)	0.0751	
1522					KM SD (logged)	0.134				95% Critical H Value (KM-Log)	1.909	
1523					KM Standard Error of Mean (logged)	0.109						
1524												
1525	**DL/2 Statistics**											
1526				**DL/2 Normal**						**DL/2 Log-Transformed**		
1527					Mean in Original Scale	0.225				Mean in Log Scale	-1.946	
1528					SD in Original Scale	0.226				SD in Log Scale	1.04	
1529					95% t UCL (Assumes normality)	0.391				95% H-Stat UCL	1.235	
1530	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1531												
1532	**Nonparametric Distribution Free UCL Statistics**											
1533	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1534												
1535	**Suggested UCL to Use**											
1536					95% KM (t) UCL	0.0826				KM H-UCL	0.0751	
1537					95% KM (BCA) UCL	N/A						
1538	**Warning: One or more Recommended UCL(s) not available!**											
1539	**Warning: Recommended UCL exceeds the maximum observation**											
1540												
1541	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1542	Recommendations are based upon data size, data distribution, and skewness.											
1543	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1544	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1545												
1546	**Beryllium (smw18d)**											
1547												
1548	**General Statistics**											
1549					Total Number of Observations	7				Number of Distinct Observations	4	
1550					Number of Detects	0				Number of Non-Detects	7	
1551					Number of Distinct Detects	0				Number of Distinct Non-Detects	4	
1552												
1553	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
1554	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
1555	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
1556												
1557	**The data set for variable Beryllium (smw18d) was not processed!**											
1558												
1559												
1560	**Beryllium (smw19)**											

1561												
1562						General Statistics						
1563					Total Number of Observations	7				Number of Distinct Observations	5	
1564					Number of Detects	0				Number of Non-Detects	7	
1565					Number of Distinct Detects	0				Number of Distinct Non-Detects	5	
1566												
1567						Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!						
1568						Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!						
1569						The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).						
1570												
1571						The data set for variable Beryllium (smw19) was not processed!						
1572												
1573												
1574	Beryllium (smw7)											
1575												
1576						General Statistics						
1577					Total Number of Observations	7				Number of Distinct Observations	4	
1578					Number of Detects	0				Number of Non-Detects	7	
1579					Number of Distinct Detects	0				Number of Distinct Non-Detects	4	
1580												
1581						Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!						
1582						Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!						
1583						The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).						
1584												
1585						The data set for variable Beryllium (smw7) was not processed!						
1586												
1587												
1588	Beryllium (smw8)											
1589												
1590						General Statistics						
1591					Total Number of Observations	7				Number of Distinct Observations	4	
1592					Number of Detects	0				Number of Non-Detects	7	
1593					Number of Distinct Detects	0				Number of Distinct Non-Detects	4	
1594												
1595						Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!						
1596						Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!						
1597						The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).						
1598												
1599						The data set for variable Beryllium (smw8) was not processed!						
1600												
1601												
1602	Beryllium (smw9)											
1603												
1604						General Statistics						
1605					Total Number of Observations	8				Number of Distinct Observations	5	
1606					Number of Detects	0				Number of Non-Detects	8	
1607					Number of Distinct Detects	0				Number of Distinct Non-Detects	5	
1608												
1609						Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!						
1610						Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!						
1611						The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).						
1612												

	A	B	C	D	E	F	G	H	I	J	K	L
1613	The data set for variable Beryllium (smw9) was not processed!											
1614												
1615												
1616	Beryllium (tw2r)											
1617												
1618	General Statistics											
1619	Total Number of Observations					8	Number of Distinct Observations					5
1620	Number of Detects					0	Number of Non-Detects					8
1621	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
1622												
1623	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
1624	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
1625	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
1626												
1627	The data set for variable Beryllium (tw2r) was not processed!											
1628												
1629												
1630	Beryllium (tw5r)											
1631												
1632	General Statistics											
1633	Total Number of Observations					7	Number of Distinct Observations					5
1634	Number of Detects					1	Number of Non-Detects					6
1635	Number of Distinct Detects					1	Number of Distinct Non-Detects					4
1636												
1637	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
1638	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
1639												
1640	The data set for variable Beryllium (tw5r) was not processed!											
1641												
1642												
1643	Beryllium (waste water clarifier well)											
1644												
1645	General Statistics											
1646	Total Number of Observations					1	Number of Distinct Observations					1
1647	Number of Detects					0	Number of Non-Detects					1
1648	Number of Distinct Detects					0	Number of Distinct Non-Detects					1
1649												
1650	Warning: This data set only has 1 observations!											
1651	Data set is too small to compute reliable and meaningful statistics and estimates!											
1652	The data set for variable Beryllium (waste water clarifier well) was not processed!											
1653												
1654	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
1655	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											
1656												
1657												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 10:48:55 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	6
Number of Detects	3	Number of Non-Detects	6
Number of Distinct Detects	3	Number of Distinct Non-Detects	3
Minimum Detect	0.044	Minimum Non-Detect	0.03
Maximum Detect	0.074	Maximum Non-Detect	0.14
Variance Detects	2.8133E-4	Percent Non-Detects	66.67%
Mean Detects	0.0547	SD Detects	0.0168
Median Detects	0.046	CV Detects	0.307
Skewness Detects	1.704	Kurtosis Detects	N/A
Mean of Logged Detects	-2.935	SD of Logged Detects	0.288

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use

guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.

For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).

Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.8	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.364	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0393	KM Standard Error of Mean	0.00632
KM SD	0.0146	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.051	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0496	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0582	95% KM Chebyshev UCL	0.0668
97.5% KM Chebyshev UCL	0.0787	99% KM Chebyshev UCL	0.102

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	17.43	k star (bias corrected MLE)	N/A

53					Theta hat (MLE)	0.00314				Theta star (bias corrected MLE)		N/A
54					nu hat (MLE)	104.6				nu star (bias corrected)		N/A
55					Mean (detects)	0.0547						
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
60					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
61					This is especially true when the sample size is small.							
62					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
63					Minimum	0.01				Mean		0.0266
64					Maximum	0.074				Median		0.0178
65					SD	0.0229				CV		0.858
66					k hat (MLE)	1.848				k star (bias corrected MLE)		1.306
67					Theta hat (MLE)	0.0144				Theta star (bias corrected MLE)		0.0204
68					nu hat (MLE)	33.27				nu star (bias corrected)		23.51
69					Adjusted Level of Significance (β)	0.0231						
70					Approximate Chi Square Value (23.51, α)	13.48				Adjusted Chi Square Value (23.51, β)		11.91
71					95% Gamma Approximate UCL (use when n>=50)	0.0465				95% Gamma Adjusted UCL (use when n<50)		N/A
72												
73					**Estimates of Gamma Parameters using KM Estimates**							
74					Mean (KM)	0.0393				SD (KM)		0.0146
75					Variance (KM)	2.1294E-4				SE of Mean (KM)		0.00632
76					k hat (KM)	7.235				k star (KM)		4.897
77					nu hat (KM)	130.2				nu star (KM)		88.15
78					theta hat (KM)	0.00543				theta star (KM)		0.00801
79					80% gamma percentile (KM)	0.0529				90% gamma percentile (KM)		0.063
80					95% gamma percentile (KM)	0.0722				99% gamma percentile (KM)		0.0917
81												
82					**Gamma Kaplan-Meier (KM) Statistics**							
83					Approximate Chi Square Value (88.15, α)	67.51				Adjusted Chi Square Value (88.15, β)		63.71
84					95% Gamma Approximate KM-UCL (use when n>=50)	0.0513				95% Gamma Adjusted KM-UCL (use when n<50)		0.0543
85												
86					**Lognormal GOF Test on Detected Observations Only**							
87					Shapiro Wilk Test Statistic	0.814				**Shapiro Wilk GOF Test**		
88					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
89					Lilliefors Test Statistic	0.358				**Lilliefors GOF Test**		
90					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
91					**Detected Data appear Lognormal at 5% Significance Level**							
92												
93					**Lognormal ROS Statistics Using Imputed Non-Detects**							
94					Mean in Original Scale	0.0318				Mean in Log Scale		-3.6
95					SD in Original Scale	0.0197				SD in Log Scale		0.577
96					95% t UCL (assumes normality of ROS data)	0.044				95% Percentile Bootstrap UCL		0.0431
97					95% BCA Bootstrap UCL	0.0446				95% Bootstrap t UCL		0.0505
98					95% H-UCL (Log ROS)	0.0525						
99												
100					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
101					KM Mean (logged)	-3.292				KM Geo Mean		0.0372
102					KM SD (logged)	0.312				95% Critical H Value (KM-Log)		2.024
103					KM Standard Error of Mean (logged)	0.135				95% H-UCL (KM -Log)		0.0488
104					KM SD (logged)	0.312				95% Critical H Value (KM-Log)		2.024

105	KM Standard Error of Mean (logged)					0.135						
106												
107	DL/2 Statistics											
108	DL/2 Normal						DL/2 Log-Transformed					
109	Mean in Original Scale					0.0345	Mean in Log Scale					-3.597
110	SD in Original Scale					0.0247	SD in Log Scale					0.713
111	95% t UCL (Assumes normality)					0.0498	95% H-Stat UCL					0.0688
112	DL/2 is not a recommended method, provided for comparisons and historical reasons											
113												
114	Nonparametric Distribution Free UCL Statistics											
115	Detected Data appear Normal Distributed at 5% Significance Level											
116												
117	Suggested UCL to Use											
118	95% KM (t) UCL					0.051						
119												
120	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
121	Recommendations are based upon data size, data distribution, and skewness.											
122	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
123	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
124												
125	Cadmium (nfmw10)											
126												
127	General Statistics											
128	Total Number of Observations					8	Number of Distinct Observations					4
129	Number of Detects					0	Number of Non-Detects					8
130	Number of Distinct Detects					0	Number of Distinct Non-Detects					4
131												
132	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
133	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
134	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
135												
136	The data set for variable Cadmium (nfmw10) was not processed!											
137												
138												
139	Cadmium (nfmw11)											
140												
141	General Statistics											
142	Total Number of Observations					8	Number of Distinct Observations					4
143	Number of Detects					0	Number of Non-Detects					8
144	Number of Distinct Detects					0	Number of Distinct Non-Detects					4
145												
146	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
147	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
148	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
149												
150	The data set for variable Cadmium (nfmw11) was not processed!											
151												
152												
153	Cadmium (nfmw12)											
154												
155	General Statistics											
156	Total Number of Observations					8	Number of Distinct Observations					4

157					Number of Detects	1				Number of Non-Detects	7	
158					Number of Distinct Detects	1				Number of Distinct Non-Detects	3	
159												
160	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
161	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
162												
163	**The data set for variable Cadmium (nfmw12) was not processed!**											
164												
165												
166	**Cadmium (nfmw19)**											
167												
168	**General Statistics**											
169					Total Number of Observations	8				Number of Distinct Observations	8	
170					Number of Detects	6				Number of Non-Detects	2	
171					Number of Distinct Detects	6				Number of Distinct Non-Detects	2	
172					Minimum Detect	0.093				Minimum Non-Detect	0.14	
173					Maximum Detect	1.8				Maximum Non-Detect	0.54	
174					Variance Detects	0.381				Percent Non-Detects	25%	
175					Mean Detects	0.706				SD Detects	0.617	
176					Median Detects	0.625				CV Detects	0.875	
177					Skewness Detects	1.205				Kurtosis Detects	1.733	
178					Mean of Logged Detects	-0.756				SD of Logged Detects	1.091	
179												
180	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
181	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
182	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
183	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
184												
185	**Normal GOF Test on Detects Only**											
186					Shapiro Wilk Test Statistic	0.892				**Shapiro Wilk GOF Test**		
187					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Normal at 5% Significance Level		
188					Lilliefors Test Statistic	0.215				**Lilliefors GOF Test**		
189					5% Lilliefors Critical Value	0.325				Detected Data appear Normal at 5% Significance Level		
190	**Detected Data appear Normal at 5% Significance Level**											
191												
192	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
193					KM Mean	0.556				KM Standard Error of Mean	0.214	
194					KM SD	0.553				95% KM (BCA) UCL	0.912	
195					95% KM (t) UCL	0.962				95% KM (Percentile Bootstrap) UCL	0.909	
196					95% KM (z) UCL	0.908				95% KM Bootstrap t UCL	1.106	
197					90% KM Chebyshev UCL	1.198				95% KM Chebyshev UCL	1.489	
198					97.5% KM Chebyshev UCL	1.893				99% KM Chebyshev UCL	2.686	
199												
200	**Gamma GOF Tests on Detected Observations Only**											
201					A-D Test Statistic	0.263				**Anderson-Darling GOF Test**		
202					5% A-D Critical Value	0.71				Detected data appear Gamma Distributed at 5% Significance Level		
203					K-S Test Statistic	0.223				**Kolmogorov-Smirnov GOF**		
204					5% K-S Critical Value	0.338				Detected data appear Gamma Distributed at 5% Significance Level		
205	**Detected data appear Gamma Distributed at 5% Significance Level**											
206												
207	**Gamma Statistics on Detected Data Only**											
208					k hat (MLE)	1.371				k star (bias corrected MLE)	0.796	

209					Theta hat (MLE)	0.515				Theta star (bias corrected MLE)		0.886
210					nu hat (MLE)	16.45				nu star (bias corrected)		9.556
211					Mean (detects)	0.706						
212												
213	**Gamma ROS Statistics using Imputed Non-Detects**											
214	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
215	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
216	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
217	This is especially true when the sample size is small.											
218	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
219					Minimum	0.01				Mean		0.535
220					Maximum	1.8				Median		0.4
221					SD	0.61				CV		1.14
222					k hat (MLE)	0.654				k star (bias corrected MLE)		0.492
223					Theta hat (MLE)	0.818				Theta star (bias corrected MLE)		1.087
224					nu hat (MLE)	10.46				nu star (bias corrected)		7.871
225					Adjusted Level of Significance (β)	0.0195						
226					Approximate Chi Square Value (7.87, α)	2.661				Adjusted Chi Square Value (7.87, β)		1.958
227					95% Gamma Approximate UCL (use when n>=50)	1.582				95% Gamma Adjusted UCL (use when n<50)		2.15
228												
229	**Estimates of Gamma Parameters using KM Estimates**											
230					Mean (KM)	0.556				SD (KM)		0.553
231					Variance (KM)	0.305				SE of Mean (KM)		0.214
232					k hat (KM)	1.012				k star (KM)		0.716
233					nu hat (KM)	16.2				nu star (KM)		11.46
234					theta hat (KM)	0.549				theta star (KM)		0.776
235					80% gamma percentile (KM)	0.913				90% gamma percentile (KM)		1.388
236					95% gamma percentile (KM)	1.877				99% gamma percentile (KM)		3.042
237												
238	**Gamma Kaplan-Meier (KM) Statistics**											
239					Approximate Chi Square Value (11.46, α)	4.872				Adjusted Chi Square Value (11.46, β)		3.844
240					95% Gamma Approximate KM-UCL (use when n>=50)	1.308				95% Gamma Adjusted KM-UCL (use when n<50)		1.657
241												
242	**Lognormal GOF Test on Detected Observations Only**											
243					Shapiro Wilk Test Statistic	0.938				**Shapiro Wilk GOF Test**		
244					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
245					Lilliefors Test Statistic	0.267				**Lilliefors GOF Test**		
246					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
247	**Detected Data appear Lognormal at 5% Significance Level**											
248												
249	**Lognormal ROS Statistics Using Imputed Non-Detects**											
250					Mean in Original Scale	0.556				Mean in Log Scale		-1.129
251					SD in Original Scale	0.591				SD in Log Scale		1.156
252					95% t UCL (assumes normality of ROS data)	0.952				95% Percentile Bootstrap UCL		0.883
253					95% BCA Bootstrap UCL	0.978				95% Bootstrap t UCL		1.256
254					95% H-UCL (Log ROS)	3.353						
255												
256	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
257					KM Mean (logged)	-1.133				KM Geo Mean		0.322
258					KM SD (logged)	1.089				95% Critical H Value (KM-Log)		3.648
259					KM Standard Error of Mean (logged)	0.425				95% H-UCL (KM -Log)		2.614
260					KM SD (logged)	1.089				95% Critical H Value (KM-Log)		3.648

261			KM Standard Error of Mean (logged)			0.425						
262												
263						DL/2 Statistics						
264			DL/2 Normal					DL/2 Log-Transformed				
265			Mean in Original Scale			0.572		Mean in Log Scale				-1.063
266			SD in Original Scale			0.58		SD in Log Scale				1.142
267			95% t UCL (Assumes normality)			0.96		95% H-Stat UCL				3.39
268			DL/2 is not a recommended method, provided for comparisons and historical reasons									
269												
270						Nonparametric Distribution Free UCL Statistics						
271						Detected Data appear Normal Distributed at 5% Significance Level						
272												
273						Suggested UCL to Use						
274			95% KM (t) UCL			0.962						
275												
276						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
277						Recommendations are based upon data size, data distribution, and skewness.						
278						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
279						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
280												
281	Cadmium (nfmw1d)											
282												
283						General Statistics						
284			Total Number of Observations			9		Number of Distinct Observations				5
285			Number of Detects			0		Number of Non-Detects				9
286			Number of Distinct Detects			0		Number of Distinct Non-Detects				5
287												
288						Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!						
289						Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!						
290						The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).						
291												
292						The data set for variable Cadmium (nfmw1d) was not processed!						
293												
294												
295	Cadmium (nfmw1s)											
296												
297						General Statistics						
298			Total Number of Observations			7		Number of Distinct Observations				7
299			Number of Detects			4		Number of Non-Detects				3
300			Number of Distinct Detects			4		Number of Distinct Non-Detects				3
301			Minimum Detect			0.044		Minimum Non-Detect				0.15
302			Maximum Detect			0.16		Maximum Non-Detect				0.54
303			Variance Detects			0.00306		Percent Non-Detects				42.86%
304			Mean Detects			0.0775		SD Detects				0.0553
305			Median Detects			0.053		CV Detects				0.714
306			Skewness Detects			1.933		Kurtosis Detects				3.764
307			Mean of Logged Detects			-2.71		SD of Logged Detects				0.596
308												
309						Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use						
310						guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.						
311						For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).						
312						Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1						

313												
314	**Normal GOF Test on Detects Only**											
315					Shapiro Wilk Test Statistic	0.722	**Shapiro Wilk GOF Test**					
316					5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level					
317					Lilliefors Test Statistic	0.388	**Lilliefors GOF Test**					
318					5% Lilliefors Critical Value	0.375	Detected Data Not Normal at 5% Significance Level					
319	**Detected Data Not Normal at 5% Significance Level**											
320												
321	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
322					KM Mean	0.072			KM Standard Error of Mean	0.0229		
323					KM SD	0.0443			95% KM (BCA) UCL	N/A		
324					95% KM (t) UCL	0.117			95% KM (Percentile Bootstrap) UCL	N/A		
325					95% KM (z) UCL	0.11			95% KM Bootstrap t UCL	N/A		
326					90% KM Chebyshev UCL	0.141			95% KM Chebyshev UCL	0.172		
327					97.5% KM Chebyshev UCL	0.215			99% KM Chebyshev UCL	0.3		
328												
329	**Gamma GOF Tests on Detected Observations Only**											
330					A-D Test Statistic	0.64	**Anderson-Darling GOF Test**					
331					5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level					
332					K-S Test Statistic	0.378	**Kolmogorov-Smirnov GOF**					
333					5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level					
334	**Detected data appear Gamma Distributed at 5% Significance Level**											
335												
336	**Gamma Statistics on Detected Data Only**											
337					k hat (MLE)	3.436			k star (bias corrected MLE)	1.026		
338					Theta hat (MLE)	0.0226			Theta star (bias corrected MLE)	0.0756		
339					nu hat (MLE)	27.49			nu star (bias corrected)	8.205		
340					Mean (detects)	0.0775						
341												
342	**Gamma ROS Statistics using Imputed Non-Detects**											
343	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
344	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
345	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
346	This is especially true when the sample size is small.											
347	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
348					Minimum	0.044			Mean	0.0705		
349					Maximum	0.16			Median	0.058		
350					SD	0.0403			CV	0.572		
351					k hat (MLE)	5.365			k star (bias corrected MLE)	3.161		
352					Theta hat (MLE)	0.0131			Theta star (bias corrected MLE)	0.0223		
353					nu hat (MLE)	75.11			nu star (bias corrected)	44.25		
354					Adjusted Level of Significance (β)	0.0158						
355					Approximate Chi Square Value (44.25, α)	30			Adjusted Chi Square Value (44.25, β)	26.5		
356					95% Gamma Approximate UCL (use when n>=50)	0.104			95% Gamma Adjusted UCL (use when n<50)	N/A		
357												
358	**Estimates of Gamma Parameters using KM Estimates**											
359					Mean (KM)	0.072			SD (KM)	0.0443		
360					Variance (KM)	0.00196			SE of Mean (KM)	0.0229		
361					k hat (KM)	2.64			k star (KM)	1.604		
362					nu hat (KM)	36.96			nu star (KM)	22.45		
363					theta hat (KM)	0.0273			theta star (KM)	0.0449		
364					80% gamma percentile (KM)	0.111			90% gamma percentile (KM)	0.148		

365	95% gamma percentile (KM)					0.183	99% gamma percentile (KM)					0.264
366												
367	**Gamma Kaplan-Meier (KM) Statistics**											
368	Approximate Chi Square Value (22.45, α)					12.68	Adjusted Chi Square Value (22.45, β)					10.53
369	95% Gamma Approximate KM-UCL (use when n>=50)					0.128	95% Gamma Adjusted KM-UCL (use when n<50)					0.154
370												
371	**Lognormal GOF Test on Detected Observations Only**											
372	Shapiro Wilk Test Statistic					0.792	**Shapiro Wilk GOF Test**					
373	5% Shapiro Wilk Critical Value					0.748	Detected Data appear Lognormal at 5% Significance Level					
374	Lilliefors Test Statistic					0.341	**Lilliefors GOF Test**					
375	5% Lilliefors Critical Value					0.375	Detected Data appear Lognormal at 5% Significance Level					
376	**Detected Data appear Lognormal at 5% Significance Level**											
377												
378	**Lognormal ROS Statistics Using Imputed Non-Detects**											
379	Mean in Original Scale					0.0696	Mean in Log Scale					-2.762
380	SD in Original Scale					0.0404	SD in Log Scale					0.43
381	95% t UCL (assumes normality of ROS data)					0.0993	95% Percentile Bootstrap UCL					0.0983
382	95% BCA Bootstrap UCL					0.103	95% Bootstrap t UCL					0.182
383	95% H-UCL (Log ROS)					0.104						
384												
385	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
386	KM Mean (logged)					-2.768	KM Geo Mean					0.0628
387	KM SD (logged)					0.479	95% Critical H Value (KM-Log)					2.417
388	KM Standard Error of Mean (logged)					0.249	95% H-UCL (KM -Log)					0.113
389	KM SD (logged)					0.479	95% Critical H Value (KM-Log)					2.417
390	KM Standard Error of Mean (logged)					0.249						
391												
392	**DL/2 Statistics**											
393	**DL/2 Normal**						**DL/2 Log-Transformed**					
394	Mean in Original Scale					0.122	Mean in Log Scale					-2.336
395	SD in Original Scale					0.0888	SD in Log Scale					0.739
396	95% t UCL (Assumes normality)					0.187	95% H-Stat UCL					0.314
397	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
398												
399	**Nonparametric Distribution Free UCL Statistics**											
400	**Detected Data appear Gamma Distributed at 5% Significance Level**											
401												
402	**Suggested UCL to Use**											
403	95% KM Adjusted Gamma UCL					0.154	95% GROS Adjusted Gamma UCL					N/A
404												
405	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
406	Recommendations are based upon data size, data distribution, and skewness.											
407	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
408	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
409												
410	**Cadmium (nfmw2)**											
411												
412	**General Statistics**											
413	Total Number of Observations					9	Number of Distinct Observations					6
414	Number of Detects					1	Number of Non-Detects					8
415	Number of Distinct Detects					1	Number of Distinct Non-Detects					5
416												

	A	B	C	D	E	F	G	H	I	J	K	L
417	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
418	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
419												
420	**The data set for variable Cadmium (nfmw2) was not processed!**											
421												
422												
423	**Cadmium (nfmw20)**											
424												
425	**General Statistics**											
426	Total Number of Observations					8	Number of Distinct Observations					5
427	Number of Detects					0	Number of Non-Detects					8
428	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
429												
430	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
431	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
432	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
433												
434	**The data set for variable Cadmium (nfmw20) was not processed!**											
435												
436												
437	**Cadmium (nfmw22)**											
438												
439	**General Statistics**											
440	Total Number of Observations					4	Number of Distinct Observations					3
441	Number of Detects					2	Number of Non-Detects					2
442	Number of Distinct Detects					2	Number of Distinct Non-Detects					1
443	Minimum Detect					0.043	Minimum Non-Detect					0.15
444	Maximum Detect					0.051	Maximum Non-Detect					0.15
445	Variance Detects					3.2000E-5	Percent Non-Detects					50%
446	Mean Detects					0.047	SD Detects					0.00566
447	Median Detects					0.047	CV Detects					0.12
448	Skewness Detects					N/A	Kurtosis Detects					N/A
449	Mean of Logged Detects					-3.061	SD of Logged Detects					0.121
450												
451	**Warning: Data set has only 2 Detected Values.**											
452	**This is not enough to compute meaningful or reliable statistics and estimates.**											
453												
454												
455	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
456	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
457	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
458	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
459												
460	**Normal GOF Test on Detects Only**											
461	**Not Enough Data to Perform GOF Test**											
462												
463	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
464	KM Mean					0.047	KM Standard Error of Mean					0.004
465	KM SD					0.004	95% KM (BCA) UCL					N/A
466	95% KM (t) UCL					0.0564	95% KM (Percentile Bootstrap) UCL					N/A
467	95% KM (z) UCL					0.0536	95% KM Bootstrap t UCL					N/A
468	90% KM Chebyshev UCL					0.059	95% KM Chebyshev UCL					0.0644

469				97.5% KM Chebyshev UCL		0.072				99% KM Chebyshev UCL		0.0868
470												
471	**Gamma GOF Tests on Detected Observations Only**											
472	**Not Enough Data to Perform GOF Test**											
473												
474	**Gamma Statistics on Detected Data Only**											
475				k hat (MLE)		137.7				k star (bias corrected MLE)		N/A
476				Theta hat (MLE)		3.4125E-4				Theta star (bias corrected MLE)		N/A
477				nu hat (MLE)		550.9				nu star (bias corrected)		N/A
478				Mean (detects)		0.047						
479												
480	**Estimates of Gamma Parameters using KM Estimates**											
481				Mean (KM)		0.047				SD (KM)		0.004
482				Variance (KM)		1.6000E-5				SE of Mean (KM)		0.004
483				k hat (KM)		138.1				k star (KM)		34.68
484				nu hat (KM)		1105				nu star (KM)		277.5
485				theta hat (KM)		3.4043E-4				theta star (KM)		0.00136
486				80% gamma percentile (KM)		0.0536				90% gamma percentile (KM)		0.0575
487				95% gamma percentile (KM)		0.0609				99% gamma percentile (KM)		0.0675
488												
489	**Gamma Kaplan-Meier (KM) Statistics**											
490										Adjusted Level of Significance (β)		0.00498
491				Approximate Chi Square Value (277.46, α)		239.9				Adjusted Chi Square Value (277.46, β)		220.5
492				95% Gamma Approximate KM-UCL (use when n>=50)		0.0544				95% Gamma Adjusted KM-UCL (use when n<50)		0.0591
493												
494	**Lognormal GOF Test on Detected Observations Only**											
495	**Not Enough Data to Perform GOF Test**											
496												
497	**Lognormal ROS Statistics Using Imputed Non-Detects**											
498				Mean in Original Scale		0.047				Mean in Log Scale		-3.061
499				SD in Original Scale		0.00462				SD in Log Scale		0.0985
500				95% t UCL (assumes normality of ROS data)		0.0524				95% Percentile Bootstrap UCL		N/A
501				95% BCA Bootstrap UCL		N/A				95% Bootstrap t UCL		N/A
502				95% H-UCL (Log ROS)		N/A						
503												
504	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
505				KM Mean (logged)		-3.061				KM Geo Mean		0.0468
506				KM SD (logged)		0.0853				95% Critical H Value (KM-Log)		N/A
507				KM Standard Error of Mean (logged)		0.0853				95% H-UCL (KM -Log)		N/A
508				KM SD (logged)		0.0853				95% Critical H Value (KM-Log)		N/A
509				KM Standard Error of Mean (logged)		0.0853						
510												
511	**DL/2 Statistics**											
512	**DL/2 Normal**									**DL/2 Log-Transformed**		
513				Mean in Original Scale		0.061				Mean in Log Scale		-2.826
514				SD in Original Scale		0.0165				SD in Log Scale		0.281
515				95% t UCL (Assumes normality)		0.0804				95% H-Stat UCL		0.0957
516	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
517												
518	**Nonparametric Distribution Free UCL Statistics**											
519	**Data do not follow a Discernible Distribution at 5% Significance Level**											
520												

	A	B	C	D	E	F	G	H	I	J	K	L
521	**Suggested UCL to Use**											
522					95% KM (t) UCL	0.0564				KM H-UCL		N/A
523					95% KM (BCA) UCL	N/A						
524	**Warning: One or more Recommended UCL(s) not available!**											
525	**Warning: Recommended UCL exceeds the maximum observation**											
526												
527	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
528	Recommendations are based upon data size, data distribution, and skewness.											
529	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
530	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
531												
532	**Cadmium (nfmw23)**											
533												
534	**General Statistics**											
535					Total Number of Observations	4				Number of Distinct Observations		4
536					Number of Detects	3				Number of Non-Detects		1
537					Number of Distinct Detects	3				Number of Distinct Non-Detects		1
538					Minimum Detect	0.06				Minimum Non-Detect		0.15
539					Maximum Detect	0.16				Maximum Non-Detect		0.15
540					Variance Detects	0.00309				Percent Non-Detects		25%
541					Mean Detects	0.096				SD Detects		0.0556
542					Median Detects	0.068				CV Detects		0.579
543					Skewness Detects	1.692				Kurtosis Detects		N/A
544					Mean of Logged Detects	-2.445				SD of Logged Detects		0.534
545												
546	**Warning: Data set has only 3 Detected Values.**											
547	**This is not enough to compute meaningful or reliable statistics and estimates.**											
548												
549												
550	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
551	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
552	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
553	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
554												
555	**Normal GOF Test on Detects Only**											
556					Shapiro Wilk Test Statistic	0.81				**Shapiro Wilk GOF Test**		
557					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Normal at 5% Significance Level		
558					Lilliefors Test Statistic	0.359				**Lilliefors GOF Test**		
559					5% Lilliefors Critical Value	0.425				Detected Data appear Normal at 5% Significance Level		
560	**Detected Data appear Normal at 5% Significance Level**											
561												
562	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
563					KM Mean	0.088				KM Standard Error of Mean		0.0256
564					KM SD	0.0417				95% KM (BCA) UCL		N/A
565					95% KM (t) UCL	0.148				95% KM (Percentile Bootstrap) UCL		N/A
566					95% KM (z) UCL	0.13				95% KM Bootstrap t UCL		N/A
567					90% KM Chebyshev UCL	0.165				95% KM Chebyshev UCL		0.2
568					97.5% KM Chebyshev UCL	0.248				99% KM Chebyshev UCL		0.343
569												
570	**Gamma GOF Tests on Detected Observations Only**											
571	**Not Enough Data to Perform GOF Test**											
572												

	A	B	C	D	E	F	G	H	I	J	K	L
573	**Gamma Statistics on Detected Data Only**											
574					k hat (MLE)	5.095				k star (bias corrected MLE)		N/A
575					Theta hat (MLE)	0.0188				Theta star (bias corrected MLE)		N/A
576					nu hat (MLE)	30.57				nu star (bias corrected)		N/A
577					Mean (detects)	0.096						
578												
579	**Gamma ROS Statistics using Imputed Non-Detects**											
580	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
581	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
582	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
583	This is especially true when the sample size is small.											
584	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
585					Minimum	0.06				Mean		0.0886
586					Maximum	0.16				Median		0.0671
587					SD	0.0477				CV		0.539
588					k hat (MLE)	5.837				k star (bias corrected MLE)		1.626
589					Theta hat (MLE)	0.0152				Theta star (bias corrected MLE)		0.0545
590					nu hat (MLE)	46.7				nu star (bias corrected)		13.01
591					Adjusted Level of Significance (β)	0.00498						
592					Approximate Chi Square Value (13.01, α)	5.898				Adjusted Chi Square Value (13.01, β)		N/A
593					95% Gamma Approximate UCL (use when n>=50)	0.195				95% Gamma Adjusted UCL (use when n<50)		N/A
594												
595	**Estimates of Gamma Parameters using KM Estimates**											
596					Mean (KM)	0.088				SD (KM)		0.0417
597					Variance (KM)	0.00174				SE of Mean (KM)		0.0256
598					k hat (KM)	4.451				k star (KM)		1.279
599					nu hat (KM)	35.6				nu star (KM)		10.23
600					theta hat (KM)	0.0198				theta star (KM)		0.0688
601					80% gamma percentile (KM)	0.138				90% gamma percentile (KM)		0.191
602					95% gamma percentile (KM)	0.242				99% gamma percentile (KM)		0.359
603												
604	**Gamma Kaplan-Meier (KM) Statistics**											
605					Approximate Chi Square Value (10.23, α)	4.089				Adjusted Chi Square Value (10.23, β)		2.261
606					95% Gamma Approximate KM-UCL (use when n>=50)	0.22				95% Gamma Adjusted KM-UCL (use when n<50)		0.398
607												
608	**Lognormal GOF Test on Detected Observations Only**											
609					Shapiro Wilk Test Statistic	0.844				**Shapiro Wilk GOF Test**		
610					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
611					Lilliefors Test Statistic	0.343				**Lilliefors GOF Test**		
612					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
613	**Detected Data appear Lognormal at 5% Significance Level**											
614												
615	**Lognormal ROS Statistics Using Imputed Non-Detects**											
616					Mean in Original Scale	0.0886				Mean in Log Scale		-2.512
617					SD in Original Scale	0.0477				SD in Log Scale		0.456
618					95% t UCL (assumes normality of ROS data)	0.145				95% Percentile Bootstrap UCL		N/A
619					95% BCA Bootstrap UCL	N/A				95% Bootstrap t UCL		N/A
620					95% H-UCL (Log ROS)	0.222						
621												
622	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
623					KM Mean (logged)	-2.521				KM Geo Mean		0.0804
624					KM SD (logged)	0.401				95% Critical H Value (KM-Log)		3.181

625	KM Standard Error of Mean (logged)					0.247				95% H-UCL (KM -Log)		0.182
626	KM SD (logged)					0.401				95% Critical H Value (KM-Log)		3.181
627	KM Standard Error of Mean (logged)					0.247						
628												
629	**DL/2 Statistics**											
630	**DL/2 Normal**						**DL/2 Log-Transformed**					
631	Mean in Original Scale					0.0908	Mean in Log Scale					-2.481
632	SD in Original Scale					0.0466	SD in Log Scale					0.442
633	95% t UCL (Assumes normality)					0.146	95% H-Stat UCL					0.218
634	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
635												
636	**Nonparametric Distribution Free UCL Statistics**											
637	**Detected Data appear Normal Distributed at 5% Significance Level**											
638												
639	**Suggested UCL to Use**											
640	95% KM (t) UCL					0.148						
641												
642	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
643	Recommendations are based upon data size, data distribution, and skewness.											
644	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
645	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
646												
647	**Cadmium (nfmw3)**											
648												
649	**General Statistics**											
650	Total Number of Observations					9	Number of Distinct Observations					5
651	Number of Detects					0	Number of Non-Detects					9
652	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
653												
654	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
655	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
656	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
657												
658	**The data set for variable Cadmium (nfmw3) was not processed!**											
659												
660												
661	**Cadmium (nfmw4)**											
662												
663	**General Statistics**											
664	Total Number of Observations					9	Number of Distinct Observations					7
665	Number of Detects					3	Number of Non-Detects					6
666	Number of Distinct Detects					3	Number of Distinct Non-Detects					5
667	Minimum Detect					0.033	Minimum Non-Detect					0.013
668	Maximum Detect					0.04	Maximum Non-Detect					0.54
669	Variance Detects					1.4333E-5	Percent Non-Detects					66.67%
670	Mean Detects					0.0357	SD Detects					0.00379
671	Median Detects					0.034	CV Detects					0.106
672	Skewness Detects					1.597	Kurtosis Detects					N/A
673	Mean of Logged Detects					-3.337	SD of Logged Detects					0.104
674												
675	**Warning: Data set has only 3 Detected Values.**											
676	**This is not enough to compute meaningful or reliable statistics and estimates.**											

	A	B	C	D	E	F	G	H	I	J	K	L
677												
678												
679	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
680	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
681	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
682	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
683												
684	**Normal GOF Test on Detects Only**											
685						Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**				
686						5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level				
687						Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**				
688						5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level				
689	**Detected Data appear Normal at 5% Significance Level**											
690												
691	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
692						KM Mean	0.0215	KM Standard Error of Mean	0.00482			
693						KM SD	0.0111	95% KM (BCA) UCL	N/A			
694						95% KM (t) UCL	0.0305	95% KM (Percentile Bootstrap) UCL	N/A			
695						95% KM (z) UCL	0.0294	95% KM Bootstrap t UCL	N/A			
696						90% KM Chebyshev UCL	0.036	95% KM Chebyshev UCL	0.0425			
697						97.5% KM Chebyshev UCL	0.0516	99% KM Chebyshev UCL	0.0695			
698												
699	**Gamma GOF Tests on Detected Observations Only**											
700	**Not Enough Data to Perform GOF Test**											
701												
702	**Gamma Statistics on Detected Data Only**											
703						k hat (MLE)	137.8	k star (bias corrected MLE)	N/A			
704						Theta hat (MLE)	2.5891E-4	Theta star (bias corrected MLE)	N/A			
705						nu hat (MLE)	826.5	nu star (bias corrected)	N/A			
706						Mean (detects)	0.0357					
707												
708	**Gamma ROS Statistics using Imputed Non-Detects**											
709	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
710	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
711	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
712	This is especially true when the sample size is small.											
713	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
714						Minimum	0.0195	Mean	0.0272			
715						Maximum	0.04	Median	0.0249			
716						SD	0.00689	CV	0.253			
717						k hat (MLE)	18.9	k star (bias corrected MLE)	12.67			
718						Theta hat (MLE)	0.00144	Theta star (bias corrected MLE)	0.00215			
719						nu hat (MLE)	340.2	nu star (bias corrected)	228.1			
720						Adjusted Level of Significance (β)	0.0231					
721						Approximate Chi Square Value (228.11, α)	194.1	Adjusted Chi Square Value (228.11, β)	187.5			
722						95% Gamma Approximate UCL (use when n>=50)	0.032	95% Gamma Adjusted UCL (use when n<50)	N/A			
723												
724	**Estimates of Gamma Parameters using KM Estimates**											
725						Mean (KM)	0.0215	SD (KM)	0.0111			
726						Variance (KM)	1.2400E-4	SE of Mean (KM)	0.00482			
727						k hat (KM)	3.728	k star (KM)	2.559			
728						nu hat (KM)	67.1	nu star (KM)	46.07			

	A	B	C	D	E	F	G	H	I	J	K	L
729					theta hat (KM)	0.00577					theta star (KM)	0.0084
730					80% gamma percentile (KM)	0.0313					90% gamma percentile (KM)	0.0395
731					95% gamma percentile (KM)	0.0473					99% gamma percentile (KM)	0.0642
732												
733					**Gamma Kaplan-Meier (KM) Statistics**							
734					Approximate Chi Square Value (46.07, α)	31.49					Adjusted Chi Square Value (46.07, β)	28.97
735					95% Gamma Approximate KM-UCL (use when n>=50)	0.0314					95% Gamma Adjusted KM-UCL (use when n<50)	0.0342
736												
737					**Lognormal GOF Test on Detected Observations Only**							
738					Shapiro Wilk Test Statistic	0.863					**Shapiro Wilk GOF Test**	
739					5% Shapiro Wilk Critical Value	0.767					Detected Data appear Lognormal at 5% Significance Level	
740					Lilliefors Test Statistic	0.332					**Lilliefors GOF Test**	
741					5% Lilliefors Critical Value	0.425					Detected Data appear Lognormal at 5% Significance Level	
742					**Detected Data appear Lognormal at 5% Significance Level**							
743												
744					**Lognormal ROS Statistics Using Imputed Non-Detects**							
745					Mean in Original Scale	0.0285					Mean in Log Scale	-3.577
746					SD in Original Scale	0.00591					SD in Log Scale	0.196
747					95% t UCL (assumes normality of ROS data)	0.0321					95% Percentile Bootstrap UCL	0.0317
748					95% BCA Bootstrap UCL	0.0322					95% Bootstrap t UCL	0.034
749					95% H-UCL (Log ROS)	0.0325						
750												
751					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
752					KM Mean (logged)	-3.966					KM Geo Mean	0.019
753					KM SD (logged)	0.49					95% Critical H Value (KM-Log)	2.219
754					KM Standard Error of Mean (logged)	0.212					95% H-UCL (KM -Log)	0.0314
755					KM SD (logged)	0.49					95% Critical H Value (KM-Log)	2.219
756					KM Standard Error of Mean (logged)	0.212						
757												
758					**DL/2 Statistics**							
759					**DL/2 Normal**						**DL/2 Log-Transformed**	
760					Mean in Original Scale	0.0493					Mean in Log Scale	-3.681
761					SD in Original Scale	0.0835					SD in Log Scale	1.055
762					95% t UCL (Assumes normality)	0.101					95% H-Stat UCL	0.154
763					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
764												
765					**Nonparametric Distribution Free UCL Statistics**							
766					**Detected Data appear Normal Distributed at 5% Significance Level**							
767												
768					**Suggested UCL to Use**							
769					95% KM (t) UCL	0.0305						
770												
771					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
772					Recommendations are based upon data size, data distribution, and skewness.							
773					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
774					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
775												
776	**Cadmium (nfmw7)**											
777												
778					**General Statistics**							
779					Total Number of Observations	9					Number of Distinct Observations	7
780					Number of Detects	6					Number of Non-Detects	3

781				Number of Distinct Detects	6					Number of Distinct Non-Detects	2	
782				Minimum Detect	0.041					Minimum Non-Detect	0.03	
783				Maximum Detect	0.14					Maximum Non-Detect	0.14	
784				Variance Detects	0.00145					Percent Non-Detects	33.33%	
785				Mean Detects	0.0748					SD Detects	0.0381	
786				Median Detects	0.06					CV Detects	0.509	
787				Skewness Detects	1.22					Kurtosis Detects	0.549	
788				Mean of Logged Detects	-2.689					SD of Logged Detects	0.469	
789												
790	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
791	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
792	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
793	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
794												
795	**Normal GOF Test on Detects Only**											
796				Shapiro Wilk Test Statistic	0.867					**Shapiro Wilk GOF Test**		
797				5% Shapiro Wilk Critical Value	0.788					Detected Data appear Normal at 5% Significance Level		
798				Lilliefors Test Statistic	0.258					**Lilliefors GOF Test**		
799				5% Lilliefors Critical Value	0.325					Detected Data appear Normal at 5% Significance Level		
800	**Detected Data appear Normal at 5% Significance Level**											
801												
802	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
803				KM Mean	0.0624					KM Standard Error of Mean	0.013	
804				KM SD	0.0348					95% KM (BCA) UCL	0.0831	
805				95% KM (t) UCL	0.0867					95% KM (Percentile Bootstrap) UCL	0.0834	
806				95% KM (z) UCL	0.0839					95% KM Bootstrap t UCL	0.11	
807				90% KM Chebyshev UCL	0.102					95% KM Chebyshev UCL	0.119	
808				97.5% KM Chebyshev UCL	0.144					99% KM Chebyshev UCL	0.192	
809												
810	**Gamma GOF Tests on Detected Observations Only**											
811				A-D Test Statistic	0.354					**Anderson-Darling GOF Test**		
812				5% A-D Critical Value	0.698					Detected data appear Gamma Distributed at 5% Significance Level		
813				K-S Test Statistic	0.221					**Kolmogorov-Smirnov GOF**		
814				5% K-S Critical Value	0.333					Detected data appear Gamma Distributed at 5% Significance Level		
815	**Detected data appear Gamma Distributed at 5% Significance Level**											
816												
817	**Gamma Statistics on Detected Data Only**											
818				k hat (MLE)	5.321					k star (bias corrected MLE)	2.772	
819				Theta hat (MLE)	0.0141					Theta star (bias corrected MLE)	0.027	
820				nu hat (MLE)	63.86					nu star (bias corrected)	33.26	
821				Mean (detects)	0.0748							
822												
823	**Gamma ROS Statistics using Imputed Non-Detects**											
824	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
825	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
826	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
827	This is especially true when the sample size is small.											
828	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
829				Minimum	0.01					Mean	0.0577	
830				Maximum	0.14					Median	0.048	
831				SD	0.0408					CV	0.707	
832				k hat (MLE)	2.037					k star (bias corrected MLE)	1.432	

833					Theta hat (MLE)	0.0283				Theta star (bias corrected MLE)		0.0403
834					nu hat (MLE)	36.66				nu star (bias corrected)		25.78
835					Adjusted Level of Significance (β)	0.0231						
836					Approximate Chi Square Value (25.78, α)	15.21				Adjusted Chi Square Value (25.78, β)		13.52
837					95% Gamma Approximate UCL (use when n>=50)	0.0977				95% Gamma Adjusted UCL (use when n<50)		0.11
838												
839	**Estimates of Gamma Parameters using KM Estimates**											
840					Mean (KM)	0.0624				SD (KM)		0.0348
841					Variance (KM)	0.00121				SE of Mean (KM)		0.013
842					k hat (KM)	3.218				k star (KM)		2.22
843					nu hat (KM)	57.93				nu star (KM)		39.96
844					theta hat (KM)	0.0194				theta star (KM)		0.0281
845					80% gamma percentile (KM)	0.0923				90% gamma percentile (KM)		0.118
846					95% gamma percentile (KM)	0.143				99% gamma percentile (KM)		0.198
847												
848	**Gamma Kaplan-Meier (KM) Statistics**											
849					Approximate Chi Square Value (39.96, α)	26.47				Adjusted Chi Square Value (39.96, β)		24.18
850					95% Gamma Approximate KM-UCL (use when n>=50)	0.0942				95% Gamma Adjusted KM-UCL (use when n<50)		0.103
851												
852	**Lognormal GOF Test on Detected Observations Only**											
853					Shapiro Wilk Test Statistic	0.932				**Shapiro Wilk GOF Test**		
854					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
855					Lilliefors Test Statistic	0.191				**Lilliefors GOF Test**		
856					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
857	**Detected Data appear Lognormal at 5% Significance Level**											
858												
859	**Lognormal ROS Statistics Using Imputed Non-Detects**											
860					Mean in Original Scale	0.0604				Mean in Log Scale		-2.966
861					SD in Original Scale	0.0377				SD in Log Scale		0.595
862					95% t UCL (assumes normality of ROS data)	0.0838				95% Percentile Bootstrap UCL		0.0809
863					95% BCA Bootstrap UCL	0.0848				95% Bootstrap t UCL		0.106
864					95% H-UCL (Log ROS)	0.102						
865												
866	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
867					KM Mean (logged)	-2.908				KM Geo Mean		0.0546
868					KM SD (logged)	0.503				95% Critical H Value (KM-Log)		2.232
869					KM Standard Error of Mean (logged)	0.191				95% H-UCL (KM -Log)		0.0921
870					KM SD (logged)	0.503				95% Critical H Value (KM-Log)		2.232
871					KM Standard Error of Mean (logged)	0.191						
872												
873	**DL/2 Statistics**											
874	**DL/2 Normal**									**DL/2 Log-Transformed**		
875					Mean in Original Scale	0.061				Mean in Log Scale		-3.022
876					SD in Original Scale	0.0399				SD in Log Scale		0.764
877					95% t UCL (Assumes normality)	0.0857				95% H-Stat UCL		0.137
878	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
879												
880	**Nonparametric Distribution Free UCL Statistics**											
881	**Detected Data appear Normal Distributed at 5% Significance Level**											
882												
883	**Suggested UCL to Use**											
884					95% KM (t) UCL	0.0867						

	A	B	C	D	E	F	G	H	I	J	K	L
885												
886	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
887	Recommendations are based upon data size, data distribution, and skewness.											
888	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
889	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
890												
891	**Cadmium (nfmw8)**											
892												
893	**General Statistics**											
894	Total Number of Observations					8	Number of Distinct Observations					5
895	Number of Detects					0	Number of Non-Detects					8
896	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
897												
898	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
899	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
900	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
901												
902	**The data set for variable Cadmium (nfmw8) was not processed!**											
903												
904												
905	**Cadmium (nfmw9)**											
906												
907	**General Statistics**											
908	Total Number of Observations					8	Number of Distinct Observations					8
909	Number of Detects					3	Number of Non-Detects					5
910	Number of Distinct Detects					3	Number of Distinct Non-Detects					5
911	Minimum Detect					0.047	Minimum Non-Detect					0.028
912	Maximum Detect					0.24	Maximum Non-Detect					0.54
913	Variance Detects					0.01	Percent Non-Detects					62.5%
914	Mean Detects					0.159	SD Detects					0.1
915	Median Detects					0.19	CV Detects					0.63
916	Skewness Detects					-1.259	Kurtosis Detects					N/A
917	Mean of Logged Detects					-2.048	SD of Logged Detects					0.882
918												
919	**Warning: Data set has only 3 Detected Values.**											
920	**This is not enough to compute meaningful or reliable statistics and estimates.**											
921												
922												
923	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
924	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
925	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
926	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
927												
928	**Normal GOF Test on Detects Only**											
929	Shapiro Wilk Test Statistic					0.928	**Shapiro Wilk GOF Test**					
930	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Normal at 5% Significance Level					
931	Lilliefors Test Statistic					0.288	**Lilliefors GOF Test**					
932	5% Lilliefors Critical Value					0.425	Detected Data appear Normal at 5% Significance Level					
933	**Detected Data appear Normal at 5% Significance Level**											
934												
935	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
936	KM Mean					0.0946	KM Standard Error of Mean					0.0434

937					KM SD	0.0867				95% KM (BCA) UCL		N/A
938					95% KM (t) UCL	0.177				95% KM (Percentile Bootstrap) UCL		N/A
939					95% KM (z) UCL	0.166				95% KM Bootstrap t UCL		N/A
940					90% KM Chebyshev UCL	0.225				95% KM Chebyshev UCL		0.284
941					97.5% KM Chebyshev UCL	0.366				99% KM Chebyshev UCL		0.526
942												
943					**Gamma GOF Tests on Detected Observations Only**							
944					**Not Enough Data to Perform GOF Test**							
945												
946					**Gamma Statistics on Detected Data Only**							
947					k hat (MLE)	2.539				k star (bias corrected MLE)		N/A
948					Theta hat (MLE)	0.0626				Theta star (bias corrected MLE)		N/A
949					nu hat (MLE)	15.24				nu star (bias corrected)		N/A
950					Mean (detects)	0.159						
951												
952					**Gamma ROS Statistics using Imputed Non-Detects**							
953					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
954					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
955					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
956					This is especially true when the sample size is small.							
957					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
958					Minimum	0.01				Mean		0.0734
959					Maximum	0.24				Median		0.0403
960					SD	0.0897				CV		1.221
961					k hat (MLE)	0.856				k star (bias corrected MLE)		0.619
962					Theta hat (MLE)	0.0858				Theta star (bias corrected MLE)		0.119
963					nu hat (MLE)	13.7				nu star (bias corrected)		9.897
964					Adjusted Level of Significance (β)	0.0195						
965					Approximate Chi Square Value (9.90, α)	3.878				Adjusted Chi Square Value (9.90, β)		2.985
966					95% Gamma Approximate UCL (use when n>=50)	0.187				95% Gamma Adjusted UCL (use when n<50)		N/A
967												
968					**Estimates of Gamma Parameters using KM Estimates**							
969					Mean (KM)	0.0946				SD (KM)		0.0867
970					Variance (KM)	0.00752				SE of Mean (KM)		0.0434
971					k hat (KM)	1.19				k star (KM)		0.827
972					nu hat (KM)	19.03				nu star (KM)		13.23
973					theta hat (KM)	0.0795				theta star (KM)		0.114
974					80% gamma percentile (KM)	0.154				90% gamma percentile (KM)		0.228
975					95% gamma percentile (KM)	0.303				99% gamma percentile (KM)		0.48
976												
977					**Gamma Kaplan-Meier (KM) Statistics**							
978					Approximate Chi Square Value (13.23, α)	6.048				Adjusted Chi Square Value (13.23, β)		4.875
979					95% Gamma Approximate KM-UCL (use when n>=50)	0.207				95% Gamma Adjusted KM-UCL (use when n<50)		0.257
980												
981					**Lognormal GOF Test on Detected Observations Only**							
982					Shapiro Wilk Test Statistic	0.855				**Shapiro Wilk GOF Test**		
983					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
984					Lilliefors Test Statistic	0.337				**Lilliefors GOF Test**		
985					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
986					**Detected Data appear Lognormal at 5% Significance Level**							
987												
988					**Lognormal ROS Statistics Using Imputed Non-Detects**							

989				Mean in Original Scale		0.0764				Mean in Log Scale		-3.116
990				SD in Original Scale		0.0876				SD in Log Scale		1.098
991			95% t UCL (assumes normality of ROS data)			0.135				95% Percentile Bootstrap UCL		0.126
992				95% BCA Bootstrap UCL		0.141				95% Bootstrap t UCL		0.355
993				95% H-UCL (Log ROS)		0.371						
994												
995	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
996				KM Mean (logged)		-2.783				KM Geo Mean		0.0618
997				KM SD (logged)		0.901				95% Critical H Value (KM-Log)		3.187
998				KM Standard Error of Mean (logged)		0.454				95% H-UCL (KM -Log)		0.275
999				KM SD (logged)		0.901				95% Critical H Value (KM-Log)		3.187
1000				KM Standard Error of Mean (logged)		0.454						
1001												
1002	**DL/2 Statistics**											
1003	**DL/2 Normal**									**DL/2 Log-Transformed**		
1004				Mean in Original Scale		0.131				Mean in Log Scale		-2.524
1005				SD in Original Scale		0.105				SD in Log Scale		1.22
1006				95% t UCL (Assumes normality)		0.201				95% H-Stat UCL		1.06
1007	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1008												
1009	**Nonparametric Distribution Free UCL Statistics**											
1010	**Detected Data appear Normal Distributed at 5% Significance Level**											
1011												
1012	**Suggested UCL to Use**											
1013				95% KM (t) UCL		0.177						
1014												
1015	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1016	Recommendations are based upon data size, data distribution, and skewness.											
1017	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1018	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1019												
1020	**Cadmium (smw10)**											
1021												
1022	**General Statistics**											
1023				Total Number of Observations		8				Number of Distinct Observations		4
1024				Number of Detects		1				Number of Non-Detects		7
1025				Number of Distinct Detects		1				Number of Distinct Non-Detects		3
1026												
1027	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
1028	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
1029												
1030	**The data set for variable Cadmium (smw10) was not processed!**											
1031												
1032												
1033	**Cadmium (smw11)**											
1034												
1035	**General Statistics**											
1036				Total Number of Observations		9				Number of Distinct Observations		6
1037				Number of Detects		1				Number of Non-Detects		8
1038				Number of Distinct Detects		1				Number of Distinct Non-Detects		5
1039												
1040	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											

	A	B	C	D	E	F	G	H	I	J	K	L
1041	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
1042												
1043	**The data set for variable Cadmium (smw11) was not processed!**											
1044												
1045												
1046	**Cadmium (smw12)**											
1047												
1048	**General Statistics**											
1049						Total Number of Observations	8			Number of Distinct Observations	4	
1050						Number of Detects	1			Number of Non-Detects	7	
1051						Number of Distinct Detects	1			Number of Distinct Non-Detects	3	
1052												
1053	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
1054	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
1055												
1056	**The data set for variable Cadmium (smw12) was not processed!**											
1057												
1058												
1059	**Cadmium (smw13)**											
1060												
1061	**General Statistics**											
1062						Total Number of Observations	8			Number of Distinct Observations	7	
1063						Number of Detects	3			Number of Non-Detects	5	
1064						Number of Distinct Detects	3			Number of Distinct Non-Detects	4	
1065						Minimum Detect	0.036			Minimum Non-Detect	0.03	
1066						Maximum Detect	0.094			Maximum Non-Detect	0.54	
1067						Variance Detects	0.00103			Percent Non-Detects	62.5%	
1068						Mean Detects	0.073			SD Detects	0.0321	
1069						Median Detects	0.089			CV Detects	0.44	
1070						Skewness Detects	-1.685			Kurtosis Detects	N/A	
1071						Mean of Logged Detects	-2.703			SD of Logged Detects	0.539	
1072												
1073	**Warning: Data set has only 3 Detected Values.**											
1074	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1075												
1076												
1077	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1078	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1079	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1080	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1081												
1082	**Normal GOF Test on Detects Only**											
1083						Shapiro Wilk Test Statistic	0.814			**Shapiro Wilk GOF Test**		
1084						5% Shapiro Wilk Critical Value	0.767			Detected Data appear Normal at 5% Significance Level		
1085						Lilliefors Test Statistic	0.357			**Lilliefors GOF Test**		
1086						5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level		
1087	**Detected Data appear Normal at 5% Significance Level**											
1088												
1089	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1090						KM Mean	0.0623			KM Standard Error of Mean	0.018	
1091						KM SD	0.0294			95% KM (BCA) UCL	N/A	
1092						95% KM (t) UCL	0.0963			95% KM (Percentile Bootstrap) UCL	N/A	

1093					95% KM (z) UCL	0.0918				95% KM Bootstrap t UCL		N/A
1094					90% KM Chebyshev UCL	0.116				95% KM Chebyshev UCL		0.141
1095					97.5% KM Chebyshev UCL	0.175				99% KM Chebyshev UCL		0.241
1096												
1097					**Gamma GOF Tests on Detected Observations Only**							
1098					**Not Enough Data to Perform GOF Test**							
1099												
1100					**Gamma Statistics on Detected Data Only**							
1101					k hat (MLE)	6.023				k star (bias corrected MLE)		N/A
1102					Theta hat (MLE)	0.0121				Theta star (bias corrected MLE)		N/A
1103					nu hat (MLE)	36.14				nu star (bias corrected)		N/A
1104					Mean (detects)	0.073						
1105												
1106					**Gamma ROS Statistics using Imputed Non-Detects**							
1107					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1108					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1109					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1110					This is especially true when the sample size is small.							
1111					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1112					Minimum	0.01				Mean		0.0561
1113					Maximum	0.094				Median		0.0542
1114					SD	0.029				CV		0.518
1115					k hat (MLE)	2.97				k star (bias corrected MLE)		1.94
1116					Theta hat (MLE)	0.0189				Theta star (bias corrected MLE)		0.0289
1117					nu hat (MLE)	47.52				nu star (bias corrected)		31.04
1118					Adjusted Level of Significance (β)	0.0195						
1119					Approximate Chi Square Value (31.04, α)	19.31				Adjusted Chi Square Value (31.04, β)		17.01
1120					95% Gamma Approximate UCL (use when n>=50)	0.0901				95% Gamma Adjusted UCL (use when n<50)		N/A
1121												
1122					**Estimates of Gamma Parameters using KM Estimates**							
1123					Mean (KM)	0.0623				SD (KM)		0.0294
1124					Variance (KM)	8.6319E-4				SE of Mean (KM)		0.018
1125					k hat (KM)	4.489				k star (KM)		2.889
1126					nu hat (KM)	71.83				nu star (KM)		46.23
1127					theta hat (KM)	0.0139				theta star (KM)		0.0215
1128					80% gamma percentile (KM)	0.0892				90% gamma percentile (KM)		0.111
1129					95% gamma percentile (KM)	0.132				99% gamma percentile (KM)		0.177
1130												
1131					**Gamma Kaplan-Meier (KM) Statistics**							
1132					Approximate Chi Square Value (46.23, α)	31.63				Adjusted Chi Square Value (46.23, β)		28.6
1133					95% Gamma Approximate KM-UCL (use when n>=50)	0.091				95% Gamma Adjusted KM-UCL (use when n<50)		0.101
1134												
1135					**Lognormal GOF Test on Detected Observations Only**							
1136					Shapiro Wilk Test Statistic	0.793				**Shapiro Wilk GOF Test**		
1137					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
1138					Lilliefors Test Statistic	0.367				**Lilliefors GOF Test**		
1139					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
1140					**Detected Data appear Lognormal at 5% Significance Level**							
1141												
1142					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1143					Mean in Original Scale	0.055				Mean in Log Scale		-3.026
1144					SD in Original Scale	0.0274				SD in Log Scale		0.563

1145	95% t UCL (assumes normality of ROS data)					0.0734	95% Percentile Bootstrap UCL					0.0709
1146	95% BCA Bootstrap UCL					0.0699	95% Bootstrap t UCL					0.0764
1147	95% H-UCL (Log ROS)					0.0961						
1148												
1149	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1150	KM Mean (logged)					-2.904	KM Geo Mean					0.0548
1151	KM SD (logged)					0.516	95% Critical H Value (KM-Log)					2.382
1152	KM Standard Error of Mean (logged)					0.316	95% H-UCL (KM -Log)					0.0997
1153	KM SD (logged)					0.516	95% Critical H Value (KM-Log)					2.382
1154	KM Standard Error of Mean (logged)					0.316						
1155												
1156	**DL/2 Statistics**											
1157	**DL/2 Normal**						**DL/2 Log-Transformed**					
1158	Mean in Original Scale					0.0899	Mean in Log Scale					-2.691
1159	SD in Original Scale					0.0774	SD in Log Scale					0.826
1160	95% t UCL (Assumes normality)					0.142	95% H-Stat UCL					0.244
1161	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1162												
1163	**Nonparametric Distribution Free UCL Statistics**											
1164	**Detected Data appear Normal Distributed at 5% Significance Level**											
1165												
1166	**Suggested UCL to Use**											
1167	95% KM (t) UCL					0.0963						
1168	**Warning: Recommended UCL exceeds the maximum observation**											
1169												
1170	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1171	Recommendations are based upon data size, data distribution, and skewness.											
1172	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1173	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1174												
1175	**Cadmium (smw14)**											
1176												
1177	**General Statistics**											
1178	Total Number of Observations					8	Number of Distinct Observations					8
1179	Number of Detects					5	Number of Non-Detects					3
1180	Number of Distinct Detects					5	Number of Distinct Non-Detects					3
1181	Minimum Detect					0.062	Minimum Non-Detect					0.14
1182	Maximum Detect					0.13	Maximum Non-Detect					0.54
1183	Variance Detects					8.5320E-4	Percent Non-Detects					37.5%
1184	Mean Detects					0.0898	SD Detects					0.0292
1185	Median Detects					0.08	CV Detects					0.325
1186	Skewness Detects					0.651	Kurtosis Detects					-1.724
1187	Mean of Logged Detects					-2.451	SD of Logged Detects					0.319
1188												
1189	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1190	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1191	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1192	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1193												
1194	**Normal GOF Test on Detects Only**											
1195	Shapiro Wilk Test Statistic					0.905	**Shapiro Wilk GOF Test**					
1196	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Normal at 5% Significance Level					

	A	B	C	D	E	F	G	H	I	J	K	L
1197					Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**					
1198					5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level					
1199	**Detected Data appear Normal at 5% Significance Level**											
1200												
1201	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1202					KM Mean	0.0898			KM Standard Error of Mean			0.0131
1203					KM SD	0.0261			95% KM (BCA) UCL			0.11
1204					95% KM (t) UCL	0.115			95% KM (Percentile Bootstrap) UCL			0.109
1205					95% KM (z) UCL	0.111			95% KM Bootstrap t UCL			0.152
1206					90% KM Chebyshev UCL	0.129			95% KM Chebyshev UCL			0.147
1207					97.5% KM Chebyshev UCL	0.171			99% KM Chebyshev UCL			0.22
1208												
1209	**Gamma GOF Tests on Detected Observations Only**											
1210					A-D Test Statistic	0.332	**Anderson-Darling GOF Test**					
1211					5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level					
1212					K-S Test Statistic	0.218	**Kolmogorov-Smirnov GOF**					
1213					5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level					
1214	**Detected data appear Gamma Distributed at 5% Significance Level**											
1215												
1216	**Gamma Statistics on Detected Data Only**											
1217					k hat (MLE)	12.3			k star (bias corrected MLE)			5.052
1218					Theta hat (MLE)	0.0073			Theta star (bias corrected MLE)			0.0178
1219					nu hat (MLE)	123			nu star (bias corrected)			50.52
1220					Mean (detects)	0.0898						
1221												
1222	**Gamma ROS Statistics using Imputed Non-Detects**											
1223	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1224	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1225	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1226	This is especially true when the sample size is small.											
1227	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1228					Minimum	0.062			Mean			0.0892
1229					Maximum	0.13			Median			0.0882
1230					SD	0.0221			CV			0.248
1231					k hat (MLE)	19.55			k star (bias corrected MLE)			12.3
1232					Theta hat (MLE)	0.00456			Theta star (bias corrected MLE)			0.00725
1233					nu hat (MLE)	312.8			nu star (bias corrected)			196.8
1234					Adjusted Level of Significance (β)	0.0195						
1235					Approximate Chi Square Value (196.81, α)	165.4			Adjusted Chi Square Value (196.81, β)			158
1236					95% Gamma Approximate UCL (use when n>=50)	0.106			95% Gamma Adjusted UCL (use when n<50)			0.111
1237												
1238	**Estimates of Gamma Parameters using KM Estimates**											
1239					Mean (KM)	0.0898			SD (KM)			0.0261
1240					Variance (KM)	6.8256E-4			SE of Mean (KM)			0.0131
1241					k hat (KM)	11.81			k star (KM)			7.467
1242					nu hat (KM)	189			nu star (KM)			119.5
1243					theta hat (KM)	0.0076			theta star (KM)			0.012
1244					80% gamma percentile (KM)	0.116			90% gamma percentile (KM)			0.134
1245					95% gamma percentile (KM)	0.15			99% gamma percentile (KM)			0.183
1246												
1247	**Gamma Kaplan-Meier (KM) Statistics**											
1248					Approximate Chi Square Value (119.48, α)	95.24			Adjusted Chi Square Value (119.48, β)			89.77

1249	95% Gamma Approximate KM-UCL (use when n>=50)					0.113	95% Gamma Adjusted KM-UCL (use when n<50)					0.12
1250												
1251	**Lognormal GOF Test on Detected Observations Only**											
1252	Shapiro Wilk Test Statistic					0.922	**Shapiro Wilk GOF Test**					
1253	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Lognormal at 5% Significance Level					
1254	Lilliefors Test Statistic					0.192	**Lilliefors GOF Test**					
1255	5% Lilliefors Critical Value					0.343	Detected Data appear Lognormal at 5% Significance Level					
1256	**Detected Data appear Lognormal at 5% Significance Level**											
1257												
1258	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1259	Mean in Original Scale					0.0884	Mean in Log Scale					-2.451
1260	SD in Original Scale					0.0222	SD in Log Scale					0.241
1261	95% t UCL (assumes normality of ROS data)					0.103	95% Percentile Bootstrap UCL					0.101
1262	95% BCA Bootstrap UCL					0.103	95% Bootstrap t UCL					0.111
1263	95% H-UCL (Log ROS)					0.106						
1264												
1265	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1266	KM Mean (logged)					-2.451	KM Geo Mean					0.0862
1267	KM SD (logged)					0.285	95% Critical H Value (KM-Log)					2.039
1268	KM Standard Error of Mean (logged)					0.142	95% H-UCL (KM -Log)					0.112
1269	KM SD (logged)					0.285	95% Critical H Value (KM-Log)					2.039
1270	KM Standard Error of Mean (logged)					0.142						
1271												
1272	**DL/2 Statistics**											
1273	**DL/2 Normal**						**DL/2 Log-Transformed**					
1274	Mean in Original Scale					0.108	Mean in Log Scale					-2.352
1275	SD in Original Scale					0.0695	SD in Log Scale					0.492
1276	95% t UCL (Assumes normality)					0.155	95% H-Stat UCL					0.166
1277	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1278												
1279	**Nonparametric Distribution Free UCL Statistics**											
1280	**Detected Data appear Normal Distributed at 5% Significance Level**											
1281												
1282	**Suggested UCL to Use**											
1283	95% KM (t) UCL					0.115						
1284												
1285	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1286	Recommendations are based upon data size, data distribution, and skewness.											
1287	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1288	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1289												
1290	**Cadmium (smw15)**											
1291												
1292	**General Statistics**											
1293	Total Number of Observations					9	Number of Distinct Observations					8
1294	Number of Detects					8	Number of Non-Detects					1
1295	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
1296	Minimum Detect					0.036	Minimum Non-Detect					0.14
1297	Maximum Detect					6.1	Maximum Non-Detect					0.14
1298	Variance Detects					4.556	Percent Non-Detects					11.11%
1299	Mean Detects					2.642	SD Detects					2.134
1300	Median Detects					1.85	CV Detects					0.808

1301					Skewness Detects	0.947					Kurtosis Detects	-0.263
1302					Mean of Logged Detects	0.404					SD of Logged Detects	1.605
1303												
1304	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1305	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1306	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1307	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1308												
1309	**Normal GOF Test on Detects Only**											
1310					Shapiro Wilk Test Statistic	0.843	**Shapiro Wilk GOF Test**					
1311					5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level					
1312					Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**					
1313					5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level					
1314	**Detected Data appear Normal at 5% Significance Level**											
1315												
1316	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1317					KM Mean	2.352	KM Standard Error of Mean	0.732				
1318					KM SD	2.053	95% KM (BCA) UCL	3.575				
1319					95% KM (t) UCL	3.713	95% KM (Percentile Bootstrap) UCL	3.549				
1320					95% KM (z) UCL	3.556	95% KM Bootstrap t UCL	4.943				
1321					90% KM Chebyshev UCL	4.547	95% KM Chebyshev UCL	5.541				
1322					97.5% KM Chebyshev UCL	6.921	99% KM Chebyshev UCL	9.631				
1323												
1324	**Gamma GOF Tests on Detected Observations Only**											
1325					A-D Test Statistic	0.628	**Anderson-Darling GOF Test**					
1326					5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level					
1327					K-S Test Statistic	0.306	**Kolmogorov-Smirnov GOF**					
1328					5% K-S Critical Value	0.301	Detected Data Not Gamma Distributed at 5% Significance Level					
1329	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
1330												
1331	**Gamma Statistics on Detected Data Only**											
1332					k hat (MLE)	1.015	k star (bias corrected MLE)	0.717				
1333					Theta hat (MLE)	2.604	Theta star (bias corrected MLE)	3.683				
1334					nu hat (MLE)	16.23	nu star (bias corrected)	11.48				
1335					Mean (detects)	2.642						
1336												
1337	**Gamma ROS Statistics using Imputed Non-Detects**											
1338	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1339	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1340	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1341	This is especially true when the sample size is small.											
1342	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1343					Minimum	0.036	Mean	2.37				
1344					Maximum	6.1	Median	1.6				
1345					SD	2.157	CV	0.91				
1346					k hat (MLE)	0.856	k star (bias corrected MLE)	0.644				
1347					Theta hat (MLE)	2.77	Theta star (bias corrected MLE)	3.677				
1348					nu hat (MLE)	15.4	nu star (bias corrected)	11.6				
1349					Adjusted Level of Significance (β)	0.0231						
1350					Approximate Chi Square Value (11.60, α)	4.965	Adjusted Chi Square Value (11.60, β)	4.089				
1351					95% Gamma Approximate UCL (use when n>=50)	5.537	95% Gamma Adjusted UCL (use when n<50)	6.724				
1352												

	A	B	C	D	E	F	G	H	I	J	K	L
1353	**Estimates of Gamma Parameters using KM Estimates**											
1354					Mean (KM)	2.352					SD (KM)	2.053
1355					Variance (KM)	4.214					SE of Mean (KM)	0.732
1356					k hat (KM)	1.313					k star (KM)	0.95
1357					nu hat (KM)	23.64					nu star (KM)	17.09
1358					theta hat (KM)	1.791					theta star (KM)	2.477
1359					80% gamma percentile (KM)	3.802					90% gamma percentile (KM)	5.486
1360					95% gamma percentile (KM)	7.178					99% gamma percentile (KM)	11.12
1361												
1362	**Gamma Kaplan-Meier (KM) Statistics**											
1363					Approximate Chi Square Value (17.09, α)	8.738					Adjusted Chi Square Value (17.09, β)	7.512
1364					95% Gamma Approximate KM-UCL (use when n>=50)	4.602					95% Gamma Adjusted KM-UCL (use when n<50)	5.352
1365												
1366	**Lognormal GOF Test on Detected Observations Only**											
1367					Shapiro Wilk Test Statistic	0.727	**Shapiro Wilk GOF Test**					
1368					5% Shapiro Wilk Critical Value	0.818	Detected Data Not Lognormal at 5% Significance Level					
1369					Lilliefors Test Statistic	0.375	**Lilliefors GOF Test**					
1370					5% Lilliefors Critical Value	0.283	Detected Data Not Lognormal at 5% Significance Level					
1371	**Detected Data Not Lognormal at 5% Significance Level**											
1372												
1373	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1374					Mean in Original Scale	2.363					Mean in Log Scale	0.133
1375					SD in Original Scale	2.165					SD in Log Scale	1.708
1376					95% t UCL (assumes normality of ROS data)	3.705					95% Percentile Bootstrap UCL	3.492
1377					95% BCA Bootstrap UCL	3.767					95% Bootstrap t UCL	4.988
1378					95% H-UCL (Log ROS)	98						
1379												
1380	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1381					KM Mean (logged)	-0.0107					KM Geo Mean	0.989
1382					KM SD (logged)	1.838					95% Critical H Value (KM-Log)	5.289
1383					KM Standard Error of Mean (logged)	0.655					95% H-UCL (KM -Log)	166.4
1384					KM SD (logged)	1.838					95% Critical H Value (KM-Log)	5.289
1385					KM Standard Error of Mean (logged)	0.655						
1386												
1387	**DL/2 Statistics**											
1388	**DL/2 Normal**						**DL/2 Log-Transformed**					
1389					Mean in Original Scale	2.356					Mean in Log Scale	0.0632
1390					SD in Original Scale	2.173					SD in Log Scale	1.816
1391					95% t UCL (Assumes normality)	3.703					95% H-Stat UCL	159.5
1392	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1393												
1394	**Nonparametric Distribution Free UCL Statistics**											
1395	**Detected Data appear Normal Distributed at 5% Significance Level**											
1396												
1397	**Suggested UCL to Use**											
1398					95% KM (t) UCL	3.713						
1399												
1400	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1401	Recommendations are based upon data size, data distribution, and skewness.											
1402	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1403	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1404												

	A	B	C	D	E	F	G	H	I	J	K	L
1405	**Cadmium (smw16)**											
1406												
1407						**General Statistics**						
1408					Total Number of Observations	9			Number of Distinct Observations	6		
1409					Number of Detects	0			Number of Non-Detects	9		
1410					Number of Distinct Detects	0			Number of Distinct Non-Detects	6		
1411												
1412					**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**							
1413					**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**							
1414					**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**							
1415												
1416					**The data set for variable Cadmium (smw16) was not processed!**							
1417												
1418												
1419	**Cadmium (smw16d)**											
1420												
1421						**General Statistics**						
1422					Total Number of Observations	8			Number of Distinct Observations	8		
1423					Number of Detects	6			Number of Non-Detects	2		
1424					Number of Distinct Detects	6			Number of Distinct Non-Detects	2		
1425					Minimum Detect	0.029			Minimum Non-Detect	0.03		
1426					Maximum Detect	0.063			Maximum Non-Detect	0.54		
1427					Variance Detects	1.8857E-4			Percent Non-Detects	25%		
1428					Mean Detects	0.0462			SD Detects	0.0137		
1429					Median Detects	0.0455			CV Detects	0.297		
1430					Skewness Detects	0.0588			Kurtosis Detects	-1.8		
1431					Mean of Logged Detects	-3.114			SD of Logged Detects	0.309		
1432												
1433					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1434					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1435					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1436					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1437												
1438						**Normal GOF Test on Detects Only**						
1439					Shapiro Wilk Test Statistic	0.94			**Shapiro Wilk GOF Test**			
1440					5% Shapiro Wilk Critical Value	0.788			Detected Data appear Normal at 5% Significance Level			
1441					Lilliefors Test Statistic	0.176			**Lilliefors GOF Test**			
1442					5% Lilliefors Critical Value	0.325			Detected Data appear Normal at 5% Significance Level			
1443						**Detected Data appear Normal at 5% Significance Level**						
1444												
1445						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
1446					KM Mean	0.0437			KM Standard Error of Mean	0.00541		
1447					KM SD	0.0131			95% KM (BCA) UCL	0.0524		
1448					95% KM (t) UCL	0.054			95% KM (Percentile Bootstrap) UCL	0.0524		
1449					95% KM (z) UCL	0.0526			95% KM Bootstrap t UCL	0.0545		
1450					90% KM Chebyshev UCL	0.0599			95% KM Chebyshev UCL	0.0673		
1451					97.5% KM Chebyshev UCL	0.0775			99% KM Chebyshev UCL	0.0976		
1452												
1453						**Gamma GOF Tests on Detected Observations Only**						
1454					A-D Test Statistic	0.252			**Anderson-Darling GOF Test**			
1455					5% A-D Critical Value	0.698			Detected data appear Gamma Distributed at 5% Significance Level			
1456					K-S Test Statistic	0.193			**Kolmogorov-Smirnov GOF**			

1457				5% K-S Critical Value		0.332	Detected data appear Gamma Distributed at 5% Significance Level					
1458	**Detected data appear Gamma Distributed at 5% Significance Level**											
1459												
1460	**Gamma Statistics on Detected Data Only**											
1461				k hat (MLE)		13.04	k star (bias corrected MLE)					6.633
1462				Theta hat (MLE)		0.00354	Theta star (bias corrected MLE)					0.00696
1463				nu hat (MLE)		156.5	nu star (bias corrected)					79.6
1464				Mean (detects)		0.0462						
1465												
1466	**Gamma ROS Statistics using Imputed Non-Detects**											
1467	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1468	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1469	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1470	This is especially true when the sample size is small.											
1471	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1472				Minimum		0.0263	Mean					0.0432
1473				Maximum		0.063	Median					0.0422
1474				SD		0.0135	CV					0.313
1475				k hat (MLE)		11.54	k star (bias corrected MLE)					7.296
1476				Theta hat (MLE)		0.00375	Theta star (bias corrected MLE)					0.00592
1477				nu hat (MLE)		184.6	nu star (bias corrected)					116.7
1478				Adjusted Level of Significance (β)		0.0195						
1479				Approximate Chi Square Value (116.73, α)		92.79	Adjusted Chi Square Value (116.73, β)					87.39
1480				95% Gamma Approximate UCL (use when n>=50)		0.0544	95% Gamma Adjusted UCL (use when n<50)					0.0577
1481												
1482	**Estimates of Gamma Parameters using KM Estimates**											
1483				Mean (KM)		0.0437	SD (KM)					0.0131
1484				Variance (KM)		1.7078E-4	SE of Mean (KM)					0.00541
1485				k hat (KM)		11.19	k star (KM)					7.077
1486				nu hat (KM)		179	nu star (KM)					113.2
1487				theta hat (KM)		0.00391	theta star (KM)					0.00618
1488				80% gamma percentile (KM)		0.0566	90% gamma percentile (KM)					0.0656
1489				95% gamma percentile (KM)		0.0738	99% gamma percentile (KM)					0.0907
1490												
1491	**Gamma Kaplan-Meier (KM) Statistics**											
1492				Approximate Chi Square Value (113.23, α)		89.67	Adjusted Chi Square Value (113.23, β)					84.37
1493				95% Gamma Approximate KM-UCL (use when n>=50)		0.0552	95% Gamma Adjusted KM-UCL (use when n<50)					0.0587
1494												
1495	**Lognormal GOF Test on Detected Observations Only**											
1496				Shapiro Wilk Test Statistic		0.943	**Shapiro Wilk GOF Test**					
1497				5% Shapiro Wilk Critical Value		0.788	Detected Data appear Lognormal at 5% Significance Level					
1498				Lilliefors Test Statistic		0.168	**Lilliefors GOF Test**					
1499				5% Lilliefors Critical Value		0.325	Detected Data appear Lognormal at 5% Significance Level					
1500	**Detected Data appear Lognormal at 5% Significance Level**											
1501												
1502	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1503				Mean in Original Scale		0.0433	Mean in Log Scale					-3.182
1504				SD in Original Scale		0.0133	SD in Log Scale					0.31
1505				95% t UCL (assumes normality of ROS data)		0.0522	95% Percentile Bootstrap UCL					0.0506
1506				95% BCA Bootstrap UCL		0.0511	95% Bootstrap t UCL					0.0536
1507				95% H-UCL (Log ROS)		0.0555						
1508												

1509	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1510					KM Mean (logged)	-3.175				KM Geo Mean	0.0418	
1511					KM SD (logged)	0.301				95% Critical H Value (KM-Log)	2.059	
1512					KM Standard Error of Mean (logged)	0.125				95% H-UCL (KM -Log)	0.0553	
1513					KM SD (logged)	0.301				95% Critical H Value (KM-Log)	2.059	
1514					KM Standard Error of Mean (logged)	0.125						
1515												
1516	**DL/2 Statistics**											
1517	**DL/2 Normal**						**DL/2 Log-Transformed**					
1518					Mean in Original Scale	0.0703				Mean in Log Scale	-3.024	
1519					SD in Original Scale	0.0823				SD in Log Scale	0.832	
1520					95% t UCL (Assumes normality)	0.125				95% H-Stat UCL	0.178	
1521	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1522												
1523	**Nonparametric Distribution Free UCL Statistics**											
1524	**Detected Data appear Normal Distributed at 5% Significance Level**											
1525												
1526	**Suggested UCL to Use**											
1527					95% KM (t) UCL	0.054						
1528												
1529	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1530	Recommendations are based upon data size, data distribution, and skewness.											
1531	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1532	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1533												
1534	**Cadmium (smw17)**											
1535												
1536	**General Statistics**											
1537					Total Number of Observations	8				Number of Distinct Observations	5	
1538					Number of Detects	1				Number of Non-Detects	7	
1539					Number of Distinct Detects	1				Number of Distinct Non-Detects	4	
1540												
1541	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
1542	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
1543												
1544	**The data set for variable Cadmium (smw17) was not processed!**											
1545												
1546												
1547	**Cadmium (smw17d)**											
1548												
1549	**General Statistics**											
1550					Total Number of Observations	8				Number of Distinct Observations	6	
1551					Number of Detects	5				Number of Non-Detects	3	
1552					Number of Distinct Detects	5				Number of Distinct Non-Detects	2	
1553					Minimum Detect	0.03				Minimum Non-Detect	0.03	
1554					Maximum Detect	0.075				Maximum Non-Detect	0.54	
1555					Variance Detects	4.1670E-4				Percent Non-Detects	37.5%	
1556					Mean Detects	0.0492				SD Detects	0.0204	
1557					Median Detects	0.04				CV Detects	0.415	
1558					Skewness Detects	0.561				Kurtosis Detects	-2.674	
1559					Mean of Logged Detects	-3.08				SD of Logged Detects	0.41	
1560												

1561	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1562	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1563	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1564	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1565												
1566	Normal GOF Test on Detects Only											
1567					Shapiro Wilk Test Statistic	0.86	Shapiro Wilk GOF Test					
1568					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level					
1569					Lilliefors Test Statistic	0.274	Lilliefors GOF Test					
1570					5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level					
1571	Detected Data appear Normal at 5% Significance Level											
1572												
1573	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
1574					KM Mean	0.0437	KM Standard Error of Mean	0.00748				
1575					KM SD	0.0177	95% KM (BCA) UCL	0.0558				
1576					95% KM (t) UCL	0.0579	95% KM (Percentile Bootstrap) UCL	0.0562				
1577					95% KM (z) UCL	0.056	95% KM Bootstrap t UCL	0.0849				
1578					90% KM Chebyshev UCL	0.0662	95% KM Chebyshev UCL	0.0763				
1579					97.5% KM Chebyshev UCL	0.0904	99% KM Chebyshev UCL	0.118				
1580												
1581	Gamma GOF Tests on Detected Observations Only											
1582					A-D Test Statistic	0.436	Anderson-Darling GOF Test					
1583					5% A-D Critical Value	0.68	Detected data appear Gamma Distributed at 5% Significance Level					
1584					K-S Test Statistic	0.264	Kolmogorov-Smirnov GOF					
1585					5% K-S Critical Value	0.358	Detected data appear Gamma Distributed at 5% Significance Level					
1586	Detected data appear Gamma Distributed at 5% Significance Level											
1587												
1588	Gamma Statistics on Detected Data Only											
1589					k hat (MLE)	7.497	k star (bias corrected MLE)	3.132				
1590					Theta hat (MLE)	0.00656	Theta star (bias corrected MLE)	0.0157				
1591					nu hat (MLE)	74.97	nu star (bias corrected)	31.32				
1592					Mean (detects)	0.0492						
1593												
1594	Gamma ROS Statistics using Imputed Non-Detects											
1595	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1596	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1597	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1598	This is especially true when the sample size is small.											
1599	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1600					Minimum	0.01	Mean	0.0376				
1601					Maximum	0.075	Median	0.0342				
1602					SD	0.0235	CV	0.626				
1603					k hat (MLE)	2.475	k star (bias corrected MLE)	1.63				
1604					Theta hat (MLE)	0.0152	Theta star (bias corrected MLE)	0.023				
1605					nu hat (MLE)	39.6	nu star (bias corrected)	26.08				
1606					Adjusted Level of Significance (β)	0.0195						
1607					Approximate Chi Square Value (26.08, α)	15.44	Adjusted Chi Square Value (26.08, β)	13.42				
1608					95% Gamma Approximate UCL (use when n>=50)	0.0634	95% Gamma Adjusted UCL (use when n<50)	0.073				
1609												
1610	Estimates of Gamma Parameters using KM Estimates											
1611					Mean (KM)	0.0437	SD (KM)	0.0177				
1612					Variance (KM)	3.1335E-4	SE of Mean (KM)	0.00748				

1613					k hat (KM)	6.098				k star (KM)		3.895
1614					nu hat (KM)	97.58				nu star (KM)		62.32
1615					theta hat (KM)	0.00717				theta star (KM)		0.0112
1616					80% gamma percentile (KM)	0.0605				90% gamma percentile (KM)		0.0734
1617					95% gamma percentile (KM)	0.0853				99% gamma percentile (KM)		0.111
1618												
1619					**Gamma Kaplan-Meier (KM) Statistics**							
1620					Approximate Chi Square Value (62.32, α)	45.16				Adjusted Chi Square Value (62.32, β)		41.49
1621					95% Gamma Approximate KM-UCL (use when n>=50)	0.0603				95% Gamma Adjusted KM-UCL (use when n<50)		0.0657
1622												
1623					**Lognormal GOF Test on Detected Observations Only**							
1624					Shapiro Wilk Test Statistic	0.886				**Shapiro Wilk GOF Test**		
1625					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
1626					Lilliefors Test Statistic	0.232				**Lilliefors GOF Test**		
1627					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
1628					**Detected Data appear Lognormal at 5% Significance Level**							
1629												
1630					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1631					Mean in Original Scale	0.039				Mean in Log Scale		-3.386
1632					SD in Original Scale	0.0217				SD in Log Scale		0.583
1633					95% t UCL (assumes normality of ROS data)	0.0535				95% Percentile Bootstrap UCL		0.0511
1634					95% BCA Bootstrap UCL	0.0536				95% Bootstrap t UCL		0.0634
1635					95% H-UCL (Log ROS)	0.0696						
1636												
1637					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1638					KM Mean (logged)	-3.202				KM Geo Mean		0.0407
1639					KM SD (logged)	0.365				95% Critical H Value (KM-Log)		2.145
1640					KM Standard Error of Mean (logged)	0.154				95% H-UCL (KM -Log)		0.0585
1641					KM SD (logged)	0.365				95% Critical H Value (KM-Log)		2.145
1642					KM Standard Error of Mean (logged)	0.154						
1643												
1644					**DL/2 Statistics**							
1645					**DL/2 Normal**					**DL/2 Log-Transformed**		
1646					Mean in Original Scale	0.0683				Mean in Log Scale		-3.139
1647					SD in Original Scale	0.0844				SD in Log Scale		0.948
1648					95% t UCL (Assumes normality)	0.125				95% H-Stat UCL		0.221
1649					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1650												
1651					**Nonparametric Distribution Free UCL Statistics**							
1652					**Detected Data appear Normal Distributed at 5% Significance Level**							
1653												
1654					**Suggested UCL to Use**							
1655					95% KM (t) UCL	0.0579						
1656												
1657					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1658					Recommendations are based upon data size, data distribution, and skewness.							
1659					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1660					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1661												
1662	**Cadmium (smw18)**											
1663												
1664					**General Statistics**							

1665				Total Number of Observations		8			Number of Distinct Observations			5
1666				Number of Detects		1			Number of Non-Detects			7
1667				Number of Distinct Detects		1			Number of Distinct Non-Detects			4
1668												
1669	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
1670	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
1671												
1672	**The data set for variable Cadmium (smw18) was not processed!**											
1673												
1674												
1675	**Cadmium (smw18d)**											
1676												
1677	**General Statistics**											
1678				Total Number of Observations		8			Number of Distinct Observations			7
1679				Number of Detects		7			Number of Non-Detects			1
1680				Number of Distinct Detects		6			Number of Distinct Non-Detects			1
1681				Minimum Detect		0.055			Minimum Non-Detect			0.54
1682				Maximum Detect		0.12			Maximum Non-Detect			0.54
1683				Variance Detects		5.7414E-4			Percent Non-Detects			12.5%
1684				Mean Detects		0.0911			SD Detects			0.024
1685				Median Detects		0.1			CV Detects			0.263
1686				Skewness Detects		-0.634			Kurtosis Detects			-0.918
1687				Mean of Logged Detects		-2.429			SD of Logged Detects			0.292
1688												
1689	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1690	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1691	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1692	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1693												
1694	**Normal GOF Test on Detects Only**											
1695				Shapiro Wilk Test Statistic		0.916			**Shapiro Wilk GOF Test**			
1696				5% Shapiro Wilk Critical Value		0.803			Detected Data appear Normal at 5% Significance Level			
1697				Lilliefors Test Statistic		0.216			**Lilliefors GOF Test**			
1698				5% Lilliefors Critical Value		0.304			Detected Data appear Normal at 5% Significance Level			
1699	**Detected Data appear Normal at 5% Significance Level**											
1700												
1701	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1702				KM Mean		0.0911			KM Standard Error of Mean			0.00906
1703				KM SD		0.0222			95% KM (BCA) UCL			0.103
1704				95% KM (t) UCL		0.108			95% KM (Percentile Bootstrap) UCL			0.105
1705				95% KM (z) UCL		0.106			95% KM Bootstrap t UCL			0.106
1706				90% KM Chebyshev UCL		0.118			95% KM Chebyshev UCL			0.131
1707				97.5% KM Chebyshev UCL		0.148			99% KM Chebyshev UCL			0.181
1708												
1709	**Gamma GOF Tests on Detected Observations Only**											
1710				A-D Test Statistic		0.472			**Anderson-Darling GOF Test**			
1711				5% A-D Critical Value		0.708			Detected data appear Gamma Distributed at 5% Significance Level			
1712				K-S Test Statistic		0.245			**Kolmogorov-Smirnov GOF**			
1713				5% K-S Critical Value		0.312			Detected data appear Gamma Distributed at 5% Significance Level			
1714	**Detected data appear Gamma Distributed at 5% Significance Level**											
1715												
1716	**Gamma Statistics on Detected Data Only**											

1717					k hat (MLE)	14.85				k star (bias corrected MLE)		8.578
1718					Theta hat (MLE)	0.00614				Theta star (bias corrected MLE)		0.0106
1719					nu hat (MLE)	207.8				nu star (bias corrected)		120.1
1720					Mean (detects)	0.0911						
1721												
1722					**Gamma ROS Statistics using Imputed Non-Detects**							
1723					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1724					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1725					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1726					This is especially true when the sample size is small.							
1727					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1728					Minimum	0.055				Mean		0.091
1729					Maximum	0.12				Median		0.095
1730					SD	0.0222				CV		0.244
1731					k hat (MLE)	16.94				k star (bias corrected MLE)		10.67
1732					Theta hat (MLE)	0.00537				Theta star (bias corrected MLE)		0.00853
1733					nu hat (MLE)	271				nu star (bias corrected)		170.7
1734					Adjusted Level of Significance (β)	0.0195						
1735					Approximate Chi Square Value (170.70, α)	141.5				Adjusted Chi Square Value (170.70, β)		134.7
1736					95% Gamma Approximate UCL (use when n>=50)	0.11				95% Gamma Adjusted UCL (use when n<50)		0.115
1737												
1738					**Estimates of Gamma Parameters using KM Estimates**							
1739					Mean (KM)	0.0911				SD (KM)		0.0222
1740					Variance (KM)	4.9212E-4				SE of Mean (KM)		0.00906
1741					k hat (KM)	16.88				k star (KM)		10.63
1742					nu hat (KM)	270.1				nu star (KM)		170.1
1743					theta hat (KM)	0.0054				theta star (KM)		0.00857
1744					80% gamma percentile (KM)	0.113				90% gamma percentile (KM)		0.128
1745					95% gamma percentile (KM)	0.141				99% gamma percentile (KM)		0.168
1746												
1747					**Gamma Kaplan-Meier (KM) Statistics**							
1748					Approximate Chi Square Value (170.13, α)	141				Adjusted Chi Square Value (170.13, β)		134.2
1749					95% Gamma Approximate KM-UCL (use when n>=50)	0.11				95% Gamma Adjusted KM-UCL (use when n<50)		0.116
1750												
1751					**Lognormal GOF Test on Detected Observations Only**							
1752					Shapiro Wilk Test Statistic	0.877				**Shapiro Wilk GOF Test**		
1753					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
1754					Lilliefors Test Statistic	0.244				**Lilliefors GOF Test**		
1755					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
1756					**Detected Data appear Lognormal at 5% Significance Level**							
1757												
1758					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1759					Mean in Original Scale	0.0908				Mean in Log Scale		-2.429
1760					SD in Original Scale	0.0222				SD in Log Scale		0.27
1761					95% t UCL (assumes normality of ROS data)	0.106				95% Percentile Bootstrap UCL		0.103
1762					95% BCA Bootstrap UCL	0.101				95% Bootstrap t UCL		0.103
1763					95% H-UCL (Log ROS)	0.112						
1764												
1765					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1766					KM Mean (logged)	-2.429				KM Geo Mean		0.0881
1767					KM SD (logged)	0.27				95% Critical H Value (KM-Log)		2.022
1768					KM Standard Error of Mean (logged)	0.11				95% H-UCL (KM -Log)		0.112

1769				KM SD (logged)		0.27			95% Critical H Value (KM-Log)			2.022
1770				KM Standard Error of Mean (logged)		0.11						
1771												
1772						**DL/2 Statistics**						
1773				**DL/2 Normal**					**DL/2 Log-Transformed**			
1774				Mean in Original Scale		0.114			Mean in Log Scale			-2.289
1775				SD in Original Scale		0.067			SD in Log Scale			0.48
1776				95% t UCL (Assumes normality)		0.158			95% H-Stat UCL			0.173
1777				**DL/2 is not a recommended method, provided for comparisons and historical reasons**								
1778												
1779						**Nonparametric Distribution Free UCL Statistics**							
1780						**Detected Data appear Normal Distributed at 5% Significance Level**							
1781												
1782						**Suggested UCL to Use**						
1783				95% KM (t) UCL		0.108						
1784												
1785						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1786						Recommendations are based upon data size, data distribution, and skewness.						
1787						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1788						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1789												
1790	**Cadmium (smw19)**											
1791												
1792						**General Statistics**						
1793				Total Number of Observations		8			Number of Distinct Observations			6
1794				Number of Detects		1			Number of Non-Detects			7
1795				Number of Distinct Detects		1			Number of Distinct Non-Detects			5
1796												
1797						**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**						
1798						**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**						
1799												
1800						**The data set for variable Cadmium (smw19) was not processed!**						
1801												
1802												
1803	**Cadmium (smw7)**											
1804												
1805						**General Statistics**						
1806				Total Number of Observations		8			Number of Distinct Observations			8
1807				Number of Detects		6			Number of Non-Detects			2
1808				Number of Distinct Detects		6			Number of Distinct Non-Detects			2
1809				Minimum Detect		0.033			Minimum Non-Detect			0.03
1810				Maximum Detect		0.094			Maximum Non-Detect			0.54
1811				Variance Detects		5.7310E-4			Percent Non-Detects			25%
1812				Mean Detects		0.0535			SD Detects			0.0239
1813				Median Detects		0.0435			CV Detects			0.447
1814				Skewness Detects		1.181			Kurtosis Detects			0.3
1815				Mean of Logged Detects		-3.003			SD of Logged Detects			0.412
1816												
1817						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1818						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
1819						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
1820						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						

	A	B	C	D	E	F	G	H	I	J	K	L
1821												
1822	**Normal GOF Test on Detects Only**											
1823					Shapiro Wilk Test Statistic	0.853	**Shapiro Wilk GOF Test**					
1824					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
1825					Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**					
1826					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
1827	**Detected Data appear Normal at 5% Significance Level**											
1828												
1829	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1830					KM Mean	0.0501	KM Standard Error of Mean	0.00904				
1831					KM SD	0.0218	95% KM (BCA) UCL	0.0651				
1832					95% KM (t) UCL	0.0673	95% KM (Percentile Bootstrap) UCL	0.0646				
1833					95% KM (z) UCL	0.065	95% KM Bootstrap t UCL	0.0927				
1834					90% KM Chebyshev UCL	0.0773	95% KM Chebyshev UCL	0.0896				
1835					97.5% KM Chebyshev UCL	0.107	99% KM Chebyshev UCL	0.14				
1836												
1837	**Gamma GOF Tests on Detected Observations Only**											
1838					A-D Test Statistic	0.431	**Anderson-Darling GOF Test**					
1839					5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level					
1840					K-S Test Statistic	0.263	**Kolmogorov-Smirnov GOF**					
1841					5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level					
1842	**Detected data appear Gamma Distributed at 5% Significance Level**											
1843												
1844	**Gamma Statistics on Detected Data Only**											
1845					k hat (MLE)	6.837	k star (bias corrected MLE)	3.53				
1846					Theta hat (MLE)	0.00783	Theta star (bias corrected MLE)	0.0152				
1847					nu hat (MLE)	82.04	nu star (bias corrected)	42.35				
1848					Mean (detects)	0.0535						
1849												
1850	**Gamma ROS Statistics using Imputed Non-Detects**											
1851	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1852	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1853	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1854	This is especially true when the sample size is small.											
1855	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1856					Minimum	0.01	Mean	0.0469				
1857					Maximum	0.094	Median	0.0413				
1858					SD	0.0253	CV	0.54				
1859					k hat (MLE)	3.323	k star (bias corrected MLE)	2.16				
1860					Theta hat (MLE)	0.0141	Theta star (bias corrected MLE)	0.0217				
1861					nu hat (MLE)	53.16	nu star (bias corrected)	34.56				
1862					Adjusted Level of Significance (β)	0.0195						
1863					Approximate Chi Square Value (34.56, α)	22.11	Adjusted Chi Square Value (34.56, β)	19.63				
1864					95% Gamma Approximate UCL (use when n>=50)	0.0734	95% Gamma Adjusted UCL (use when n<50)	0.0826				
1865												
1866	**Estimates of Gamma Parameters using KM Estimates**											
1867					Mean (KM)	0.0501	SD (KM)	0.0218				
1868					Variance (KM)	4.7698E-4	SE of Mean (KM)	0.00904				
1869					k hat (KM)	5.271	k star (KM)	3.378				
1870					nu hat (KM)	84.34	nu star (KM)	54.05				
1871					theta hat (KM)	0.00951	theta star (KM)	0.0148				
1872					80% gamma percentile (KM)	0.0705	90% gamma percentile (KM)	0.0867				

1873					95% gamma percentile (KM)	0.102				99% gamma percentile (KM)		0.134
1874												
1875					**Gamma Kaplan-Meier (KM) Statistics**							
1876					Approximate Chi Square Value (54.05, α)	38.16				Adjusted Chi Square Value (54.05, β)		34.81
1877					95% Gamma Approximate KM-UCL (use when n>=50)	0.071				95% Gamma Adjusted KM-UCL (use when n<50)		0.0779
1878												
1879					**Lognormal GOF Test on Detected Observations Only**							
1880					Shapiro Wilk Test Statistic	0.899				**Shapiro Wilk GOF Test**		
1881					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
1882					Lilliefors Test Statistic	0.241				**Lilliefors GOF Test**		
1883					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
1884					**Detected Data appear Lognormal at 5% Significance Level**							
1885												
1886					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1887					Mean in Original Scale	0.0478				Mean in Log Scale		-3.149
1888					SD in Original Scale	0.0239				SD in Log Scale		0.502
1889					95% t UCL (assumes normality of ROS data)	0.0638				95% Percentile Bootstrap UCL		0.0619
1890					95% BCA Bootstrap UCL	0.0634				95% Bootstrap t UCL		0.0766
1891					95% H-UCL (Log ROS)	0.0761						
1892												
1893					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1894					KM Mean (logged)	-3.075				KM Geo Mean		0.0462
1895					KM SD (logged)	0.391				95% Critical H Value (KM-Log)		2.181
1896					KM Standard Error of Mean (logged)	0.162				95% H-UCL (KM -Log)		0.0688
1897					KM SD (logged)	0.391				95% Critical H Value (KM-Log)		2.181
1898					KM Standard Error of Mean (logged)	0.162						
1899												
1900					**DL/2 Statistics**							
1901					**DL/2 Normal**					**DL/2 Log-Transformed**		
1902					Mean in Original Scale	0.0758				Mean in Log Scale		-2.941
1903					SD in Original Scale	0.0822				SD in Log Scale		0.855
1904					95% t UCL (Assumes normality)	0.131				95% H-Stat UCL		0.206
1905					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1906												
1907					**Nonparametric Distribution Free UCL Statistics**							
1908					**Detected Data appear Normal Distributed at 5% Significance Level**							
1909												
1910					**Suggested UCL to Use**							
1911					95% KM (t) UCL	0.0673						
1912												
1913					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1914					Recommendations are based upon data size, data distribution, and skewness.							
1915					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1916					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1917												
1918	**Cadmium (smw8)**											
1919												
1920					**General Statistics**							
1921					Total Number of Observations	8				Number of Distinct Observations		4
1922					Number of Detects	0				Number of Non-Detects		8
1923					Number of Distinct Detects	0				Number of Distinct Non-Detects		4
1924												

1925	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
1926	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
1927	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
1928												
1929	**The data set for variable Cadmium (smw8) was not processed!**											
1930												
1931												
1932	**Cadmium (smw9)**											
1933												
1934	**General Statistics**											
1935						Total Number of Observations	9			Number of Distinct Observations	7	
1936						Number of Detects	4			Number of Non-Detects	5	
1937						Number of Distinct Detects	4			Number of Distinct Non-Detects	3	
1938						Minimum Detect	0.035			Minimum Non-Detect	0.03	
1939						Maximum Detect	0.06			Maximum Non-Detect	0.54	
1940						Variance Detects	1.2758E-4			Percent Non-Detects	55.56%	
1941						Mean Detects	0.0453			SD Detects	0.0113	
1942						Median Detects	0.043			CV Detects	0.25	
1943						Skewness Detects	0.82			Kurtosis Detects	-0.969	
1944						Mean of Logged Detects	-3.118			SD of Logged Detects	0.243	
1945												
1946	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1947	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1948	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1949	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1950												
1951	**Normal GOF Test on Detects Only**											
1952						Shapiro Wilk Test Statistic	0.929			**Shapiro Wilk GOF Test**		
1953						5% Shapiro Wilk Critical Value	0.748			Detected Data appear Normal at 5% Significance Level		
1954						Lilliefors Test Statistic	0.24			**Lilliefors GOF Test**		
1955						5% Lilliefors Critical Value	0.375			Detected Data appear Normal at 5% Significance Level		
1956	**Detected Data appear Normal at 5% Significance Level**											
1957												
1958	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1959						KM Mean	0.0387			KM Standard Error of Mean	0.00461	
1960						KM SD	0.0106			95% KM (BCA) UCL	N/A	
1961						95% KM (t) UCL	0.0473			95% KM (Percentile Bootstrap) UCL	N/A	
1962						95% KM (z) UCL	0.0463			95% KM Bootstrap t UCL	N/A	
1963						90% KM Chebyshev UCL	0.0525			95% KM Chebyshev UCL	0.0588	
1964						97.5% KM Chebyshev UCL	0.0675			99% KM Chebyshev UCL	0.0846	
1965												
1966	**Gamma GOF Tests on Detected Observations Only**											
1967						A-D Test Statistic	0.293			**Anderson-Darling GOF Test**		
1968						5% A-D Critical Value	0.657			Detected data appear Gamma Distributed at 5% Significance Level		
1969						K-S Test Statistic	0.267			**Kolmogorov-Smirnov GOF**		
1970						5% K-S Critical Value	0.394			Detected data appear Gamma Distributed at 5% Significance Level		
1971	**Detected data appear Gamma Distributed at 5% Significance Level**											
1972												
1973	**Gamma Statistics on Detected Data Only**											
1974						k hat (MLE)	22.31			k star (bias corrected MLE)	5.743	
1975						Theta hat (MLE)	0.00203			Theta star (bias corrected MLE)	0.00788	
1976						nu hat (MLE)	178.4			nu star (bias corrected)	45.95	

1977					Mean (detects)	0.0453						
1978												
1979					**Gamma ROS Statistics using Imputed Non-Detects**							
1980					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1981					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1982					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1983					This is especially true when the sample size is small.							
1984					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1985					Minimum	0.01				Mean	0.0322	
1986					Maximum	0.06				Median	0.0311	
1987					SD	0.0157				CV	0.489	
1988					k hat (MLE)	4.107				k star (bias corrected MLE)	2.812	
1989					Theta hat (MLE)	0.00783				Theta star (bias corrected MLE)	0.0114	
1990					nu hat (MLE)	73.93				nu star (bias corrected)	50.62	
1991					Adjusted Level of Significance (β)	0.0231						
1992					Approximate Chi Square Value (50.62, α)	35.28				Adjusted Chi Square Value (50.62, β)	32.6	
1993					95% Gamma Approximate UCL (use when n>=50)	0.0461				95% Gamma Adjusted UCL (use when n<50)	N/A	
1994												
1995					**Estimates of Gamma Parameters using KM Estimates**							
1996					Mean (KM)	0.0387				SD (KM)	0.0106	
1997					Variance (KM)	1.1163E-4				SE of Mean (KM)	0.00461	
1998					k hat (KM)	13.43				k star (KM)	9.025	
1999					nu hat (KM)	241.7				nu star (KM)	162.4	
2000					theta hat (KM)	0.00288				theta star (KM)	0.00429	
2001					80% gamma percentile (KM)	0.0489				90% gamma percentile (KM)	0.0559	
2002					95% gamma percentile (KM)	0.0621				99% gamma percentile (KM)	0.0748	
2003												
2004					**Gamma Kaplan-Meier (KM) Statistics**							
2005					Approximate Chi Square Value (162.45, α)	134				Adjusted Chi Square Value (162.45, β)	128.5	
2006					95% Gamma Approximate KM-UCL (use when n>=50)	0.0469				95% Gamma Adjusted KM-UCL (use when n<50)	0.0489	
2007												
2008					**Lognormal GOF Test on Detected Observations Only**							
2009					Shapiro Wilk Test Statistic	0.945				**Shapiro Wilk GOF Test**		
2010					5% Shapiro Wilk Critical Value	0.748				Detected Data appear Lognormal at 5% Significance Level		
2011					Lilliefors Test Statistic	0.234				**Lilliefors GOF Test**		
2012					5% Lilliefors Critical Value	0.375				Detected Data appear Lognormal at 5% Significance Level		
2013					**Detected Data appear Lognormal at 5% Significance Level**							
2014												
2015					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2016					Mean in Original Scale	0.0344				Mean in Log Scale	-3.435	
2017					SD in Original Scale	0.0133				SD in Log Scale	0.387	
2018					95% t UCL (assumes normality of ROS data)	0.0426				95% Percentile Bootstrap UCL	0.0419	
2019					95% BCA Bootstrap UCL	0.0421				95% Bootstrap t UCL	0.0449	
2020					95% H-UCL (Log ROS)	0.0464						
2021												
2022					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2023					KM Mean (logged)	-3.285				KM Geo Mean	0.0375	
2024					KM SD (logged)	0.25				95% Critical H Value (KM-Log)	1.957	
2025					KM Standard Error of Mean (logged)	0.109				95% H-UCL (KM -Log)	0.0459	
2026					KM SD (logged)	0.25				95% Critical H Value (KM-Log)	1.957	
2027					KM Standard Error of Mean (logged)	0.109						
2028												

	A	B	C	D	E	F	G	H	I	J	K	L
2029	**DL/2 Statistics**											
2030	**DL/2 Normal**						**DL/2 Log-Transformed**					
2031	Mean in Original Scale					0.0629	Mean in Log Scale					-3.227
2032	SD in Original Scale					0.0802	SD in Log Scale					0.94
2033	95% t UCL (Assumes normality)					0.113	95% H-Stat UCL					0.173
2034	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2035												
2036	**Nonparametric Distribution Free UCL Statistics**											
2037	**Detected Data appear Normal Distributed at 5% Significance Level**											
2038												
2039	**Suggested UCL to Use**											
2040	95% KM (t) UCL					0.0473						
2041												
2042	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2043	Recommendations are based upon data size, data distribution, and skewness.											
2044	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2045	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2046												
2047	**Cadmium (tw2r)**											
2048												
2049	**General Statistics**											
2050	Total Number of Observations					9	Number of Distinct Observations					6
2051	Number of Detects					0	Number of Non-Detects					9
2052	Number of Distinct Detects					0	Number of Distinct Non-Detects					6
2053												
2054	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
2055	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
2056	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
2057												
2058	**The data set for variable Cadmium (tw2r) was not processed!**											
2059												
2060												
2061	**Cadmium (tw5r)**											
2062												
2063	**General Statistics**											
2064	Total Number of Observations					8	Number of Distinct Observations					6
2065	Number of Detects					2	Number of Non-Detects					6
2066	Number of Distinct Detects					2	Number of Distinct Non-Detects					4
2067	Minimum Detect					0.025	Minimum Non-Detect					0.028
2068	Maximum Detect					0.034	Maximum Non-Detect					0.54
2069	Variance Detects					4.0500E-5	Percent Non-Detects					75%
2070	Mean Detects					0.0295	SD Detects					0.00636
2071	Median Detects					0.0295	CV Detects					0.216
2072	Skewness Detects					N/A	Kurtosis Detects					N/A
2073	Mean of Logged Detects					-3.535	SD of Logged Detects					0.217
2074												
2075	**Warning: Data set has only 2 Detected Values.**											
2076	**This is not enough to compute meaningful or reliable statistics and estimates.**											
2077												
2078												
2079	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2080	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											

	A	B	C	D	E	F	G	H	I	J	K	L
2081	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
2082	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
2083												
2084	Normal GOF Test on Detects Only											
2085	Not Enough Data to Perform GOF Test											
2086												
2087	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
2088					KM Mean	0.0265			KM Standard Error of Mean	0.00194		
2089					KM SD	0.00335			95% KM (BCA) UCL	N/A		
2090					95% KM (t) UCL	0.0302			95% KM (Percentile Bootstrap) UCL	N/A		
2091					95% KM (z) UCL	0.0297			95% KM Bootstrap t UCL	N/A		
2092					90% KM Chebyshev UCL	0.0323			95% KM Chebyshev UCL	0.0349		
2093					97.5% KM Chebyshev UCL	0.0386			99% KM Chebyshev UCL	0.0458		
2094												
2095	Gamma GOF Tests on Detected Observations Only											
2096	Not Enough Data to Perform GOF Test											
2097												
2098	Gamma Statistics on Detected Data Only											
2099					k hat (MLE)	42.64			k star (bias corrected MLE)	N/A		
2100					Theta hat (MLE)	6.9185E-4			Theta star (bias corrected MLE)	N/A		
2101					nu hat (MLE)	170.6			nu star (bias corrected)	N/A		
2102					Mean (detects)	0.0295						
2103												
2104	Estimates of Gamma Parameters using KM Estimates											
2105					Mean (KM)	0.0265			SD (KM)	0.00335		
2106					Variance (KM)	1.1250E-5			SE of Mean (KM)	0.00194		
2107					k hat (KM)	62.42			k star (KM)	39.1		
2108					nu hat (KM)	998.8			nu star (KM)	625.6		
2109					theta hat (KM)	4.2453E-4			theta star (KM)	6.7780E-4		
2110					80% gamma percentile (KM)	0.03			90% gamma percentile (KM)	0.0321		
2111					95% gamma percentile (KM)	0.0338			99% gamma percentile (KM)	0.0373		
2112												
2113	Gamma Kaplan-Meier (KM) Statistics											
2114									Adjusted Level of Significance (β)	0.0195		
2115					Approximate Chi Square Value (625.56, α)	568.5			Adjusted Chi Square Value (625.56, β)	554.7		
2116					95% Gamma Approximate KM-UCL (use when n>=50)	0.0292			95% Gamma Adjusted KM-UCL (use when n<50)	0.0299		
2117												
2118	Lognormal GOF Test on Detected Observations Only											
2119	Not Enough Data to Perform GOF Test											
2120												
2121	Lognormal ROS Statistics Using Imputed Non-Detects											
2122					Mean in Original Scale	0.0264			Mean in Log Scale	-3.642		
2123					SD in Original Scale	0.00344			SD in Log Scale	0.122		
2124					95% t UCL (assumes normality of ROS data)	0.0287			95% Percentile Bootstrap UCL	0.0284		
2125					95% BCA Bootstrap UCL	0.029			95% Bootstrap t UCL	0.0307		
2126					95% H-UCL (Log ROS)	0.0288						
2127												
2128	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution											
2129					KM Mean (logged)	-3.638			KM Geo Mean	0.0263		
2130					KM SD (logged)	0.115			95% Critical H Value (KM-Log)	1.861		
2131					KM Standard Error of Mean (logged)	0.0662			95% H-UCL (KM -Log)	0.0287		
2132					KM SD (logged)	0.115			95% Critical H Value (KM-Log)	1.861		

2133	KM Standard Error of Mean (logged)					0.0662						
2134												
2135	**DL/2 Statistics**											
2136	**DL/2 Normal**						**DL/2 Log-Transformed**					
2137	Mean in Original Scale					0.0535	Mean in Log Scale					-3.558
2138	SD in Original Scale					0.088	SD in Log Scale					0.997
2139	95% t UCL (Assumes normality)					0.112	95% H-Stat UCL					0.17
2140	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2141												
2142	**Nonparametric Distribution Free UCL Statistics**											
2143	**Data do not follow a Discernible Distribution at 5% Significance Level**											
2144												
2145	**Suggested UCL to Use**											
2146	95% KM (t) UCL					0.0302	KM H-UCL					0.0287
2147	95% KM (BCA) UCL					N/A						
2148	**Warning: One or more Recommended UCL(s) not available!**											
2149												
2150	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2151	Recommendations are based upon data size, data distribution, and skewness.											
2152	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2153	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2154												
2155												
2156	**Cadmium (waste water clarifier well)**											
2157												
2158	**General Statistics**											
2159	Total Number of Observations					1	Number of Distinct Observations					1
2160							Number of Missing Observations					0
2161	Minimum					0.58	Mean					0.58
2162	Maximum					0.58	Median					0.58
2163												
2164	**Warning: This data set only has 1 observations!**											
2165	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
2166	**The data set for variable Cadmium (waste water clarifier well) was not processed!**											
2167												
2168	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
2169	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 10:50:56 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Chromium (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
Number of Detects	8	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	0.87	Minimum Non-Detect	4.6
Maximum Detect	3.2	Maximum Non-Detect	4.6
Variance Detects	0.586	Percent Non-Detects	11.11%
Mean Detects	1.896	SD Detects	0.765
Median Detects	1.7	CV Detects	0.404
Skewness Detects	0.689	Kurtosis Detects	-0.102
Mean of Logged Detects	0.568	SD of Logged Detects	0.412

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.931	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.226	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.896	KM Standard Error of Mean	0.271
KM SD	0.716	95% KM (BCA) UCL	2.341
95% KM (t) UCL	2.399	95% KM (Percentile Bootstrap) UCL	2.31
95% KM (z) UCL	2.341	95% KM Bootstrap t UCL	2.687
90% KM Chebyshev UCL	2.708	95% KM Chebyshev UCL	3.076
97.5% KM Chebyshev UCL	3.586	99% KM Chebyshev UCL	4.589

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.267	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.717	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.188	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	7.074	k star (bias corrected MLE)	4.505

	A	B	C	D	E	F	G	H	I	J	K	L
53					Theta hat (MLE)	0.268				Theta star (bias corrected MLE)		0.421
54					nu hat (MLE)	113.2				nu star (bias corrected)		72.07
55					Mean (detects)	1.896						
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
60					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
61					This is especially true when the sample size is small.							
62					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
63					Minimum	0.87				Mean		1.889
64					Maximum	3.2				Median		1.7
65					SD	0.716				CV		0.379
66					k hat (MLE)	7.931				k star (bias corrected MLE)		5.361
67					Theta hat (MLE)	0.238				Theta star (bias corrected MLE)		0.352
68					nu hat (MLE)	142.8				nu star (bias corrected)		96.5
69					Adjusted Level of Significance (β)	0.0231						
70					Approximate Chi Square Value (96.50, α)	74.84				Adjusted Chi Square Value (96.50, β)		70.83
71					95% Gamma Approximate UCL (use when n>=50)	2.435				95% Gamma Adjusted UCL (use when n<50)		2.573
72												
73					**Estimates of Gamma Parameters using KM Estimates**							
74					Mean (KM)	1.896				SD (KM)		0.716
75					Variance (KM)	0.513				SE of Mean (KM)		0.271
76					k hat (KM)	7.015				k star (KM)		4.751
77					nu hat (KM)	126.3				nu star (KM)		85.51
78					theta hat (KM)	0.27				theta star (KM)		0.399
79					80% gamma percentile (KM)	2.564				90% gamma percentile (KM)		3.061
80					95% gamma percentile (KM)	3.516				99% gamma percentile (KM)		4.479
81												
82					**Gamma Kaplan-Meier (KM) Statistics**							
83					Approximate Chi Square Value (85.51, α)	65.2				Adjusted Chi Square Value (85.51, β)		61.47
84					95% Gamma Approximate KM-UCL (use when n>=50)	2.487				95% Gamma Adjusted KM-UCL (use when n<50)		2.638
85												
86					**Lognormal GOF Test on Detected Observations Only**							
87					Shapiro Wilk Test Statistic	0.963				**Shapiro Wilk GOF Test**		
88					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Lognormal at 5% Significance Level		
89					Lilliefors Test Statistic	0.161				**Lilliefors GOF Test**		
90					5% Lilliefors Critical Value	0.283				Detected Data appear Lognormal at 5% Significance Level		
91					**Detected Data appear Lognormal at 5% Significance Level**							
92												
93					**Lognormal ROS Statistics Using Imputed Non-Detects**							
94					Mean in Original Scale	1.882				Mean in Log Scale		0.568
95					SD in Original Scale	0.717				SD in Log Scale		0.386
96					95% t UCL (assumes normality of ROS data)	2.326				95% Percentile Bootstrap UCL		2.289
97					95% BCA Bootstrap UCL	2.307				95% Bootstrap t UCL		2.575
98					95% H-UCL (Log ROS)	2.535						
99												
100					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
101					KM Mean (logged)	0.568				KM Geo Mean		1.764
102					KM SD (logged)	0.386				95% Critical H Value (KM-Log)		2.115
103					KM Standard Error of Mean (logged)	0.146				95% H-UCL (KM -Log)		2.535
104					KM SD (logged)	0.386				95% Critical H Value (KM-Log)		2.115

	A	B	C	D	E	F	G	H	I	J	K	L
105	KM Standard Error of Mean (logged)					0.146						
106												
107	**DL/2 Statistics**											
108	**DL/2 Normal**						**DL/2 Log-Transformed**					
109	Mean in Original Scale					1.941	Mean in Log Scale					0.597
110	SD in Original Scale					0.728	SD in Log Scale					0.396
111	95% t UCL (Assumes normality)					2.393	95% H-Stat UCL					2.645
112	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
113												
114	**Nonparametric Distribution Free UCL Statistics**											
115	**Detected Data appear Normal Distributed at 5% Significance Level**											
116												
117	**Suggested UCL to Use**											
118	95% KM (t) UCL					2.399						
119												
120	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
121	Recommendations are based upon data size, data distribution, and skewness.											
122	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
123	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
124												
125												
126	**Chromium (nfmw10)**											
127												
128	**General Statistics**											
129	Total Number of Observations					8	Number of Distinct Observations					8
130							Number of Missing Observations					0
131	Minimum					2.4	Mean					4.738
132	Maximum					8.2	Median					4.55
133	SD					2.046	Std. Error of Mean					0.723
134	Coefficient of Variation					0.432	Skewness					0.46
135												
136	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
137	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
138	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
139	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
140												
141	**Normal GOF Test**											
142	Shapiro Wilk Test Statistic					0.941	**Shapiro Wilk GOF Test**					
143	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					
144	Lilliefors Test Statistic					0.134	**Lilliefors GOF Test**					
145	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
146	**Data appear Normal at 5% Significance Level**											
147												
148	**Assuming Normal Distribution**											
149	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
150	95% Student's-t UCL					6.108	95% Adjusted-CLT UCL (Chen-1995)					6.053
151							95% Modified-t UCL (Johnson-1978)					6.127
152												
153	**Gamma GOF Test**											
154	A-D Test Statistic					0.25	**Anderson-Darling Gamma GOF Test**					
155	5% A-D Critical Value					0.718	Detected data appear Gamma Distributed at 5% Significance Level					
156	K-S Test Statistic					0.157	**Kolmogorov-Smirnov Gamma GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
157				5% K-S Critical Value		0.295	Detected data appear Gamma Distributed at 5% Significance Level					
158	**Detected data appear Gamma Distributed at 5% Significance Level**											
159												
160	**Gamma Statistics**											
161				k hat (MLE)		6.001				k star (bias corrected MLE)		3.834
162				Theta hat (MLE)		0.789				Theta star (bias corrected MLE)		1.236
163				nu hat (MLE)		96.02				nu star (bias corrected)		61.35
164				MLE Mean (bias corrected)		4.738				MLE Sd (bias corrected)		2.419
165										Approximate Chi Square Value (0.05)		44.33
166				Adjusted Level of Significance		0.0195				Adjusted Chi Square Value		40.7
167												
168	**Assuming Gamma Distribution**											
169			95% Approximate Gamma UCL (use when n>=50))			6.556			95% Adjusted Gamma UCL (use when n<50)			7.141
170												
171	**Lognormal GOF Test**											
172				Shapiro Wilk Test Statistic		0.943	**Shapiro Wilk Lognormal GOF Test**					
173				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
174				Lilliefors Test Statistic		0.149	**Lilliefors Lognormal GOF Test**					
175				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
176	**Data appear Lognormal at 5% Significance Level**											
177												
178	**Lognormal Statistics**											
179				Minimum of Logged Data		0.875				Mean of logged Data		1.47
180				Maximum of Logged Data		2.104				SD of logged Data		0.449
181												
182	**Assuming Lognormal Distribution**											
183				95% H-UCL		7.074				90% Chebyshev (MVUE) UCL		7.027
184				95% Chebyshev (MVUE) UCL		8.06				97.5% Chebyshev (MVUE) UCL		9.494
185				99% Chebyshev (MVUE) UCL		12.31						
186												
187	**Nonparametric Distribution Free UCL Statistics**											
188	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
189												
190	**Nonparametric Distribution Free UCLs**											
191				95% CLT UCL		5.927				95% Jackknife UCL		6.108
192				95% Standard Bootstrap UCL		5.857				95% Bootstrap-t UCL		6.407
193				95% Hall's Bootstrap UCL		5.96				95% Percentile Bootstrap UCL		5.913
194				95% BCA Bootstrap UCL		5.975						
195				90% Chebyshev(Mean, Sd) UCL		6.907				95% Chebyshev(Mean, Sd) UCL		7.89
196				97.5% Chebyshev(Mean, Sd) UCL		9.255				99% Chebyshev(Mean, Sd) UCL		11.93
197												
198	**Suggested UCL to Use**											
199				95% Student's-t UCL		6.108						
200												
201	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
202	Recommendations are based upon data size, data distribution, and skewness.											
203	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
204	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
205												
206	**Chromium (nfmw11)**											
207												
208	**General Statistics**											

209	Total Number of Observations					8	Number of Distinct Observations					8
210	Number of Detects					5	Number of Non-Detects					3
211	Number of Distinct Detects					5	Number of Distinct Non-Detects					3
212	Minimum Detect					0.33	Minimum Non-Detect					0.8
213	Maximum Detect					1.3	Maximum Non-Detect					4.6
214	Variance Detects					0.164	Percent Non-Detects					37.5%
215	Mean Detects					0.66	SD Detects					0.405
216	Median Detects					0.45	CV Detects					0.613
217	Skewness Detects					1.277	Kurtosis Detects					0.687
218	Mean of Logged Detects					-0.552	SD of Logged Detects					0.568
219												
220	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
221	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
222	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
223	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
224												
225	**Normal GOF Test on Detects Only**											
226	Shapiro Wilk Test Statistic					0.849	**Shapiro Wilk GOF Test**					
227	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Normal at 5% Significance Level					
228	Lilliefors Test Statistic					0.298	**Lilliefors GOF Test**					
229	5% Lilliefors Critical Value					0.343	Detected Data appear Normal at 5% Significance Level					
230	**Detected Data appear Normal at 5% Significance Level**											
231												
232	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
233	KM Mean					0.616	KM Standard Error of Mean					0.158
234	KM SD					0.346	95% KM (BCA) UCL					0.908
235	95% KM (t) UCL					0.915	95% KM (Percentile Bootstrap) UCL					0.89
236	95% KM (z) UCL					0.876	95% KM Bootstrap t UCL					1.93
237	90% KM Chebyshev UCL					1.09	95% KM Chebyshev UCL					1.305
238	97.5% KM Chebyshev UCL					1.603	99% KM Chebyshev UCL					2.19
239												
240	**Gamma GOF Tests on Detected Observations Only**											
241	A-D Test Statistic					0.399	**Anderson-Darling GOF Test**					
242	5% A-D Critical Value					0.681	Detected data appear Gamma Distributed at 5% Significance Level					
243	K-S Test Statistic					0.301	**Kolmogorov-Smirnov GOF**					
244	5% K-S Critical Value					0.359	Detected data appear Gamma Distributed at 5% Significance Level					
245	**Detected data appear Gamma Distributed at 5% Significance Level**											
246												
247	**Gamma Statistics on Detected Data Only**											
248	k hat (MLE)					3.825	k star (bias corrected MLE)					1.663
249	Theta hat (MLE)					0.173	Theta star (bias corrected MLE)					0.397
250	nu hat (MLE)					38.25	nu star (bias corrected)					16.63
251	Mean (detects)					0.66						
252												
253	**Gamma ROS Statistics using Imputed Non-Detects**											
254	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
255	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
256	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
257	This is especially true when the sample size is small.											
258	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
259	Minimum					0.33	Mean					0.603
260	Maximum					1.3	Median					0.507

261					SD	0.32				CV	0.531	
262					k hat (MLE)	5.273				k star (bias corrected MLE)	3.379	
263					Theta hat (MLE)	0.114				Theta star (bias corrected MLE)	0.179	
264					nu hat (MLE)	84.37				nu star (bias corrected)	54.07	
265					Adjusted Level of Significance (β)	0.0195						
266					Approximate Chi Square Value (54.07, α)	38.17				Adjusted Chi Square Value (54.07, β)	34.82	
267					95% Gamma Approximate UCL (use when n>=50)	0.854				95% Gamma Adjusted UCL (use when n<50)	0.937	
268												
269					**Estimates of Gamma Parameters using KM Estimates**							
270					Mean (KM)	0.616				SD (KM)	0.346	
271					Variance (KM)	0.12				SE of Mean (KM)	0.158	
272					k hat (KM)	3.169				k star (KM)	2.064	
273					nu hat (KM)	50.7				nu star (KM)	33.02	
274					theta hat (KM)	0.194				theta star (KM)	0.298	
275					80% gamma percentile (KM)	0.918				90% gamma percentile (KM)	1.188	
276					95% gamma percentile (KM)	1.446				99% gamma percentile (KM)	2.015	
277												
278					**Gamma Kaplan-Meier (KM) Statistics**							
279					Approximate Chi Square Value (33.02, α)	20.88				Adjusted Chi Square Value (33.02, β)	18.48	
280					95% Gamma Approximate KM-UCL (use when n>=50)	0.973				95% Gamma Adjusted KM-UCL (use when n<50)	1.1	
281												
282					**Lognormal GOF Test on Detected Observations Only**							
283					Shapiro Wilk Test Statistic	0.91				**Shapiro Wilk GOF Test**		
284					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
285					Lilliefors Test Statistic	0.268				**Lilliefors GOF Test**		
286					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
287					**Detected Data appear Lognormal at 5% Significance Level**							
288												
289					**Lognormal ROS Statistics Using Imputed Non-Detects**							
290					Mean in Original Scale	0.597				Mean in Log Scale	-0.613	
291					SD in Original Scale	0.32				SD in Log Scale	0.446	
292					95% t UCL (assumes normality of ROS data)	0.812				95% Percentile Bootstrap UCL	0.791	
293					95% BCA Bootstrap UCL	0.857				95% Bootstrap t UCL	1.207	
294					95% H-UCL (Log ROS)	0.876						
295												
296					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
297					KM Mean (logged)	-0.617				KM Geo Mean	0.54	
298					KM SD (logged)	0.489				95% Critical H Value (KM-Log)	2.335	
299					KM Standard Error of Mean (logged)	0.225				95% H-UCL (KM -Log)	0.936	
300					KM SD (logged)	0.489				95% Critical H Value (KM-Log)	2.335	
301					KM Standard Error of Mean (logged)	0.225						
302												
303					**DL/2 Statistics**							
304					**DL/2 Normal**					**DL/2 Log-Transformed**		
305					Mean in Original Scale	0.95				Mean in Log Scale	-0.297	
306					SD in Original Scale	0.72				SD in Log Scale	0.743	
307					95% t UCL (Assumes normality)	1.432				95% H-Stat UCL	2.167	
308					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
309												
310					**Nonparametric Distribution Free UCL Statistics**							
311					**Detected Data appear Normal Distributed at 5% Significance Level**							
312												

	A	B	C	D	E	F	G	H	I	J	K	L
313	**Suggested UCL to Use**											
314					95% KM (t) UCL	0.915						
315												
316	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
317	Recommendations are based upon data size, data distribution, and skewness.											
318	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
319	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
320												
321	**Chromium (nfmw12)**											
322												
323	**General Statistics**											
324					Total Number of Observations	8				Number of Distinct Observations	8	
325					Number of Detects	3				Number of Non-Detects	5	
326					Number of Distinct Detects	3				Number of Distinct Non-Detects	5	
327					Minimum Detect	0.25				Minimum Non-Detect	0.26	
328					Maximum Detect	0.35				Maximum Non-Detect	4.6	
329					Variance Detects	0.0028				Percent Non-Detects	62.5%	
330					Mean Detects	0.29				SD Detects	0.0529	
331					Median Detects	0.27				CV Detects	0.182	
332					Skewness Detects	1.458				Kurtosis Detects	N/A	
333					Mean of Logged Detects	-1.248				SD of Logged Detects	0.176	
334												
335	**Warning: Data set has only 3 Detected Values.**											
336	**This is not enough to compute meaningful or reliable statistics and estimates.**											
337												
338												
339	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
340	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
341	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
342	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
343												
344	**Normal GOF Test on Detects Only**											
345					Shapiro Wilk Test Statistic	0.893				**Shapiro Wilk GOF Test**		
346					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Normal at 5% Significance Level		
347					Lilliefors Test Statistic	0.314				**Lilliefors GOF Test**		
348					5% Lilliefors Critical Value	0.425				Detected Data appear Normal at 5% Significance Level		
349	**Detected Data appear Normal at 5% Significance Level**											
350												
351	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
352					KM Mean	0.275				KM Standard Error of Mean	0.0211	
353					KM SD	0.0383				95% KM (BCA) UCL	N/A	
354					95% KM (t) UCL	0.315				95% KM (Percentile Bootstrap) UCL	N/A	
355					95% KM (z) UCL	0.31				95% KM Bootstrap t UCL	N/A	
356					90% KM Chebyshev UCL	0.339				95% KM Chebyshev UCL	0.367	
357					97.5% KM Chebyshev UCL	0.407				99% KM Chebyshev UCL	0.486	
358												
359	**Gamma GOF Tests on Detected Observations Only**											
360	**Not Enough Data to Perform GOF Test**											
361												
362	**Gamma Statistics on Detected Data Only**											
363					k hat (MLE)	47.3				k star (bias corrected MLE)	N/A	
364					Theta hat (MLE)	0.00613				Theta star (bias corrected MLE)	N/A	

	A	B	C	D	E	F	G	H	I	J	K	L
365					nu hat (MLE)	283.8				nu star (bias corrected)		N/A
366					Mean (detects)	0.29						
367												
368	**Gamma ROS Statistics using Imputed Non-Detects**											
369	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
370	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
371	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
372	This is especially true when the sample size is small.											
373	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
374					Minimum	0.24				Mean		0.272
375					Maximum	0.35				Median		0.27
376					SD	0.0335				CV		0.123
377					k hat (MLE)	84.6				k star (bias corrected MLE)		52.96
378					Theta hat (MLE)	0.00322				Theta star (bias corrected MLE)		0.00514
379					nu hat (MLE)	1354				nu star (bias corrected)		847.3
380					Adjusted Level of Significance (β)	0.0195						
381					Approximate Chi Square Value (847.33, α)	780.8				Adjusted Chi Square Value (847.33, β)		764.5
382					95% Gamma Approximate UCL (use when n>=50)	0.295				95% Gamma Adjusted UCL (use when n<50)		N/A
383												
384	**Estimates of Gamma Parameters using KM Estimates**											
385					Mean (KM)	0.275				SD (KM)		0.0383
386					Variance (KM)	0.00146				SE of Mean (KM)		0.0211
387					k hat (KM)	51.75				k star (KM)		32.43
388					nu hat (KM)	828				nu star (KM)		518.8
389					theta hat (KM)	0.00532				theta star (KM)		0.00849
390					80% gamma percentile (KM)	0.315				90% gamma percentile (KM)		0.339
391					95% gamma percentile (KM)	0.359				99% gamma percentile (KM)		0.4
392												
393	**Gamma Kaplan-Meier (KM) Statistics**											
394					Approximate Chi Square Value (518.84, α)	467				Adjusted Chi Square Value (518.84, β)		454.5
395					95% Gamma Approximate KM-UCL (use when n>=50)	0.306				95% Gamma Adjusted KM-UCL (use when n<50)		0.314
396												
397	**Lognormal GOF Test on Detected Observations Only**											
398					Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk GOF Test**					
399					5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level					
400					Lilliefors Test Statistic	0.302	**Lilliefors GOF Test**					
401					5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level					
402	**Detected Data appear Lognormal at 5% Significance Level**											
403												
404	**Lognormal ROS Statistics Using Imputed Non-Detects**											
405					Mean in Original Scale	0.272				Mean in Log Scale		-1.307
406					SD in Original Scale	0.0331				SD in Log Scale		0.112
407					95% t UCL (assumes normality of ROS data)	0.295				95% Percentile Bootstrap UCL		0.293
408					95% BCA Bootstrap UCL	0.298				95% Bootstrap t UCL		0.316
409					95% H-UCL (Log ROS)	0.295						
410												
411	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
412					KM Mean (logged)	-1.298				KM Geo Mean		0.273
413					KM SD (logged)	0.128				95% Critical H Value (KM-Log)		1.874
414					KM Standard Error of Mean (logged)	0.0711				95% H-UCL (KM -Log)		0.301
415					KM SD (logged)	0.128				95% Critical H Value (KM-Log)		1.874
416					KM Standard Error of Mean (logged)	0.0711						

	A	B	C	D	E	F	G	H	I	J	K	L
417												
418	**DL/2 Statistics**											
419	**DL/2 Normal**						**DL/2 Log-Transformed**					
420	Mean in Original Scale					0.511	Mean in Log Scale					-1.153
421	SD in Original Scale					0.729	SD in Log Scale					0.894
422	95% t UCL (Assumes normality)					0.999	95% H-Stat UCL					1.374
423	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
424												
425	**Nonparametric Distribution Free UCL Statistics**											
426	**Detected Data appear Normal Distributed at 5% Significance Level**											
427												
428	**Suggested UCL to Use**											
429	95% KM (t) UCL					0.315						
430												
431	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
432	Recommendations are based upon data size, data distribution, and skewness.											
433	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
434	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
435												
436	**Chromium (nfmw19)**											
437												
438	**General Statistics**											
439	Total Number of Observations					8	Number of Distinct Observations					8
440	Number of Detects					4	Number of Non-Detects					4
441	Number of Distinct Detects					4	Number of Distinct Non-Detects					4
442	Minimum Detect					0.47	Minimum Non-Detect					0.64
443	Maximum Detect					2	Maximum Non-Detect					3.2
444	Variance Detects					0.685	Percent Non-Detects					50%
445	Mean Detects					1.235	SD Detects					0.828
446	Median Detects					1.235	CV Detects					0.67
447	Skewness Detects					6.528E-16	Kurtosis Detects					-5.855
448	Mean of Logged Detects					0.00446	SD of Logged Detects					0.77
449												
450	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
451	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
452	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
453	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
454												
455	**Normal GOF Test on Detects Only**											
456	Shapiro Wilk Test Statistic					0.79	**Shapiro Wilk GOF Test**					
457	5% Shapiro Wilk Critical Value					0.748	Detected Data appear Normal at 5% Significance Level					
458	Lilliefors Test Statistic					0.289	**Lilliefors GOF Test**					
459	5% Lilliefors Critical Value					0.375	Detected Data appear Normal at 5% Significance Level					
460	**Detected Data appear Normal at 5% Significance Level**											
461												
462	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
463	KM Mean					0.929	KM Standard Error of Mean					0.284
464	KM SD					0.648	95% KM (BCA) UCL					N/A
465	95% KM (t) UCL					1.466	95% KM (Percentile Bootstrap) UCL					N/A
466	95% KM (z) UCL					1.395	95% KM Bootstrap t UCL					N/A
467	90% KM Chebyshev UCL					1.78	95% KM Chebyshev UCL					2.165
468	97.5% KM Chebyshev UCL					2.7	99% KM Chebyshev UCL					3.751

	A	B	C	D	E	F	G	H	I	J	K	L
469												
470	**Gamma GOF Tests on Detected Observations Only**											
471					A-D Test Statistic	0.578	**Anderson-Darling GOF Test**					
472					5% A-D Critical Value	0.66	Detected data appear Gamma Distributed at 5% Significance Level					
473					K-S Test Statistic	0.328	**Kolmogorov-Smirnov GOF**					
474					5% K-S Critical Value	0.397	Detected data appear Gamma Distributed at 5% Significance Level					
475	**Detected data appear Gamma Distributed at 5% Significance Level**											
476												
477	**Gamma Statistics on Detected Data Only**											
478					k hat (MLE)	2.575	k star (bias corrected MLE)	0.81				
479					Theta hat (MLE)	0.48	Theta star (bias corrected MLE)	1.524				
480					nu hat (MLE)	20.6	nu star (bias corrected)	6.482				
481					Mean (detects)	1.235						
482												
483	**Gamma ROS Statistics using Imputed Non-Detects**											
484	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
485	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
486	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
487	This is especially true when the sample size is small.											
488	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
489					Minimum	0.47	Mean	0.939				
490					Maximum	2	Median	0.58				
491					SD	0.633	CV	0.674				
492					k hat (MLE)	3.241	k star (bias corrected MLE)	2.109				
493					Theta hat (MLE)	0.29	Theta star (bias corrected MLE)	0.445				
494					nu hat (MLE)	51.86	nu star (bias corrected)	33.75				
495					Adjusted Level of Significance (β)	0.0195						
496					Approximate Chi Square Value (33.75, α)	21.46	Adjusted Chi Square Value (33.75, β)	19.02				
497					95% Gamma Approximate UCL (use when n>=50)	1.477	95% Gamma Adjusted UCL (use when n<50)	N/A				
498												
499	**Estimates of Gamma Parameters using KM Estimates**											
500					Mean (KM)	0.929	SD (KM)	0.648				
501					Variance (KM)	0.42	SE of Mean (KM)	0.284				
502					k hat (KM)	2.054	k star (KM)	1.367				
503					nu hat (KM)	32.86	nu star (KM)	21.87				
504					theta hat (KM)	0.452	theta star (KM)	0.679				
505					80% gamma percentile (KM)	1.451	90% gamma percentile (KM)	1.979				
506					95% gamma percentile (KM)	2.496	99% gamma percentile (KM)	3.669				
507												
508	**Gamma Kaplan-Meier (KM) Statistics**											
509					Approximate Chi Square Value (21.87, α)	12.24	Adjusted Chi Square Value (21.87, β)	10.47				
510					95% Gamma Approximate KM-UCL (use when n>=50)	1.659	95% Gamma Adjusted KM-UCL (use when n<50)	1.94				
511												
512	**Lognormal GOF Test on Detected Observations Only**											
513					Shapiro Wilk Test Statistic	0.806	**Shapiro Wilk GOF Test**					
514					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level					
515					Lilliefors Test Statistic	0.296	**Lilliefors GOF Test**					
516					5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level					
517	**Detected Data appear Lognormal at 5% Significance Level**											
518												
519	**Lognormal ROS Statistics Using Imputed Non-Detects**											
520					Mean in Original Scale	0.921	Mean in Log Scale	-0.252				

521				SD in Original Scale		0.641				SD in Log Scale		0.582
522			95% t UCL (assumes normality of ROS data)			1.35				95% Percentile Bootstrap UCL		1.281
523				95% BCA Bootstrap UCL		1.328				95% Bootstrap t UCL		3.188
524				95% H-UCL (Log ROS)		1.596						
525												
526	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
527				KM Mean (logged)		-0.28				KM Geo Mean		0.756
528				KM SD (logged)		0.605				95% Critical H Value (KM-Log)		2.543
529			KM Standard Error of Mean (logged)			0.268				95% H-UCL (KM -Log)		1.623
530				KM SD (logged)		0.605				95% Critical H Value (KM-Log)		2.543
531			KM Standard Error of Mean (logged)			0.268						
532												
533	**DL/2 Statistics**											
534	**DL/2 Normal**									**DL/2 Log-Transformed**		
535				Mean in Original Scale		0.97				Mean in Log Scale		-0.283
536				SD in Original Scale		0.727				SD in Log Scale		0.754
537			95% t UCL (Assumes normality)			1.457				95% H-Stat UCL		2.256
538	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
539												
540	**Nonparametric Distribution Free UCL Statistics**											
541	**Detected Data appear Normal Distributed at 5% Significance Level**											
542												
543	**Suggested UCL to Use**											
544				95% KM (t) UCL		1.466						
545												
546	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
547	Recommendations are based upon data size, data distribution, and skewness.											
548	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
549	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
550												
551												
552	**Chromium (nfmw1d)**											
553												
554	**General Statistics**											
555				Total Number of Observations		9				Number of Distinct Observations		8
556										Number of Missing Observations		0
557				Minimum		4.7				Mean		6.767
558				Maximum		8.5				Median		7.1
559				SD		1.332				Std. Error of Mean		0.444
560				Coefficient of Variation		0.197				Skewness		-0.143
561												
562	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
563	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
564	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
565	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
566												
567	**Normal GOF Test**											
568				Shapiro Wilk Test Statistic		0.939				**Shapiro Wilk GOF Test**		
569				5% Shapiro Wilk Critical Value		0.829				Data appear Normal at 5% Significance Level		
570				Lilliefors Test Statistic		0.162				**Lilliefors GOF Test**		
571				5% Lilliefors Critical Value		0.274				Data appear Normal at 5% Significance Level		
572	**Data appear Normal at 5% Significance Level**											

573												
574	**Assuming Normal Distribution**											
575	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
576	95% Student's-t UCL				7.592		95% Adjusted-CLT UCL (Chen-1995)				7.474	
577							95% Modified-t UCL (Johnson-1978)				7.589	
578												
579	**Gamma GOF Test**											
580	A-D Test Statistic				0.32		**Anderson-Darling Gamma GOF Test**					
581	5% A-D Critical Value				0.721		Detected data appear Gamma Distributed at 5% Significance Level					
582	K-S Test Statistic				0.181		**Kolmogorov-Smirnov Gamma GOF Test**					
583	5% K-S Critical Value				0.279		Detected data appear Gamma Distributed at 5% Significance Level					
584	**Detected data appear Gamma Distributed at 5% Significance Level**											
585												
586	**Gamma Statistics**											
587	k hat (MLE)				27.89		k star (bias corrected MLE)				18.67	
588	Theta hat (MLE)				0.243		Theta star (bias corrected MLE)				0.362	
589	nu hat (MLE)				502		nu star (bias corrected)				336	
590	MLE Mean (bias corrected)				6.767		MLE Sd (bias corrected)				1.566	
591							Approximate Chi Square Value (0.05)				294.5	
592	Adjusted Level of Significance				0.0231		Adjusted Chi Square Value				286.3	
593												
594	**Assuming Gamma Distribution**											
595	95% Approximate Gamma UCL (use when n>=50))				7.719		95% Adjusted Gamma UCL (use when n<50)				7.941	
596												
597	**Lognormal GOF Test**											
598	Shapiro Wilk Test Statistic				0.936		**Shapiro Wilk Lognormal GOF Test**					
599	5% Shapiro Wilk Critical Value				0.829		Data appear Lognormal at 5% Significance Level					
600	Lilliefors Test Statistic				0.183		**Lilliefors Lognormal GOF Test**					
601	5% Lilliefors Critical Value				0.274		Data appear Lognormal at 5% Significance Level					
602	**Data appear Lognormal at 5% Significance Level**											
603												
604	**Lognormal Statistics**											
605	Minimum of Logged Data				1.548		Mean of logged Data				1.894	
606	Maximum of Logged Data				2.14		SD of logged Data				0.204	
607												
608	**Assuming Lognormal Distribution**											
609	95% H-UCL				7.788		90% Chebyshev (MVUE) UCL				8.154	
610	95% Chebyshev (MVUE) UCL				8.781		97.5% Chebyshev (MVUE) UCL				9.651	
611	99% Chebyshev (MVUE) UCL				11.36							
612												
613	**Nonparametric Distribution Free UCL Statistics**											
614	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
615												
616	**Nonparametric Distribution Free UCLs**											
617	95% CLT UCL				7.497		95% Jackknife UCL				7.592	
618	95% Standard Bootstrap UCL				7.468		95% Bootstrap-t UCL				7.566	
619	95% Hall's Bootstrap UCL				7.39		95% Percentile Bootstrap UCL				7.444	
620	95% BCA Bootstrap UCL				7.433							
621	90% Chebyshev(Mean, Sd) UCL				8.099		95% Chebyshev(Mean, Sd) UCL				8.702	
622	97.5% Chebyshev(Mean, Sd) UCL				9.54		99% Chebyshev(Mean, Sd) UCL				11.19	
623												
624	**Suggested UCL to Use**											

625				95% Student's-t UCL		7.592						
626												
627	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
628	Recommendations are based upon data size, data distribution, and skewness.											
629	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
630	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
631												
632	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
633	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
634												
635												
636	**Chromium (nfmw1s)**											
637												
638	**General Statistics**											
639				Total Number of Observations		7			Number of Distinct Observations			7
640									Number of Missing Observations			0
641				Minimum		3.2			Mean			31.94
642				Maximum		157			Median			5.7
643				SD		56.19			Std. Error of Mean			21.24
644				Coefficient of Variation		1.759			Skewness			2.456
645												
646	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
647	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
648	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
649	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
650												
651	**Normal GOF Test**											
652				Shapiro Wilk Test Statistic		0.597			**Shapiro Wilk GOF Test**			
653				5% Shapiro Wilk Critical Value		0.803			Data Not Normal at 5% Significance Level			
654				Lilliefors Test Statistic		0.348			**Lilliefors GOF Test**			
655				5% Lilliefors Critical Value		0.304			Data Not Normal at 5% Significance Level			
656	**Data Not Normal at 5% Significance Level**											
657												
658	**Assuming Normal Distribution**											
659				**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**			
660				95% Student's-t UCL		73.21			95% Adjusted-CLT UCL (Chen-1995)			87.94
661									95% Modified-t UCL (Johnson-1978)			76.5
662												
663	**Gamma GOF Test**											
664				A-D Test Statistic		0.734			**Anderson-Darling Gamma GOF Test**			
665				5% A-D Critical Value		0.745			Detected data appear Gamma Distributed at 5% Significance Level			
666				K-S Test Statistic		0.292			**Kolmogorov-Smirnov Gamma GOF Test**			
667				5% K-S Critical Value		0.325			Detected data appear Gamma Distributed at 5% Significance Level			
668	**Detected data appear Gamma Distributed at 5% Significance Level**											
669												
670	**Gamma Statistics**											
671				k hat (MLE)		0.606			k star (bias corrected MLE)			0.441
672				Theta hat (MLE)		52.74			Theta star (bias corrected MLE)			72.38
673				nu hat (MLE)		8.479			nu star (bias corrected)			6.178
674				MLE Mean (bias corrected)		31.94			MLE Sd (bias corrected)			48.08
675									Approximate Chi Square Value (0.05)			1.732
676				Adjusted Level of Significance		0.0158			Adjusted Chi Square Value			1.115

677												
678	**Assuming Gamma Distribution**											
679	95% Approximate Gamma UCL (use when n>=50)					114	95% Adjusted Gamma UCL (use when n<50)					176.9
680												
681	**Lognormal GOF Test**											
682	Shapiro Wilk Test Statistic					0.87	**Shapiro Wilk Lognormal GOF Test**					
683	5% Shapiro Wilk Critical Value					0.803	Data appear Lognormal at 5% Significance Level					
684	Lilliefors Test Statistic					0.261	**Lilliefors Lognormal GOF Test**					
685	5% Lilliefors Critical Value					0.304	Data appear Lognormal at 5% Significance Level					
686	**Data appear Lognormal at 5% Significance Level**											
687												
688	**Lognormal Statistics**											
689	Minimum of Logged Data					1.163	Mean of logged Data					2.445
690	Maximum of Logged Data					5.056	SD of logged Data					1.428
691												
692	**Assuming Lognormal Distribution**											
693	95% H-UCL					577	90% Chebyshev (MVUE) UCL					66.2
694	95% Chebyshev (MVUE) UCL					84.61	97.5% Chebyshev (MVUE) UCL					110.2
695	99% Chebyshev (MVUE) UCL					160.4						
696												
697	**Nonparametric Distribution Free UCL Statistics**											
698	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
699												
700	**Nonparametric Distribution Free UCLs**											
701	95% CLT UCL					66.88	95% Jackknife UCL					73.21
702	95% Standard Bootstrap UCL					64.96	95% Bootstrap-t UCL					283.7
703	95% Hall's Bootstrap UCL					350.2	95% Percentile Bootstrap UCL					71.29
704	95% BCA Bootstrap UCL					83.81						
705	90% Chebyshev(Mean, Sd) UCL					95.66	95% Chebyshev(Mean, Sd) UCL					124.5
706	97.5% Chebyshev(Mean, Sd) UCL					164.6	99% Chebyshev(Mean, Sd) UCL					243.3
707												
708	**Suggested UCL to Use**											
709	95% Adjusted Gamma UCL					176.9						
710												
711	**Recommended UCL exceeds the maximum observation**											
712												
713	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
714	Recommendations are based upon data size, data distribution, and skewness.											
715	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
716	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
717												
718	**Chromium (nfmw2)**											
719												
720	**General Statistics**											
721	Total Number of Observations					9	Number of Distinct Observations					6
722	Number of Detects					3	Number of Non-Detects					6
723	Number of Distinct Detects					3	Number of Distinct Non-Detects					3
724	Minimum Detect					0.28	Minimum Non-Detect					0.21
725	Maximum Detect					0.88	Maximum Non-Detect					3.2
726	Variance Detects					0.103	Percent Non-Detects					66.67%
727	Mean Detects					0.513	SD Detects					0.321
728	Median Detects					0.38	CV Detects					0.626

729				Skewness Detects		1.545				Kurtosis Detects		N/A
730				Mean of Logged Detects		-0.789				SD of Logged Detects		0.593
731												
732						**Warning: Data set has only 3 Detected Values.**							
733						**This is not enough to compute meaningful or reliable statistics and estimates.**						
734												
735												
736						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
737						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
738						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
739						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
740												
741						**Normal GOF Test on Detects Only**						
742				Shapiro Wilk Test Statistic		0.871				**Shapiro Wilk GOF Test**		
743				5% Shapiro Wilk Critical Value		0.767				Detected Data appear Normal at 5% Significance Level		
744				Lilliefors Test Statistic		0.328				**Lilliefors GOF Test**		
745				5% Lilliefors Critical Value		0.425				Detected Data appear Normal at 5% Significance Level		
746						**Detected Data appear Normal at 5% Significance Level**						
747												
748						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
749				KM Mean		0.357				KM Standard Error of Mean		0.105
750				KM SD		0.223				95% KM (BCA) UCL		N/A
751				95% KM (t) UCL		0.553				95% KM (Percentile Bootstrap) UCL		N/A
752				95% KM (z) UCL		0.53				95% KM Bootstrap t UCL		N/A
753				90% KM Chebyshev UCL		0.673				95% KM Chebyshev UCL		0.816
754				97.5% KM Chebyshev UCL		1.015				99% KM Chebyshev UCL		1.405
755												
756						**Gamma GOF Tests on Detected Observations Only**						
757						**Not Enough Data to Perform GOF Test**						
758												
759						**Gamma Statistics on Detected Data Only**						
760				k hat (MLE)		4.237				k star (bias corrected MLE)		N/A
761				Theta hat (MLE)		0.121				Theta star (bias corrected MLE)		N/A
762				nu hat (MLE)		25.42				nu star (bias corrected)		N/A
763				Mean (detects)		0.513						
764												
765						**Gamma ROS Statistics using Imputed Non-Detects**						
766						GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs						
767						GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)						
768						For such situations, GROS method may yield incorrect values of UCLs and BTVs						
769						This is especially true when the sample size is small.						
770						For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates						
771				Minimum		0.01				Mean		0.246
772				Maximum		0.88				Median		0.254
773				SD		0.284				CV		1.152
774				k hat (MLE)		0.599				k star (bias corrected MLE)		0.473
775				Theta hat (MLE)		0.411				Theta star (bias corrected MLE)		0.52
776				nu hat (MLE)		10.78				nu star (bias corrected)		8.522
777				Adjusted Level of Significance (β)		0.0231						
778				Approximate Chi Square Value (8.52, α)		3.041				Adjusted Chi Square Value (8.52, β)		2.393
779				95% Gamma Approximate UCL (use when n>=50)		0.69				95% Gamma Adjusted UCL (use when n<50)		N/A
780												

781	**Estimates of Gamma Parameters using KM Estimates**											
782					Mean (KM)	0.357				SD (KM)		0.223
783					Variance (KM)	0.0497				SE of Mean (KM)		0.105
784					k hat (KM)	2.565				k star (KM)		1.784
785					nu hat (KM)	46.18				nu star (KM)		32.12
786					theta hat (KM)	0.139				theta star (KM)		0.2
787					80% gamma percentile (KM)	0.542				90% gamma percentile (KM)		0.714
788					95% gamma percentile (KM)	0.879				99% gamma percentile (KM)		1.247
789												
790	**Gamma Kaplan-Meier (KM) Statistics**											
791					Approximate Chi Square Value (32.12, α)	20.17				Adjusted Chi Square Value (32.12, β)		18.19
792					95% Gamma Approximate KM-UCL (use when n>=50)	0.569				95% Gamma Adjusted KM-UCL (use when n<50)		0.63
793												
794	**Lognormal GOF Test on Detected Observations Only**											
795					Shapiro Wilk Test Statistic	0.932				**Shapiro Wilk GOF Test**		
796					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
797					Lilliefors Test Statistic	0.285				**Lilliefors GOF Test**		
798					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
799	**Detected Data appear Lognormal at 5% Significance Level**											
800												
801	**Lognormal ROS Statistics Using Imputed Non-Detects**											
802					Mean in Original Scale	0.299				Mean in Log Scale		-1.433
803					SD in Original Scale	0.24				SD in Log Scale		0.687
804					95% t UCL (assumes normality of ROS data)	0.448				95% Percentile Bootstrap UCL		0.429
805					95% BCA Bootstrap UCL	0.48				95% Bootstrap t UCL		0.597
806					95% H-UCL (Log ROS)	0.568						
807												
808	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
809					KM Mean (logged)	-1.167				KM Geo Mean		0.311
810					KM SD (logged)	0.481				95% Critical H Value (KM-Log)		2.212
811					KM Standard Error of Mean (logged)	0.235				95% H-UCL (KM -Log)		0.509
812					KM SD (logged)	0.481				95% Critical H Value (KM-Log)		2.212
813					KM Standard Error of Mean (logged)	0.235						
814												
815	**DL/2 Statistics**											
816					**DL/2 Normal**					**DL/2 Log-Transformed**		
817					Mean in Original Scale	0.606				Mean in Log Scale		-0.968
818					SD in Original Scale	0.609				SD in Log Scale		1.036
819					95% t UCL (Assumes normality)	0.983				95% H-Stat UCL		2.194
820	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
821												
822	**Nonparametric Distribution Free UCL Statistics**											
823	**Detected Data appear Normal Distributed at 5% Significance Level**											
824												
825	**Suggested UCL to Use**											
826					95% KM (t) UCL	0.553						
827												
828	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
829	Recommendations are based upon data size, data distribution, and skewness.											
830	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
831	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
832												

833	**Chromium (nfmw20)**											
834												
835	**General Statistics**											
836					Total Number of Observations	8			Number of Distinct Observations	7		
837					Number of Detects	5			Number of Non-Detects	3		
838					Number of Distinct Detects	4			Number of Distinct Non-Detects	3		
839					Minimum Detect	1.1			Minimum Non-Detect	2.5		
840					Maximum Detect	2.4			Maximum Non-Detect	4.6		
841					Variance Detects	0.428			Percent Non-Detects	37.5%		
842					Mean Detects	1.64			SD Detects	0.654		
843					Median Detects	1.3			CV Detects	0.399		
844					Skewness Detects	0.554			Kurtosis Detects	-3.177		
845					Mean of Logged Detects	0.432			SD of Logged Detects	0.391		
846												
847	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
848	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
849	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
850	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
851												
852	**Normal GOF Test on Detects Only**											
853					Shapiro Wilk Test Statistic	0.777			**Shapiro Wilk GOF Test**			
854					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
855					Lilliefors Test Statistic	0.298			**Lilliefors GOF Test**			
856					5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			
857	**Detected Data appear Normal at 5% Significance Level**											
858												
859	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
860					KM Mean	1.64			KM Standard Error of Mean	0.293		
861					KM SD	0.585			95% KM (BCA) UCL	N/A		
862					95% KM (t) UCL	2.194			95% KM (Percentile Bootstrap) UCL	N/A		
863					95% KM (z) UCL	2.121			95% KM Bootstrap t UCL	N/A		
864					90% KM Chebyshev UCL	2.518			95% KM Chebyshev UCL	2.915		
865					97.5% KM Chebyshev UCL	3.467			99% KM Chebyshev UCL	4.551		
866												
867	**Gamma GOF Tests on Detected Observations Only**											
868					A-D Test Statistic	0.648			**Anderson-Darling GOF Test**			
869					5% A-D Critical Value	0.68			Detected data appear Gamma Distributed at 5% Significance Level			
870					K-S Test Statistic	0.299			**Kolmogorov-Smirnov GOF**			
871					5% K-S Critical Value	0.358			Detected data appear Gamma Distributed at 5% Significance Level			
872	**Detected data appear Gamma Distributed at 5% Significance Level**											
873												
874	**Gamma Statistics on Detected Data Only**											
875					k hat (MLE)	8.173			k star (bias corrected MLE)	3.402		
876					Theta hat (MLE)	0.201			Theta star (bias corrected MLE)	0.482		
877					nu hat (MLE)	81.73			nu star (bias corrected)	34.02		
878					Mean (detects)	1.64						
879												
880	**Gamma ROS Statistics using Imputed Non-Detects**											
881	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
882	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
883	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
884	This is especially true when the sample size is small.											

	A	B	C	D	E	F	G	H	I	J	K	L
885	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
886					Minimum	1.1				Mean		1.624
887					Maximum	2.4				Median		1.598
888					SD	0.495				CV		0.305
889					k hat (MLE)	12.95				k star (bias corrected MLE)		8.179
890					Theta hat (MLE)	0.125				Theta star (bias corrected MLE)		0.199
891					nu hat (MLE)	207.3				nu star (bias corrected)		130.9
892					Adjusted Level of Significance (β)	0.0195						
893					Approximate Chi Square Value (130.87, α)	105.4				Adjusted Chi Square Value (130.87, β)		99.67
894					95% Gamma Approximate UCL (use when n>=50)	2.016				95% Gamma Adjusted UCL (use when n<50)		2.132
895												
896	**Estimates of Gamma Parameters using KM Estimates**											
897					Mean (KM)	1.64				SD (KM)		0.585
898					Variance (KM)	0.342				SE of Mean (KM)		0.293
899					k hat (KM)	7.855				k star (KM)		4.993
900					nu hat (KM)	125.7				nu star (KM)		79.88
901					theta hat (KM)	0.209				theta star (KM)		0.328
902					80% gamma percentile (KM)	2.205				90% gamma percentile (KM)		2.623
903					95% gamma percentile (KM)	3.003				99% gamma percentile (KM)		3.808
904												
905	**Gamma Kaplan-Meier (KM) Statistics**											
906					Approximate Chi Square Value (79.88, α)	60.29				Adjusted Chi Square Value (79.88, β)		56
907					95% Gamma Approximate KM-UCL (use when n>=50)	2.173				95% Gamma Adjusted KM-UCL (use when n<50)		2.339
908												
909	**Lognormal GOF Test on Detected Observations Only**											
910					Shapiro Wilk Test Statistic	0.791				**Shapiro Wilk GOF Test**		
911					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
912					Lilliefors Test Statistic	0.268				**Lilliefors GOF Test**		
913					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
914	**Detected Data appear Lognormal at 5% Significance Level**											
915												
916	**Lognormal ROS Statistics Using Imputed Non-Detects**											
917					Mean in Original Scale	1.603				Mean in Log Scale		0.432
918					SD in Original Scale	0.497				SD in Log Scale		0.296
919					95% t UCL (assumes normality of ROS data)	1.936				95% Percentile Bootstrap UCL		1.885
920					95% BCA Bootstrap UCL	1.92				95% Bootstrap t UCL		2.189
921					95% H-UCL (Log ROS)	2.025						
922												
923	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
924					KM Mean (logged)	0.432				KM Geo Mean		1.541
925					KM SD (logged)	0.35				95% Critical H Value (KM-Log)		2.124
926					KM Standard Error of Mean (logged)	0.175				95% H-UCL (KM -Log)		2.17
927					KM SD (logged)	0.35				95% Critical H Value (KM-Log)		2.124
928					KM Standard Error of Mean (logged)	0.175						
929												
930	**DL/2 Statistics**											
931	**DL/2 Normal**						**DL/2 Log-Transformed**					
932					Mean in Original Scale	1.669				Mean in Log Scale		0.461
933					SD in Original Scale	0.573				SD in Log Scale		0.341
934					95% t UCL (Assumes normality)	2.052				95% H-Stat UCL		2.205
935	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
936												

	A	B	C	D	E	F	G	H	I	J	K	L
937	**Nonparametric Distribution Free UCL Statistics**											
938	**Detected Data appear Normal Distributed at 5% Significance Level**											
939												
940	**Suggested UCL to Use**											
941	95% KM (t) UCL					2.194						
942												
943	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
944	Recommendations are based upon data size, data distribution, and skewness.											
945	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
946	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
947												
948												
949	**Chromium (nfmw22)**											
950												
951	**General Statistics**											
952	Total Number of Observations					4	Number of Distinct Observations					3
953							Number of Missing Observations					0
954	Minimum					3.5	Mean					3.975
955	Maximum					4.2	Median					4.1
956	SD					0.33	Std. Error of Mean					0.165
957	Coefficient of Variation					0.0831	Skewness					-1.56
958												
959	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
960	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
961	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
962	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
963												
964	**Normal GOF Test**											
965	Shapiro Wilk Test Statistic					0.809	**Shapiro Wilk GOF Test**					
966	5% Shapiro Wilk Critical Value					0.748	Data appear Normal at 5% Significance Level					
967	Lilliefors Test Statistic					0.28	**Lilliefors GOF Test**					
968	5% Lilliefors Critical Value					0.375	Data appear Normal at 5% Significance Level					
969	**Data appear Normal at 5% Significance Level**											
970												
971	**Assuming Normal Distribution**											
972	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
973	95% Student's-t UCL					4.364	95% Adjusted-CLT UCL (Chen-1995)					4.109
974							95% Modified-t UCL (Johnson-1978)					4.342
975												
976	**Gamma GOF Test**											
977	A-D Test Statistic					0.544	**Anderson-Darling Gamma GOF Test**					
978	5% A-D Critical Value					0.657	Detected data appear Gamma Distributed at 5% Significance Level					
979	K-S Test Statistic					0.294	**Kolmogorov-Smirnov Gamma GOF Test**					
980	5% K-S Critical Value					0.394	Detected data appear Gamma Distributed at 5% Significance Level					
981	**Detected data appear Gamma Distributed at 5% Significance Level**											
982												
983	**Gamma Statistics**											
984	k hat (MLE)					184.1	k star (bias corrected MLE)					46.2
985	Theta hat (MLE)					0.0216	Theta star (bias corrected MLE)					0.086
986	nu hat (MLE)					1473	nu star (bias corrected)					369.6
987	MLE Mean (bias corrected)					3.975	MLE Sd (bias corrected)					0.585
988							Approximate Chi Square Value (0.05)					326

989					Adjusted Level of Significance	N/A				Adjusted Chi Square Value		N/A
990												
991					**Assuming Gamma Distribution**							
992					95% Approximate Gamma UCL (use when n>=50))	4.506				95% Adjusted Gamma UCL (use when n<50)		N/A
993												
994					**Lognormal GOF Test**							
995					Shapiro Wilk Test Statistic	0.8				**Shapiro Wilk Lognormal GOF Test**		
996					5% Shapiro Wilk Critical Value	0.748				Data appear Lognormal at 5% Significance Level		
997					Lilliefors Test Statistic	0.292				**Lilliefors Lognormal GOF Test**		
998					5% Lilliefors Critical Value	0.375				Data appear Lognormal at 5% Significance Level		
999					**Data appear Lognormal at 5% Significance Level**							
1000												
1001					**Lognormal Statistics**							
1002					Minimum of Logged Data	1.253				Mean of logged Data		1.377
1003					Maximum of Logged Data	1.435				SD of logged Data		0.0862
1004												
1005					**Assuming Lognormal Distribution**							
1006					95% H-UCL	N/A				90% Chebyshev (MVUE) UCL		4.489
1007					95% Chebyshev (MVUE) UCL	4.721				97.5% Chebyshev (MVUE) UCL		5.044
1008					99% Chebyshev (MVUE) UCL	5.678						
1009												
1010					**Nonparametric Distribution Free UCL Statistics**							
1011					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
1012												
1013					**Nonparametric Distribution Free UCLs**							
1014					95% CLT UCL	4.247				95% Jackknife UCL		4.364
1015					95% Standard Bootstrap UCL	N/A				95% Bootstrap-t UCL		N/A
1016					95% Hall's Bootstrap UCL	N/A				95% Percentile Bootstrap UCL		N/A
1017					95% BCA Bootstrap UCL	N/A						
1018					90% Chebyshev(Mean, Sd) UCL	4.471				95% Chebyshev(Mean, Sd) UCL		4.695
1019					97.5% Chebyshev(Mean, Sd) UCL	5.007				99% Chebyshev(Mean, Sd) UCL		5.619
1020												
1021					**Suggested UCL to Use**							
1022					95% Student's-t UCL	4.364						
1023												
1024					**Recommended UCL exceeds the maximum observation**							
1025												
1026					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1027					Recommendations are based upon data size, data distribution, and skewness.							
1028					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1029					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1030												
1031					**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**							
1032					**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**							
1033												
1034												
1035	**Chromium (nfmw23)**											
1036												
1037					**General Statistics**							
1038					Total Number of Observations	4				Number of Distinct Observations		3
1039										Number of Missing Observations		0
1040					Minimum	3.5				Mean		3.775

1041					Maximum	3.9					Median	3.85
1042					SD	0.189					Std. Error of Mean	0.0946
1043					Coefficient of Variation	0.0501					Skewness	-1.659
1044												
1045	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1046	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1047	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1048	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1049												
1050	**Normal GOF Test**											
1051					Shapiro Wilk Test Statistic	0.791	**Shapiro Wilk GOF Test**					
1052					5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level					
1053					Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**					
1054					5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level					
1055	**Data appear Normal at 5% Significance Level**											
1056												
1057	**Assuming Normal Distribution**											
1058	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1059					95% Student's-t UCL	3.998					95% Adjusted-CLT UCL (Chen-1995)	3.847
1060											95% Modified-t UCL (Johnson-1978)	3.985
1061												
1062	**Gamma GOF Test**											
1063					A-D Test Statistic	0.577	**Anderson-Darling Gamma GOF Test**					
1064					5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level					
1065					K-S Test Statistic	0.315	**Kolmogorov-Smirnov Gamma GOF Test**					
1066					5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level					
1067	**Detected data appear Gamma Distributed at 5% Significance Level**											
1068												
1069	**Gamma Statistics**											
1070					k hat (MLE)	515					k star (bias corrected MLE)	128.9
1071					Theta hat (MLE)	0.00733					Theta star (bias corrected MLE)	0.0293
1072					nu hat (MLE)	4120					nu star (bias corrected)	1031
1073					MLE Mean (bias corrected)	3.775					MLE Sd (bias corrected)	0.332
1074											Approximate Chi Square Value (0.05)	957.9
1075					Adjusted Level of Significance	N/A					Adjusted Chi Square Value	N/A
1076												
1077	**Assuming Gamma Distribution**											
1078					95% Approximate Gamma UCL (use when n>=50))	4.065					95% Adjusted Gamma UCL (use when n<50)	N/A
1079												
1080	**Lognormal GOF Test**											
1081					Shapiro Wilk Test Statistic	0.786	**Shapiro Wilk Lognormal GOF Test**					
1082					5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level					
1083					Lilliefors Test Statistic	0.309	**Lilliefors Lognormal GOF Test**					
1084					5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level					
1085	**Data appear Lognormal at 5% Significance Level**											
1086												
1087	**Lognormal Statistics**											
1088					Minimum of Logged Data	1.253					Mean of logged Data	1.327
1089					Maximum of Logged Data	1.361					SD of logged Data	0.0513
1090												
1091	**Assuming Lognormal Distribution**											
1092					95% H-UCL	N/A					90% Chebyshev (MVUE) UCL	4.065

1093				95% Chebyshev (MVUE) UCL		4.197			97.5% Chebyshev (MVUE) UCL			4.379
1094				99% Chebyshev (MVUE) UCL		4.738						
1095												
1096						**Nonparametric Distribution Free UCL Statistics**							
1097						**Data appear to follow a Discernible Distribution at 5% Significance Level**						
1098												
1099						**Nonparametric Distribution Free UCLs**						
1100				95% CLT UCL		3.931			95% Jackknife UCL			3.998
1101				95% Standard Bootstrap UCL		N/A			95% Bootstrap-t UCL			N/A
1102				95% Hall's Bootstrap UCL		N/A			95% Percentile Bootstrap UCL			N/A
1103				95% BCA Bootstrap UCL		N/A						
1104				90% Chebyshev(Mean, Sd) UCL		4.059			95% Chebyshev(Mean, Sd) UCL			4.188
1105				97.5% Chebyshev(Mean, Sd) UCL		4.366			99% Chebyshev(Mean, Sd) UCL			4.717
1106												
1107						**Suggested UCL to Use**							
1108				95% Student's-t UCL		3.998						
1109												
1110						**Recommended UCL exceeds the maximum observation**							
1111												
1112						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1113						Recommendations are based upon data size, data distribution, and skewness.							
1114						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1115						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1116												
1117						**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**							
1118						**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**							
1119												
1120	**Chromium (nfmw3)**											
1121												
1122						**General Statistics**							
1123				Total Number of Observations		9			Number of Distinct Observations			8
1124				Number of Detects		8			Number of Non-Detects			1
1125				Number of Distinct Detects		7			Number of Distinct Non-Detects			1
1126				Minimum Detect		3.2			Minimum Non-Detect			4.6
1127				Maximum Detect		5.8			Maximum Non-Detect			4.6
1128				Variance Detects		1.077			Percent Non-Detects			11.11%
1129				Mean Detects		4.438			SD Detects			1.038
1130				Median Detects		4.4			CV Detects			0.234
1131				Skewness Detects		0.0113			Kurtosis Detects			-1.931
1132				Mean of Logged Detects		1.465			SD of Logged Detects			0.24
1133												
1134						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1135						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1136						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1137						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1138												
1139						**Normal GOF Test on Detects Only**							
1140				Shapiro Wilk Test Statistic		0.898			**Shapiro Wilk GOF Test**			
1141				5% Shapiro Wilk Critical Value		0.818			Detected Data appear Normal at 5% Significance Level			
1142				Lilliefors Test Statistic		0.198			**Lilliefors GOF Test**			
1143				5% Lilliefors Critical Value		0.283			Detected Data appear Normal at 5% Significance Level			
1144						**Detected Data appear Normal at 5% Significance Level**							

1145												
1146	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1147				KM Mean	4.336			KM Standard Error of Mean	0.347			
1148				KM SD	0.965			95% KM (BCA) UCL	4.889			
1149				95% KM (t) UCL	4.981			95% KM (Percentile Bootstrap) UCL	4.889			
1150				95% KM (z) UCL	4.906			95% KM Bootstrap t UCL	5.063			
1151				90% KM Chebyshev UCL	5.376			95% KM Chebyshev UCL	5.847			
1152				97.5% KM Chebyshev UCL	6.501			99% KM Chebyshev UCL	7.786			
1153												
1154	**Gamma GOF Tests on Detected Observations Only**											
1155				A-D Test Statistic	0.439			**Anderson-Darling GOF Test**				
1156				5% A-D Critical Value	0.716			Detected data appear Gamma Distributed at 5% Significance Level				
1157				K-S Test Statistic	0.201			**Kolmogorov-Smirnov GOF**				
1158				5% K-S Critical Value	0.294			Detected data appear Gamma Distributed at 5% Significance Level				
1159	**Detected data appear Gamma Distributed at 5% Significance Level**											
1160												
1161	**Gamma Statistics on Detected Data Only**											
1162				k hat (MLE)	20.37			k star (bias corrected MLE)	12.82			
1163				Theta hat (MLE)	0.218			Theta star (bias corrected MLE)	0.346			
1164				nu hat (MLE)	326			nu star (bias corrected)	205.1			
1165				Mean (detects)	4.438							
1166												
1167	**Gamma ROS Statistics using Imputed Non-Detects**											
1168	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1169	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1170	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1171	This is especially true when the sample size is small.											
1172	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1173				Minimum	3.2			Mean	4.348			
1174				Maximum	5.8			Median	3.9			
1175				SD	1.007			CV	0.232			
1176				k hat (MLE)	21.11			k star (bias corrected MLE)	14.14			
1177				Theta hat (MLE)	0.206			Theta star (bias corrected MLE)	0.307			
1178				nu hat (MLE)	379.9			nu star (bias corrected)	254.6			
1179				Adjusted Level of Significance (β)	0.0231							
1180				Approximate Chi Square Value (254.59, α)	218.6			Adjusted Chi Square Value (254.59, β)	211.6			
1181				95% Gamma Approximate UCL (use when n>=50)	5.063			95% Gamma Adjusted UCL (use when n<50)	5.231			
1182												
1183	**Estimates of Gamma Parameters using KM Estimates**											
1184				Mean (KM)	4.336			SD (KM)	0.965			
1185				Variance (KM)	0.932			SE of Mean (KM)	0.347			
1186				k hat (KM)	20.18			k star (KM)	13.53			
1187				nu hat (KM)	363.2			nu star (KM)	243.5			
1188				theta hat (KM)	0.215			theta star (KM)	0.321			
1189				80% gamma percentile (KM)	5.285			90% gamma percentile (KM)	5.899			
1190				95% gamma percentile (KM)	6.44			99% gamma percentile (KM)	7.538			
1191												
1192	**Gamma Kaplan-Meier (KM) Statistics**											
1193				Approximate Chi Square Value (243.48, α)	208.4			Adjusted Chi Square Value (243.48, β)	201.5			
1194				95% Gamma Approximate KM-UCL (use when n>=50)	5.067			95% Gamma Adjusted KM-UCL (use when n<50)	5.24			
1195												
1196	**Lognormal GOF Test on Detected Observations Only**											

1197				Shapiro Wilk Test Statistic		0.891	**Shapiro Wilk GOF Test**					
1198				5% Shapiro Wilk Critical Value		0.818	Detected Data appear Lognormal at 5% Significance Level					
1199				Lilliefors Test Statistic		0.197	**Lilliefors GOF Test**					
1200				5% Lilliefors Critical Value		0.283	Detected Data appear Lognormal at 5% Significance Level					
1201				**Detected Data appear Lognormal at 5% Significance Level**								
1202												
1203				**Lognormal ROS Statistics Using Imputed Non-Detects**								
1204				Mean in Original Scale		4.346	Mean in Log Scale					1.445
1205				SD in Original Scale		1.009	SD in Log Scale					0.232
1206				95% t UCL (assumes normality of ROS data)		4.971	95% Percentile Bootstrap UCL					4.868
1207				95% BCA Bootstrap UCL		4.889	95% Bootstrap t UCL					5.041
1208				95% H-UCL (Log ROS)		5.111						
1209												
1210				**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**								
1211				KM Mean (logged)		1.442	KM Geo Mean					4.229
1212				KM SD (logged)		0.224	95% Critical H Value (KM-Log)					1.931
1213				KM Standard Error of Mean (logged)		0.0806	95% H-UCL (KM -Log)					5.052
1214				KM SD (logged)		0.224	95% Critical H Value (KM-Log)					1.931
1215				KM Standard Error of Mean (logged)		0.0806						
1216												
1217				**DL/2 Statistics**								
1218				**DL/2 Normal**			**DL/2 Log-Transformed**					
1219				Mean in Original Scale		4.2	Mean in Log Scale					1.395
1220				SD in Original Scale		1.204	SD in Log Scale					0.308
1221				95% t UCL (Assumes normality)		4.946	95% H-Stat UCL					5.271
1222				**DL/2 is not a recommended method, provided for comparisons and historical reasons**								
1223												
1224				**Nonparametric Distribution Free UCL Statistics**								
1225				**Detected Data appear Normal Distributed at 5% Significance Level**								
1226												
1227				**Suggested UCL to Use**								
1228				95% KM (t) UCL		4.981						
1229												
1230				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
1231				Recommendations are based upon data size, data distribution, and skewness.								
1232				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
1233				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
1234												
1235	**Chromium (nfmw4)**											
1236												
1237				**General Statistics**								
1238				Total Number of Observations		9	Number of Distinct Observations					9
1239				Number of Detects		7	Number of Non-Detects					2
1240				Number of Distinct Detects		7	Number of Distinct Non-Detects					2
1241				Minimum Detect		0.36	Minimum Non-Detect					3.2
1242				Maximum Detect		1.4	Maximum Non-Detect					4.6
1243				Variance Detects		0.118	Percent Non-Detects					22.22%
1244				Mean Detects		0.751	SD Detects					0.344
1245				Median Detects		0.7	CV Detects					0.458
1246				Skewness Detects		1.054	Kurtosis Detects					1.614
1247				Mean of Logged Detects		-0.373	SD of Logged Detects					0.453
1248												

1249	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1250	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1251	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1252	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1253												
1254	**Normal GOF Test on Detects Only**											
1255				Shapiro Wilk Test Statistic		0.92	**Shapiro Wilk GOF Test**					
1256				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Normal at 5% Significance Level					
1257				Lilliefors Test Statistic		0.222	**Lilliefors GOF Test**					
1258				5% Lilliefors Critical Value		0.304	Detected Data appear Normal at 5% Significance Level					
1259	**Detected Data appear Normal at 5% Significance Level**											
1260												
1261	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1262				KM Mean		0.751	KM Standard Error of Mean					0.13
1263				KM SD		0.318	95% KM (BCA) UCL					0.968
1264				95% KM (t) UCL		0.993	95% KM (Percentile Bootstrap) UCL					0.967
1265				95% KM (z) UCL		0.965	95% KM Bootstrap t UCL					1.092
1266				90% KM Chebyshev UCL		1.141	95% KM Chebyshev UCL					1.318
1267				97.5% KM Chebyshev UCL		1.563	99% KM Chebyshev UCL					2.045
1268												
1269	**Gamma GOF Tests on Detected Observations Only**											
1270				A-D Test Statistic		0.223	**Anderson-Darling GOF Test**					
1271				5% A-D Critical Value		0.71	Detected data appear Gamma Distributed at 5% Significance Level					
1272				K-S Test Statistic		0.165	**Kolmogorov-Smirnov GOF**					
1273				5% K-S Critical Value		0.313	Detected data appear Gamma Distributed at 5% Significance Level					
1274	**Detected data appear Gamma Distributed at 5% Significance Level**											
1275												
1276	**Gamma Statistics on Detected Data Only**											
1277				k hat (MLE)		5.895	k star (bias corrected MLE)					3.464
1278				Theta hat (MLE)		0.127	Theta star (bias corrected MLE)					0.217
1279				nu hat (MLE)		82.53	nu star (bias corrected)					48.49
1280				Mean (detects)		0.751						
1281												
1282	**Gamma ROS Statistics using Imputed Non-Detects**											
1283	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1284	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1285	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1286	This is especially true when the sample size is small.											
1287	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1288				Minimum		0.36	Mean					0.744
1289				Maximum		1.4	Median					0.72
1290				SD		0.298	CV					0.401
1291				k hat (MLE)		7.517	k star (bias corrected MLE)					5.086
1292				Theta hat (MLE)		0.099	Theta star (bias corrected MLE)					0.146
1293				nu hat (MLE)		135.3	nu star (bias corrected)					91.54
1294				Adjusted Level of Significance (β)		0.0231						
1295				Approximate Chi Square Value (91.54, α)		70.48	Adjusted Chi Square Value (91.54, β)					66.59
1296				95% Gamma Approximate UCL (use when n>=50)		0.967	95% Gamma Adjusted UCL (use when n<50)					1.023
1297												
1298	**Estimates of Gamma Parameters using KM Estimates**											
1299				Mean (KM)		0.751	SD (KM)					0.318
1300				Variance (KM)		0.101	SE of Mean (KM)					0.13

	A	B	C	D	E	F	G	H	I	J	K	L
1301					k hat (KM)	5.569					k star (KM)	3.787
1302					nu hat (KM)	100.2					nu star (KM)	68.17
1303					theta hat (KM)	0.135					theta star (KM)	0.198
1304					80% gamma percentile (KM)	1.043					90% gamma percentile (KM)	1.269
1305					95% gamma percentile (KM)	1.478					99% gamma percentile (KM)	1.925
1306												
1307					**Gamma Kaplan-Meier (KM) Statistics**							
1308					Approximate Chi Square Value (68.17, α)	50.16					Adjusted Chi Square Value (68.17, β)	46.92
1309					95% Gamma Approximate KM-UCL (use when n>=50)	1.021					95% Gamma Adjusted KM-UCL (use when n<50)	1.092
1310												
1311					**Lognormal GOF Test on Detected Observations Only**							
1312					Shapiro Wilk Test Statistic	0.972					**Shapiro Wilk GOF Test**	
1313					5% Shapiro Wilk Critical Value	0.803					Detected Data appear Lognormal at 5% Significance Level	
1314					Lilliefors Test Statistic	0.16					**Lilliefors GOF Test**	
1315					5% Lilliefors Critical Value	0.304					Detected Data appear Lognormal at 5% Significance Level	
1316					**Detected Data appear Lognormal at 5% Significance Level**							
1317												
1318					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1319					Mean in Original Scale	0.737					Mean in Log Scale	-0.373
1320					SD in Original Scale	0.299					SD in Log Scale	0.392
1321					95% t UCL (assumes normality of ROS data)	0.923					95% Percentile Bootstrap UCL	0.907
1322					95% BCA Bootstrap UCL	0.933					95% Bootstrap t UCL	0.985
1323					95% H-UCL (Log ROS)	0.998						
1324												
1325					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1326					KM Mean (logged)	-0.373					KM Geo Mean	0.689
1327					KM SD (logged)	0.419					95% Critical H Value (KM-Log)	2.154
1328					KM Standard Error of Mean (logged)	0.171					95% H-UCL (KM -Log)	1.035
1329					KM SD (logged)	0.419					95% Critical H Value (KM-Log)	2.154
1330					KM Standard Error of Mean (logged)	0.171						
1331												
1332					**DL/2 Statistics**							
1333					**DL/2 Normal**						**DL/2 Log-Transformed**	
1334					Mean in Original Scale	1.018					Mean in Log Scale	-0.145
1335					SD in Original Scale	0.631					SD in Log Scale	0.605
1336					95% t UCL (Assumes normality)	1.409					95% H-Stat UCL	1.753
1337					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1338												
1339					**Nonparametric Distribution Free UCL Statistics**							
1340					**Detected Data appear Normal Distributed at 5% Significance Level**							
1341												
1342					**Suggested UCL to Use**							
1343					95% KM (t) UCL	0.993						
1344												
1345					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1346					Recommendations are based upon data size, data distribution, and skewness.							
1347					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1348					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1349												
1350	**Chromium (nfmw7)**											
1351												
1352					**General Statistics**							

1353	Total Number of Observations					9	Number of Distinct Observations					9
1354	Number of Detects					7	Number of Non-Detects					2
1355	Number of Distinct Detects					7	Number of Distinct Non-Detects					2
1356	Minimum Detect					0.44	Minimum Non-Detect					0.8
1357	Maximum Detect					3.5	Maximum Non-Detect					4.6
1358	Variance Detects					1.927	Percent Non-Detects					22.22%
1359	Mean Detects					1.439	SD Detects					1.388
1360	Median Detects					0.75	CV Detects					0.965
1361	Skewness Detects					1.15	Kurtosis Detects					-0.908
1362	Mean of Logged Detects					-0.00936	SD of Logged Detects					0.9
1363												
1364	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1365	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1366	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1367	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1368												
1369	**Normal GOF Test on Detects Only**											
1370	Shapiro Wilk Test Statistic					0.711	**Shapiro Wilk GOF Test**					
1371	5% Shapiro Wilk Critical Value					0.803	Detected Data Not Normal at 5% Significance Level					
1372	Lilliefors Test Statistic					0.338	**Lilliefors GOF Test**					
1373	5% Lilliefors Critical Value					0.304	Detected Data Not Normal at 5% Significance Level					
1374	**Detected Data Not Normal at 5% Significance Level**											
1375												
1376	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1377	KM Mean					1.327	KM Standard Error of Mean					0.474
1378	KM SD					1.239	95% KM (BCA) UCL					2.144
1379	95% KM (t) UCL					2.207	95% KM (Percentile Bootstrap) UCL					2.108
1380	95% KM (z) UCL					2.105	95% KM Bootstrap t UCL					5.654
1381	90% KM Chebyshev UCL					2.747	95% KM Chebyshev UCL					3.391
1382	97.5% KM Chebyshev UCL					4.284	99% KM Chebyshev UCL					6.038
1383												
1384	**Gamma GOF Tests on Detected Observations Only**											
1385	A-D Test Statistic					0.783	**Anderson-Darling GOF Test**					
1386	5% A-D Critical Value					0.721	Detected Data Not Gamma Distributed at 5% Significance Level					
1387	K-S Test Statistic					0.268	**Kolmogorov-Smirnov GOF**					
1388	5% K-S Critical Value					0.317	Detected data appear Gamma Distributed at 5% Significance Level					
1389	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
1390												
1391	**Gamma Statistics on Detected Data Only**											
1392	k hat (MLE)					1.485	k star (bias corrected MLE)					0.944
1393	Theta hat (MLE)					0.969	Theta star (bias corrected MLE)					1.524
1394	nu hat (MLE)					20.79	nu star (bias corrected)					13.21
1395	Mean (detects)					1.439						
1396												
1397	**Gamma ROS Statistics using Imputed Non-Detects**											
1398	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1399	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1400	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1401	This is especially true when the sample size is small.											
1402	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1403	Minimum					0.44	Mean					1.291
1404	Maximum					3.5	Median					0.75

1405					SD	1.245			CV	0.964		
1406					k hat (MLE)	1.646			k star (bias corrected MLE)	1.171		
1407					Theta hat (MLE)	0.785			Theta star (bias corrected MLE)	1.103		
1408					nu hat (MLE)	29.62			nu star (bias corrected)	21.08		
1409					Adjusted Level of Significance (β)	0.0231						
1410					Approximate Chi Square Value (21.08, α)	11.65			Adjusted Chi Square Value (21.08, β)	10.21		
1411					95% Gamma Approximate UCL (use when n>=50)	2.337			95% Gamma Adjusted UCL (use when n<50)	2.668		
1412												
1413					**Estimates of Gamma Parameters using KM Estimates**							
1414					Mean (KM)	1.327			SD (KM)	1.239		
1415					Variance (KM)	1.535			SE of Mean (KM)	0.474		
1416					k hat (KM)	1.146			k star (KM)	0.838		
1417					nu hat (KM)	20.63			nu star (KM)	15.09		
1418					theta hat (KM)	1.157			theta star (KM)	1.582		
1419					80% gamma percentile (KM)	2.162			90% gamma percentile (KM)	3.189		
1420					95% gamma percentile (KM)	4.232			99% gamma percentile (KM)	6.684		
1421												
1422					**Gamma Kaplan-Meier (KM) Statistics**							
1423					Approximate Chi Square Value (15.09, α)	7.324			Adjusted Chi Square Value (15.09, β)	6.218		
1424					95% Gamma Approximate KM-UCL (use when n>=50)	2.733			95% Gamma Adjusted KM-UCL (use when n<50)	3.219		
1425												
1426					**Lognormal GOF Test on Detected Observations Only**							
1427					Shapiro Wilk Test Statistic	0.818			**Shapiro Wilk GOF Test**			
1428					5% Shapiro Wilk Critical Value	0.803			Detected Data appear Lognormal at 5% Significance Level			
1429					Lilliefors Test Statistic	0.21			**Lilliefors GOF Test**			
1430					5% Lilliefors Critical Value	0.304			Detected Data appear Lognormal at 5% Significance Level			
1431					**Detected Data appear Lognormal at 5% Significance Level**							
1432												
1433					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1434					Mean in Original Scale	1.283			Mean in Log Scale	-0.08		
1435					SD in Original Scale	1.244			SD in Log Scale	0.801		
1436					95% t UCL (assumes normality of ROS data)	2.054			95% Percentile Bootstrap UCL	1.95		
1437					95% BCA Bootstrap UCL	2.205			95% Bootstrap t UCL	4.907		
1438					95% H-UCL (Log ROS)	2.821						
1439												
1440					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1441					KM Mean (logged)	-0.0876			KM Geo Mean	0.916		
1442					KM SD (logged)	0.81			95% Critical H Value (KM-Log)	2.834		
1443					KM Standard Error of Mean (logged)	0.311			95% H-UCL (KM -Log)	2.865		
1444					KM SD (logged)	0.81			95% Critical H Value (KM-Log)	2.834		
1445					KM Standard Error of Mean (logged)	0.311						
1446												
1447					**DL/2 Statistics**							
1448					**DL/2 Normal**				**DL/2 Log-Transformed**			
1449					Mean in Original Scale	1.419			Mean in Log Scale	-0.0165		
1450					SD in Original Scale	1.293			SD in Log Scale	0.894		
1451					95% t UCL (Assumes normality)	2.221			95% H-Stat UCL	3.797		
1452					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1453												
1454					**Nonparametric Distribution Free UCL Statistics**							
1455					**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**							
1456												

1457	**Suggested UCL to Use**											
1458					95% KM Bootstrap t UCL	5.654		Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)				3.219
1459												
1460	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
1461	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
1462												
1463	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1464	Recommendations are based upon data size, data distribution, and skewness.											
1465	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1466	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1467												
1468	**Chromium (nfmw8)**											
1469												
1470	**General Statistics**											
1471					Total Number of Observations	8		Number of Distinct Observations				7
1472					Number of Detects	5		Number of Non-Detects				3
1473					Number of Distinct Detects	5		Number of Distinct Non-Detects				2
1474					Minimum Detect	2.1		Minimum Non-Detect				3.2
1475					Maximum Detect	4.1		Maximum Non-Detect				4.6
1476					Variance Detects	0.61		Percent Non-Detects				37.5%
1477					Mean Detects	2.8		SD Detects				0.781
1478					Median Detects	2.7		CV Detects				0.279
1479					Skewness Detects	1.511		Kurtosis Detects				2.611
1480					Mean of Logged Detects	1.002		SD of Logged Detects				0.257
1481												
1482	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1483	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1484	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1485	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1486												
1487	**Normal GOF Test on Detects Only**											
1488					Shapiro Wilk Test Statistic	0.862		**Shapiro Wilk GOF Test**				
1489					5% Shapiro Wilk Critical Value	0.762		Detected Data appear Normal at 5% Significance Level				
1490					Lilliefors Test Statistic	0.3		**Lilliefors GOF Test**				
1491					5% Lilliefors Critical Value	0.343		Detected Data appear Normal at 5% Significance Level				
1492	**Detected Data appear Normal at 5% Significance Level**											
1493												
1494	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1495					KM Mean	2.707		KM Standard Error of Mean				0.277
1496					KM SD	0.627		95% KM (BCA) UCL				3.167
1497					95% KM (t) UCL	3.231		95% KM (Percentile Bootstrap) UCL				3.154
1498					95% KM (z) UCL	3.162		95% KM Bootstrap t UCL				3.514
1499					90% KM Chebyshev UCL	3.537		95% KM Chebyshev UCL				3.913
1500					97.5% KM Chebyshev UCL	4.435		99% KM Chebyshev UCL				5.46
1501												
1502	**Gamma GOF Tests on Detected Observations Only**											
1503					A-D Test Statistic	0.373		**Anderson-Darling GOF Test**				
1504					5% A-D Critical Value	0.679		Detected data appear Gamma Distributed at 5% Significance Level				
1505					K-S Test Statistic	0.269		**Kolmogorov-Smirnov GOF**				
1506					5% K-S Critical Value	0.357		Detected data appear Gamma Distributed at 5% Significance Level				
1507	**Detected data appear Gamma Distributed at 5% Significance Level**											
1508												

1509	**Gamma Statistics on Detected Data Only**											
1510					k hat (MLE)	18.1			k star (bias corrected MLE)			7.373
1511					Theta hat (MLE)	0.155			Theta star (bias corrected MLE)			0.38
1512					nu hat (MLE)	181			nu star (bias corrected)			73.73
1513					Mean (detects)	2.8						
1514												
1515	**Gamma ROS Statistics using Imputed Non-Detects**											
1516	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1517	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1518	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1519	This is especially true when the sample size is small.											
1520	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1521					Minimum	2.1			Mean			2.71
1522					Maximum	4.1			Median			2.678
1523					SD	0.624			CV			0.23
1524					k hat (MLE)	25.02			k star (bias corrected MLE)			15.72
1525					Theta hat (MLE)	0.108			Theta star (bias corrected MLE)			0.172
1526					nu hat (MLE)	400.3			nu star (bias corrected)			251.5
1527					Adjusted Level of Significance (β)	0.0195						
1528					Approximate Chi Square Value (251.54, α)	215.8			Adjusted Chi Square Value (251.54, β)			207.4
1529					95% Gamma Approximate UCL (use when n>=50)	3.159			95% Gamma Adjusted UCL (use when n<50)			3.287
1530												
1531	**Estimates of Gamma Parameters using KM Estimates**											
1532					Mean (KM)	2.707			SD (KM)			0.627
1533					Variance (KM)	0.394			SE of Mean (KM)			0.277
1534					k hat (KM)	18.62			k star (KM)			11.72
1535					nu hat (KM)	298			nu star (KM)			187.6
1536					theta hat (KM)	0.145			theta star (KM)			0.231
1537					80% gamma percentile (KM)	3.34			90% gamma percentile (KM)			3.757
1538					95% gamma percentile (KM)	4.125			99% gamma percentile (KM)			4.877
1539												
1540	**Gamma Kaplan-Meier (KM) Statistics**											
1541					Approximate Chi Square Value (187.57, α)	156.9			Adjusted Chi Square Value (187.57, β)			149.8
1542					95% Gamma Approximate KM-UCL (use when n>=50)	3.237			95% Gamma Adjusted KM-UCL (use when n<50)			3.39
1543												
1544	**Lognormal GOF Test on Detected Observations Only**											
1545					Shapiro Wilk Test Statistic	0.916			**Shapiro Wilk GOF Test**			
1546					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Lognormal at 5% Significance Level			
1547					Lilliefors Test Statistic	0.257			**Lilliefors GOF Test**			
1548					5% Lilliefors Critical Value	0.343			Detected Data appear Lognormal at 5% Significance Level			
1549	**Detected Data appear Lognormal at 5% Significance Level**											
1550												
1551	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1552					Mean in Original Scale	2.705			Mean in Log Scale			0.975
1553					SD in Original Scale	0.621			SD in Log Scale			0.206
1554					95% t UCL (assumes normality of ROS data)	3.122			95% Percentile Bootstrap UCL			3.058
1555					95% BCA Bootstrap UCL	3.233			95% Bootstrap t UCL			3.366
1556					95% H-UCL (Log ROS)	3.153						
1557												
1558	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1559					KM Mean (logged)	0.973			KM Geo Mean			2.645
1560					KM SD (logged)	0.209			95% Critical H Value (KM-Log)			1.953

1561	KM Standard Error of Mean (logged)					0.0942	95% H-UCL (KM -Log)					3.155
1562	KM SD (logged)					0.209	95% Critical H Value (KM-Log)					1.953
1563	KM Standard Error of Mean (logged)					0.0942						
1564												
1565	**DL/2 Statistics**											
1566	**DL/2 Normal**						**DL/2 Log-Transformed**					
1567	Mean in Original Scale					2.438	Mean in Log Scale					0.848
1568	SD in Original Scale					0.803	SD in Log Scale					0.309
1569	95% t UCL (Assumes normality)					2.976	95% H-Stat UCL					3.118
1570	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1571												
1572	**Nonparametric Distribution Free UCL Statistics**											
1573	**Detected Data appear Normal Distributed at 5% Significance Level**											
1574												
1575	**Suggested UCL to Use**											
1576	95% KM (t) UCL					3.231						
1577												
1578	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1579	Recommendations are based upon data size, data distribution, and skewness.											
1580	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1581	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1582												
1583												
1584	**Chromium (nfmw9)**											
1585												
1586	**General Statistics**											
1587	Total Number of Observations					8	Number of Distinct Observations					8
1588							Number of Missing Observations					0
1589	Minimum					7.1	Mean					9.413
1590	Maximum					13.5	Median					9
1591	SD					2.058	Std. Error of Mean					0.728
1592	Coefficient of Variation					0.219	Skewness					1.101
1593												
1594	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1595	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1596	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1597	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1598												
1599	**Normal GOF Test**											
1600	Shapiro Wilk Test Statistic					0.913	**Shapiro Wilk GOF Test**					
1601	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					
1602	Lilliefors Test Statistic					0.174	**Lilliefors GOF Test**					
1603	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
1604	**Data appear Normal at 5% Significance Level**											
1605												
1606	**Assuming Normal Distribution**											
1607	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1608	95% Student's-t UCL					10.79	95% Adjusted-CLT UCL (Chen-1995)					10.91
1609							95% Modified-t UCL (Johnson-1978)					10.84
1610												
1611	**Gamma GOF Test**											
1612	A-D Test Statistic					0.284	**Anderson-Darling Gamma GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
1613				5% A-D Critical Value		0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1614				K-S Test Statistic		0.172	**Kolmogorov-Smirnov Gamma GOF Test**					
1615				5% K-S Critical Value		0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1616	**Detected data appear Gamma Distributed at 5% Significance Level**											
1617												
1618	**Gamma Statistics**											
1619				k hat (MLE)		25.9	k star (bias corrected MLE)					16.27
1620				Theta hat (MLE)		0.363	Theta star (bias corrected MLE)					0.578
1621				nu hat (MLE)		414.4	nu star (bias corrected)					260.4
1622				MLE Mean (bias corrected)		9.413	MLE Sd (bias corrected)					2.333
1623							Approximate Chi Square Value (0.05)					224
1624				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					215.4
1625												
1626	**Assuming Gamma Distribution**											
1627			95% Approximate Gamma UCL (use when n>=50))			10.94	95% Adjusted Gamma UCL (use when n<50)					11.38
1628												
1629	**Lognormal GOF Test**											
1630				Shapiro Wilk Test Statistic		0.952	**Shapiro Wilk Lognormal GOF Test**					
1631				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
1632				Lilliefors Test Statistic		0.155	**Lilliefors Lognormal GOF Test**					
1633				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
1634	**Data appear Lognormal at 5% Significance Level**											
1635												
1636	**Lognormal Statistics**											
1637				Minimum of Logged Data		1.96	Mean of logged Data					2.223
1638				Maximum of Logged Data		2.603	SD of logged Data					0.207
1639												
1640	**Assuming Lognormal Distribution**											
1641				95% H-UCL		10.99	90% Chebyshev (MVUE) UCL					11.48
1642				95% Chebyshev (MVUE) UCL		12.42	97.5% Chebyshev (MVUE) UCL					13.72
1643				99% Chebyshev (MVUE) UCL		16.28						
1644												
1645	**Nonparametric Distribution Free UCL Statistics**											
1646	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1647												
1648	**Nonparametric Distribution Free UCLs**											
1649				95% CLT UCL		10.61	95% Jackknife UCL					10.79
1650				95% Standard Bootstrap UCL		10.55	95% Bootstrap-t UCL					11.37
1651				95% Hall's Bootstrap UCL		11.46	95% Percentile Bootstrap UCL					10.6
1652				95% BCA Bootstrap UCL		10.79						
1653				90% Chebyshev(Mean, Sd) UCL		11.6	95% Chebyshev(Mean, Sd) UCL					12.58
1654				97.5% Chebyshev(Mean, Sd) UCL		13.96	99% Chebyshev(Mean, Sd) UCL					16.65
1655												
1656	**Suggested UCL to Use**											
1657				95% Student's-t UCL		10.79						
1658												
1659	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1660	Recommendations are based upon data size, data distribution, and skewness.											
1661	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1662	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1663												
1664	**Chromium (smw10)**											

1665												
1666	**General Statistics**											
1667					Total Number of Observations	8			Number of Distinct Observations	8		
1668					Number of Detects	6			Number of Non-Detects	2		
1669					Number of Distinct Detects	6			Number of Distinct Non-Detects	2		
1670					Minimum Detect	1.3			Minimum Non-Detect	3.2		
1671					Maximum Detect	2.3			Maximum Non-Detect	4.6		
1672					Variance Detects	0.142			Percent Non-Detects	25%		
1673					Mean Detects	1.717			SD Detects	0.376		
1674					Median Detects	1.65			CV Detects	0.219		
1675					Skewness Detects	0.65			Kurtosis Detects	-0.578		
1676					Mean of Logged Detects	0.521			SD of Logged Detects	0.215		
1677												
1678	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1679	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1680	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1681	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1682												
1683	**Normal GOF Test on Detects Only**											
1684					Shapiro Wilk Test Statistic	0.95			**Shapiro Wilk GOF Test**			
1685					5% Shapiro Wilk Critical Value	0.788			Detected Data appear Normal at 5% Significance Level			
1686					Lilliefors Test Statistic	0.184			**Lilliefors GOF Test**			
1687					5% Lilliefors Critical Value	0.325			Detected Data appear Normal at 5% Significance Level			
1688	**Detected Data appear Normal at 5% Significance Level**											
1689												
1690	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1691					KM Mean	1.717			KM Standard Error of Mean	0.154		
1692					KM SD	0.344			95% KM (BCA) UCL	1.943		
1693					95% KM (t) UCL	2.008			95% KM (Percentile Bootstrap) UCL	1.963		
1694					95% KM (z) UCL	1.969			95% KM Bootstrap t UCL	2.181		
1695					90% KM Chebyshev UCL	2.178			95% KM Chebyshev UCL	2.386		
1696					97.5% KM Chebyshev UCL	2.676			99% KM Chebyshev UCL	3.246		
1697												
1698	**Gamma GOF Tests on Detected Observations Only**											
1699					A-D Test Statistic	0.216			**Anderson-Darling GOF Test**			
1700					5% A-D Critical Value	0.697			Detected data appear Gamma Distributed at 5% Significance Level			
1701					K-S Test Statistic	0.16			**Kolmogorov-Smirnov GOF**			
1702					5% K-S Critical Value	0.332			Detected data appear Gamma Distributed at 5% Significance Level			
1703	**Detected data appear Gamma Distributed at 5% Significance Level**											
1704												
1705	**Gamma Statistics on Detected Data Only**											
1706					k hat (MLE)	25.85			k star (bias corrected MLE)	13.04		
1707					Theta hat (MLE)	0.0664			Theta star (bias corrected MLE)	0.132		
1708					nu hat (MLE)	310.3			nu star (bias corrected)	156.5		
1709					Mean (detects)	1.717						
1710												
1711	**Gamma ROS Statistics using Imputed Non-Detects**											
1712	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1713	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1714	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1715	This is especially true when the sample size is small.											
1716	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											

	A	B	C	D	E	F	G	H	I	J	K	L
1717					Minimum	1.3					Mean	1.713
1718					Maximum	2.3					Median	1.7
1719					SD	0.318					CV	0.186
1720					k hat (MLE)	34.4					k star (bias corrected MLE)	21.58
1721					Theta hat (MLE)	0.0498					Theta star (bias corrected MLE)	0.0794
1722					nu hat (MLE)	550.4					nu star (bias corrected)	345.3
1723					Adjusted Level of Significance (β)	0.0195						
1724					Approximate Chi Square Value (345.32, α)	303.3					Adjusted Chi Square Value (345.32, β)	293.3
1725					95% Gamma Approximate UCL (use when n>=50)	1.95					95% Gamma Adjusted UCL (use when n<50)	2.017
1726												
1727					**Estimates of Gamma Parameters using KM Estimates**							
1728					Mean (KM)	1.717					SD (KM)	0.344
1729					Variance (KM)	0.118					SE of Mean (KM)	0.154
1730					k hat (KM)	24.96					k star (KM)	15.68
1731					nu hat (KM)	399.4					nu star (KM)	251
1732					theta hat (KM)	0.0688					theta star (KM)	0.109
1733					80% gamma percentile (KM)	2.067					90% gamma percentile (KM)	2.29
1734					95% gamma percentile (KM)	2.486					99% gamma percentile (KM)	2.882
1735												
1736					**Gamma Kaplan-Meier (KM) Statistics**							
1737					Approximate Chi Square Value (250.96, α)	215.3					Adjusted Chi Square Value (250.96, β)	206.9
1738					95% Gamma Approximate KM-UCL (use when n>=50)	2.001					95% Gamma Adjusted KM-UCL (use when n<50)	2.082
1739												
1740					**Lognormal GOF Test on Detected Observations Only**							
1741					Shapiro Wilk Test Statistic	0.968					**Shapiro Wilk GOF Test**	
1742					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Lognormal at 5% Significance Level	
1743					Lilliefors Test Statistic	0.149					**Lilliefors GOF Test**	
1744					5% Lilliefors Critical Value	0.325					Detected Data appear Lognormal at 5% Significance Level	
1745					**Detected Data appear Lognormal at 5% Significance Level**							
1746												
1747					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1748					Mean in Original Scale	1.708					Mean in Log Scale	0.521
1749					SD in Original Scale	0.318					SD in Log Scale	0.181
1750					95% t UCL (assumes normality of ROS data)	1.922					95% Percentile Bootstrap UCL	1.885
1751					95% BCA Bootstrap UCL	1.9					95% Bootstrap t UCL	2.006
1752					95% H-UCL (Log ROS)	1.953						
1753												
1754					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1755					KM Mean (logged)	0.521					KM Geo Mean	1.684
1756					KM SD (logged)	0.196					95% Critical H Value (KM-Log)	1.939
1757					KM Standard Error of Mean (logged)	0.0877					95% H-UCL (KM -Log)	1.981
1758					KM SD (logged)	0.196					95% Critical H Value (KM-Log)	1.939
1759					KM Standard Error of Mean (logged)	0.0877						
1760												
1761					**DL/2 Statistics**							
1762					**DL/2 Normal**						**DL/2 Log-Transformed**	
1763					Mean in Original Scale	1.775					Mean in Log Scale	0.554
1764					SD in Original Scale	0.385					SD in Log Scale	0.214
1765					95% t UCL (Assumes normality)	2.033					95% H-Stat UCL	2.086
1766					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1767												
1768					**Nonparametric Distribution Free UCL Statistics**							

	A	B	C	D	E	F	G	H	I	J	K	L
1769	**Detected Data appear Normal Distributed at 5% Significance Level**											
1770												
1771	**Suggested UCL to Use**											
1772	95% KM (t) UCL	2.008										
1773												
1774	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1775	Recommendations are based upon data size, data distribution, and skewness.											
1776	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1777	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1778												
1779	**Chromium (smw11)**											
1780												
1781	**General Statistics**											
1782	Total Number of Observations	9				Number of Distinct Observations	7					
1783	Number of Detects	8				Number of Non-Detects	1					
1784	Number of Distinct Detects	6				Number of Distinct Non-Detects	1					
1785	Minimum Detect	0.87				Minimum Non-Detect	4.6					
1786	Maximum Detect	4.3				Maximum Non-Detect	4.6					
1787	Variance Detects	1.767				Percent Non-Detects	11.11%					
1788	Mean Detects	3.434				SD Detects	1.329					
1789	Median Detects	4.1				CV Detects	0.387					
1790	Skewness Detects	-1.523				Kurtosis Detects	0.836					
1791	Mean of Logged Detects	1.12				SD of Logged Detects	0.587					
1792												
1793	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1794	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1795	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1796	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1797												
1798	**Normal GOF Test on Detects Only**											
1799	Shapiro Wilk Test Statistic	0.702				**Shapiro Wilk GOF Test**						
1800	5% Shapiro Wilk Critical Value	0.818				Detected Data Not Normal at 5% Significance Level						
1801	Lilliefors Test Statistic	0.359				**Lilliefors GOF Test**						
1802	5% Lilliefors Critical Value	0.283				Detected Data Not Normal at 5% Significance Level						
1803	**Detected Data Not Normal at 5% Significance Level**											
1804												
1805	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1806	KM Mean	3.434				KM Standard Error of Mean	0.47					
1807	KM SD	1.244				95% KM (BCA) UCL	4.122					
1808	95% KM (t) UCL	4.308				95% KM (Percentile Bootstrap) UCL	4.113					
1809	95% KM (z) UCL	4.207				95% KM Bootstrap t UCL	4.091					
1810	90% KM Chebyshev UCL	4.844				95% KM Chebyshev UCL	5.483					
1811	97.5% KM Chebyshev UCL	6.369				99% KM Chebyshev UCL	8.11					
1812												
1813	**Gamma GOF Tests on Detected Observations Only**											
1814	A-D Test Statistic	1.346				**Anderson-Darling GOF Test**						
1815	5% A-D Critical Value	0.719				Detected Data Not Gamma Distributed at 5% Significance Level						
1816	K-S Test Statistic	0.396				**Kolmogorov-Smirnov GOF**						
1817	5% K-S Critical Value	0.295				Detected Data Not Gamma Distributed at 5% Significance Level						
1818	**Detected Data Not Gamma Distributed at 5% Significance Level**											
1819												
1820	**Gamma Statistics on Detected Data Only**											

1821					k hat (MLE)	4.546				k star (bias corrected MLE)		2.925
1822					Theta hat (MLE)	0.755				Theta star (bias corrected MLE)		1.174
1823					nu hat (MLE)	72.74				nu star (bias corrected)		46.79
1824					Mean (detects)	3.434						
1825												
1826	**Gamma ROS Statistics using Imputed Non-Detects**											
1827	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1828	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1829	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1830	This is especially true when the sample size is small.											
1831	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1832					Minimum	0.87				Mean		3.421
1833					Maximum	4.3				Median		4
1834					SD	1.244				CV		0.364
1835					k hat (MLE)	5.092				k star (bias corrected MLE)		3.469
1836					Theta hat (MLE)	0.672				Theta star (bias corrected MLE)		0.986
1837					nu hat (MLE)	91.66				nu star (bias corrected)		62.44
1838					Adjusted Level of Significance (β)	0.0231						
1839					Approximate Chi Square Value (62.44, α)	45.26				Adjusted Chi Square Value (62.44, β)		42.2
1840					95% Gamma Approximate UCL (use when n>=50)	4.719				95% Gamma Adjusted UCL (use when n<50)		5.062
1841												
1842	**Estimates of Gamma Parameters using KM Estimates**											
1843					Mean (KM)	3.434				SD (KM)		1.244
1844					Variance (KM)	1.546				SE of Mean (KM)		0.47
1845					k hat (KM)	7.624				k star (KM)		5.157
1846					nu hat (KM)	137.2				nu star (KM)		92.82
1847					theta hat (KM)	0.45				theta star (KM)		0.666
1848					80% gamma percentile (KM)	4.6				90% gamma percentile (KM)		5.458
1849					95% gamma percentile (KM)	6.239				99% gamma percentile (KM)		7.886
1850												
1851	**Gamma Kaplan-Meier (KM) Statistics**											
1852					Approximate Chi Square Value (92.82, α)	71.61				Adjusted Chi Square Value (92.82, β)		67.69
1853					95% Gamma Approximate KM-UCL (use when n>=50)	4.451				95% Gamma Adjusted KM-UCL (use when n<50)		4.709
1854												
1855	**Lognormal GOF Test on Detected Observations Only**											
1856					Shapiro Wilk Test Statistic	0.661				**Shapiro Wilk GOF Test**		
1857					5% Shapiro Wilk Critical Value	0.818				Detected Data Not Lognormal at 5% Significance Level		
1858					Lilliefors Test Statistic	0.393				**Lilliefors GOF Test**		
1859					5% Lilliefors Critical Value	0.283				Detected Data Not Lognormal at 5% Significance Level		
1860	**Detected Data Not Lognormal at 5% Significance Level**											
1861												
1862	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1863					Mean in Original Scale	3.393				Mean in Log Scale		1.12
1864					SD in Original Scale	1.25				SD in Log Scale		0.549
1865					95% t UCL (assumes normality of ROS data)	4.167				95% Percentile Bootstrap UCL		4
1866					95% BCA Bootstrap UCL	3.911				95% Bootstrap t UCL		3.978
1867					95% H-UCL (Log ROS)	5.587						
1868												
1869	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1870					KM Mean (logged)	1.12				KM Geo Mean		3.064
1871					KM SD (logged)	0.549				95% Critical H Value (KM-Log)		2.317
1872					KM Standard Error of Mean (logged)	0.208				95% H-UCL (KM -Log)		5.587

1873					KM SD (logged)	0.549				95% Critical H Value (KM-Log)		2.317
1874					KM Standard Error of Mean (logged)	0.208						
1875												
1876	**DL/2 Statistics**											
1877	**DL/2 Normal**						**DL/2 Log-Transformed**					
1878					Mean in Original Scale	3.308				Mean in Log Scale		1.088
1879					SD in Original Scale	1.3				SD in Log Scale		0.558
1880					95% t UCL (Assumes normality)	4.113				95% H-Stat UCL		5.493
1881	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1882												
1883	**Nonparametric Distribution Free UCL Statistics**											
1884	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1885												
1886	**Suggested UCL to Use**											
1887					95% KM (Chebyshev) UCL	5.483						
1888	**Warning: Recommended UCL exceeds the maximum observation**											
1889												
1890	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1891	Recommendations are based upon data size, data distribution, and skewness.											
1892	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1893	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1894												
1895												
1896	**Chromium (smw12)**											
1897												
1898	**General Statistics**											
1899					Total Number of Observations	8				Number of Distinct Observations		8
1900										Number of Missing Observations		0
1901					Minimum	2				Mean		4.2
1902					Maximum	7.3				Median		3.65
1903					SD	1.754				Std. Error of Mean		0.62
1904					Coefficient of Variation	0.418				Skewness		0.8
1905												
1906	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1907	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1908	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1909	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1910												
1911	**Normal GOF Test**											
1912					Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk GOF Test**					
1913					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1914					Lilliefors Test Statistic	0.193	**Lilliefors GOF Test**					
1915					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1916	**Data appear Normal at 5% Significance Level**											
1917												
1918	**Assuming Normal Distribution**											
1919	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1920					95% Student's-t UCL	5.375				95% Adjusted-CLT UCL (Chen-1995)		5.407
1921										95% Modified-t UCL (Johnson-1978)		5.404
1922												
1923	**Gamma GOF Test**											
1924					A-D Test Statistic	0.211	**Anderson-Darling Gamma GOF Test**					

1925				5% A-D Critical Value		0.718	Detected data appear Gamma Distributed at 5% Significance Level					
1926				K-S Test Statistic		0.157	**Kolmogorov-Smirnov Gamma GOF Test**					
1927				5% K-S Critical Value		0.295	Detected data appear Gamma Distributed at 5% Significance Level					
1928	**Detected data appear Gamma Distributed at 5% Significance Level**											
1929												
1930	**Gamma Statistics**											
1931				k hat (MLE)		6.824	k star (bias corrected MLE)					4.349
1932				Theta hat (MLE)		0.615	Theta star (bias corrected MLE)					0.966
1933				nu hat (MLE)		109.2	nu star (bias corrected)					69.58
1934				MLE Mean (bias corrected)		4.2	MLE Sd (bias corrected)					2.014
1935							Approximate Chi Square Value (0.05)					51.38
1936				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					47.44
1937												
1938	**Assuming Gamma Distribution**											
1939			95% Approximate Gamma UCL (use when n>=50))			5.688	95% Adjusted Gamma UCL (use when n<50)					6.16
1940												
1941	**Lognormal GOF Test**											
1942				Shapiro Wilk Test Statistic		0.98	**Shapiro Wilk Lognormal GOF Test**					
1943				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
1944				Lilliefors Test Statistic		0.129	**Lilliefors Lognormal GOF Test**					
1945				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
1946	**Data appear Lognormal at 5% Significance Level**											
1947												
1948	**Lognormal Statistics**											
1949				Minimum of Logged Data		0.693	Mean of logged Data					1.36
1950				Maximum of Logged Data		1.988	SD of logged Data					0.415
1951												
1952	**Assuming Lognormal Distribution**											
1953				95% H-UCL		6.018	90% Chebyshev (MVUE) UCL					6.064
1954				95% Chebyshev (MVUE) UCL		6.908	97.5% Chebyshev (MVUE) UCL					8.08
1955				99% Chebyshev (MVUE) UCL		10.38						
1956												
1957	**Nonparametric Distribution Free UCL Statistics**											
1958	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1959												
1960	**Nonparametric Distribution Free UCLs**											
1961				95% CLT UCL		5.22	95% Jackknife UCL					5.375
1962				95% Standard Bootstrap UCL		5.137	95% Bootstrap-t UCL					5.895
1963				95% Hall's Bootstrap UCL		6.94	95% Percentile Bootstrap UCL					5.15
1964				95% BCA Bootstrap UCL		5.325						
1965				90% Chebyshev(Mean, Sd) UCL		6.061	95% Chebyshev(Mean, Sd) UCL					6.903
1966				97.5% Chebyshev(Mean, Sd) UCL		8.073	99% Chebyshev(Mean, Sd) UCL					10.37
1967												
1968	**Suggested UCL to Use**											
1969				95% Student's-t UCL		5.375						
1970												
1971	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1972	Recommendations are based upon data size, data distribution, and skewness.											
1973	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1974	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1975												
1976	**Chromium (smw13)**											

1977												
1978	**General Statistics**											
1979					Total Number of Observations	8			Number of Distinct Observations	8		
1980					Number of Detects	5			Number of Non-Detects	3		
1981					Number of Distinct Detects	5			Number of Distinct Non-Detects	3		
1982					Minimum Detect	0.27			Minimum Non-Detect	0.8		
1983					Maximum Detect	2.7			Maximum Non-Detect	4.6		
1984					Variance Detects	0.909			Percent Non-Detects	37.5%		
1985					Mean Detects	1.136			SD Detects	0.953		
1986					Median Detects	0.85			CV Detects	0.839		
1987					Skewness Detects	1.426			Kurtosis Detects	2.077		
1988					Mean of Logged Detects	-0.159			SD of Logged Detects	0.867		
1989												
1990	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1991	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1992	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1993	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1994												
1995	**Normal GOF Test on Detects Only**											
1996					Shapiro Wilk Test Statistic	0.885			**Shapiro Wilk GOF Test**			
1997					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
1998					Lilliefors Test Statistic	0.232			**Lilliefors GOF Test**			
1999					5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			
2000	**Detected Data appear Normal at 5% Significance Level**											
2001												
2002	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2003					KM Mean	1.016			KM Standard Error of Mean	0.378		
2004					KM SD	0.826			95% KM (BCA) UCL	1.583		
2005					95% KM (t) UCL	1.733			95% KM (Percentile Bootstrap) UCL	1.689		
2006					95% KM (z) UCL	1.638			95% KM Bootstrap t UCL	2.469		
2007					90% KM Chebyshev UCL	2.151			95% KM Chebyshev UCL	2.665		
2008					97.5% KM Chebyshev UCL	3.379			99% KM Chebyshev UCL	4.78		
2009												
2010	**Gamma GOF Tests on Detected Observations Only**											
2011					A-D Test Statistic	0.187			**Anderson-Darling GOF Test**			
2012					5% A-D Critical Value	0.685			Detected data appear Gamma Distributed at 5% Significance Level			
2013					K-S Test Statistic	0.152			**Kolmogorov-Smirnov GOF**			
2014					5% K-S Critical Value	0.361			Detected data appear Gamma Distributed at 5% Significance Level			
2015	**Detected data appear Gamma Distributed at 5% Significance Level**											
2016												
2017	**Gamma Statistics on Detected Data Only**											
2018					k hat (MLE)	1.894			k star (bias corrected MLE)	0.891		
2019					Theta hat (MLE)	0.6			Theta star (bias corrected MLE)	1.275		
2020					nu hat (MLE)	18.94			nu star (bias corrected)	8.907		
2021					Mean (detects)	1.136						
2022												
2023	**Gamma ROS Statistics using Imputed Non-Detects**											
2024	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2025	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2026	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2027	This is especially true when the sample size is small.											
2028	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											

	A	B	C	D	E	F	G	H	I	J	K	L
2029					Minimum	0.27					Mean	0.951
2030					Maximum	2.7					Median	0.827
2031					SD	0.784					CV	0.825
2032					k hat (MLE)	2.078					k star (bias corrected MLE)	1.382
2033					Theta hat (MLE)	0.458					Theta star (bias corrected MLE)	0.688
2034					nu hat (MLE)	33.24					nu star (bias corrected)	22.11
2035					Adjusted Level of Significance (β)	0.0195						
2036					Approximate Chi Square Value (22.11, α)	12.42					Adjusted Chi Square Value (22.11, β)	10.63
2037					95% Gamma Approximate UCL (use when n>=50)	1.692					95% Gamma Adjusted UCL (use when n<50)	1.977
2038												
2039					**Estimates of Gamma Parameters using KM Estimates**							
2040					Mean (KM)	1.016					SD (KM)	0.826
2041					Variance (KM)	0.682					SE of Mean (KM)	0.378
2042					k hat (KM)	1.514					k star (KM)	1.029
2043					nu hat (KM)	24.22					nu star (KM)	16.47
2044					theta hat (KM)	0.671					theta star (KM)	0.987
2045					80% gamma percentile (KM)	1.631					90% gamma percentile (KM)	2.322
2046					95% gamma percentile (KM)	3.012					99% gamma percentile (KM)	4.611
2047												
2048					**Gamma Kaplan-Meier (KM) Statistics**							
2049					Approximate Chi Square Value (16.47, α)	8.294					Adjusted Chi Square Value (16.47, β)	6.879
2050					95% Gamma Approximate KM-UCL (use when n>=50)	2.017					95% Gamma Adjusted KM-UCL (use when n<50)	2.432
2051												
2052					**Lognormal GOF Test on Detected Observations Only**							
2053					Shapiro Wilk Test Statistic	1					**Shapiro Wilk GOF Test**	
2054					5% Shapiro Wilk Critical Value	0.762					Detected Data appear Lognormal at 5% Significance Level	
2055					Lilliefors Test Statistic	0.114					**Lilliefors GOF Test**	
2056					5% Lilliefors Critical Value	0.343					Detected Data appear Lognormal at 5% Significance Level	
2057					**Detected Data appear Lognormal at 5% Significance Level**							
2058												
2059					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2060					Mean in Original Scale	0.94					Mean in Log Scale	-0.3
2061					SD in Original Scale	0.778					SD in Log Scale	0.715
2062					95% t UCL (assumes normality of ROS data)	1.461					95% Percentile Bootstrap UCL	1.393
2063					95% BCA Bootstrap UCL	1.571					95% Bootstrap t UCL	2.242
2064					95% H-UCL (Log ROS)	2.019						
2065												
2066					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2067					KM Mean (logged)	-0.29					KM Geo Mean	0.748
2068					KM SD (logged)	0.78					95% Critical H Value (KM-Log)	2.908
2069					KM Standard Error of Mean (logged)	0.366					95% H-UCL (KM -Log)	2.391
2070					KM SD (logged)	0.78					95% Critical H Value (KM-Log)	2.908
2071					KM Standard Error of Mean (logged)	0.366						
2072												
2073					**DL/2 Statistics**							
2074					**DL/2 Normal**						**DL/2 Log-Transformed**	
2075					Mean in Original Scale	1.248					Mean in Log Scale	-0.0512
2076					SD in Original Scale	0.898					SD in Log Scale	0.834
2077					95% t UCL (Assumes normality)	1.849					95% H-Stat UCL	3.493
2078					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2079												
2080					**Nonparametric Distribution Free UCL Statistics**							

	A	B	C	D	E	F	G	H	I	J	K	L
2081	**Detected Data appear Normal Distributed at 5% Significance Level**											
2082												
2083	**Suggested UCL to Use**											
2084	95% KM (t) UCL	1.733										
2085												
2086	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2087	Recommendations are based upon data size, data distribution, and skewness.											
2088	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2089	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2090												
2091	**Chromium (smw14)**											
2092												
2093	**General Statistics**											
2094	Total Number of Observations	8				Number of Distinct Observations	8					
2095	Number of Detects	4				Number of Non-Detects	4					
2096	Number of Distinct Detects	4				Number of Distinct Non-Detects	4					
2097	Minimum Detect	0.27				Minimum Non-Detect	0.8					
2098	Maximum Detect	1.4				Maximum Non-Detect	4.6					
2099	Variance Detects	0.262				Percent Non-Detects	50%					
2100	Mean Detects	0.888				SD Detects	0.511					
2101	Median Detects	0.94				CV Detects	0.576					
2102	Skewness Detects	-0.395				Kurtosis Detects	-2.499					
2103	Mean of Logged Detects	-0.294				SD of Logged Detects	0.745					
2104												
2105	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2106	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2107	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2108	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2109												
2110	**Normal GOF Test on Detects Only**											
2111	Shapiro Wilk Test Statistic	0.951				**Shapiro Wilk GOF Test**						
2112	5% Shapiro Wilk Critical Value	0.748				Detected Data appear Normal at 5% Significance Level						
2113	Lilliefors Test Statistic	0.229				**Lilliefors GOF Test**						
2114	5% Lilliefors Critical Value	0.375				Detected Data appear Normal at 5% Significance Level						
2115	**Detected Data appear Normal at 5% Significance Level**											
2116												
2117	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2118	KM Mean	0.75				KM Standard Error of Mean	0.216					
2119	KM SD	0.427				95% KM (BCA) UCL	N/A					
2120	95% KM (t) UCL	1.16				95% KM (Percentile Bootstrap) UCL	N/A					
2121	95% KM (z) UCL	1.106				95% KM Bootstrap t UCL	N/A					
2122	90% KM Chebyshev UCL	1.399				95% KM Chebyshev UCL	1.693					
2123	97.5% KM Chebyshev UCL	2.101				99% KM Chebyshev UCL	2.903					
2124												
2125	**Gamma GOF Tests on Detected Observations Only**											
2126	A-D Test Statistic	0.317				**Anderson-Darling GOF Test**						
2127	5% A-D Critical Value	0.659				Detected data appear Gamma Distributed at 5% Significance Level						
2128	K-S Test Statistic	0.27				**Kolmogorov-Smirnov GOF**						
2129	5% K-S Critical Value	0.397				Detected data appear Gamma Distributed at 5% Significance Level						
2130	**Detected data appear Gamma Distributed at 5% Significance Level**											
2131												
2132	**Gamma Statistics on Detected Data Only**											

2133					k hat (MLE)	3.018				k star (bias corrected MLE)		0.921
2134					Theta hat (MLE)	0.294				Theta star (bias corrected MLE)		0.963
2135					nu hat (MLE)	24.15				nu star (bias corrected)		7.37
2136					Mean (detects)	0.888						
2137												
2138	**Gamma ROS Statistics using Imputed Non-Detects**											
2139	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2140	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2141	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2142	This is especially true when the sample size is small.											
2143	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2144					Minimum	0.27				Mean		0.732
2145					Maximum	1.4				Median		0.678
2146					SD	0.381				CV		0.521
2147					k hat (MLE)	4.396				k star (bias corrected MLE)		2.831
2148					Theta hat (MLE)	0.167				Theta star (bias corrected MLE)		0.259
2149					nu hat (MLE)	70.33				nu star (bias corrected)		45.29
2150					Adjusted Level of Significance (β)	0.0195						
2151					Approximate Chi Square Value (45.29, α)	30.85				Adjusted Chi Square Value (45.29, β)		27.87
2152					95% Gamma Approximate UCL (use when n>=50)	1.075				95% Gamma Adjusted UCL (use when n<50)		N/A
2153												
2154	**Estimates of Gamma Parameters using KM Estimates**											
2155					Mean (KM)	0.75				SD (KM)		0.427
2156					Variance (KM)	0.183				SE of Mean (KM)		0.216
2157					k hat (KM)	3.081				k star (KM)		2.009
2158					nu hat (KM)	49.29				nu star (KM)		32.14
2159					theta hat (KM)	0.243				theta star (KM)		0.373
2160					80% gamma percentile (KM)	1.122				90% gamma percentile (KM)		1.457
2161					95% gamma percentile (KM)	1.777				99% gamma percentile (KM)		2.485
2162												
2163	**Gamma Kaplan-Meier (KM) Statistics**											
2164					Approximate Chi Square Value (32.14, α)	20.18				Adjusted Chi Square Value (32.14, β)		17.83
2165					95% Gamma Approximate KM-UCL (use when n>=50)	1.194				95% Gamma Adjusted KM-UCL (use when n<50)		1.352
2166												
2167	**Lognormal GOF Test on Detected Observations Only**											
2168					Shapiro Wilk Test Statistic	0.904				**Shapiro Wilk GOF Test**		
2169					5% Shapiro Wilk Critical Value	0.748				Detected Data appear Lognormal at 5% Significance Level		
2170					Lilliefors Test Statistic	0.239				**Lilliefors GOF Test**		
2171					5% Lilliefors Critical Value	0.375				Detected Data appear Lognormal at 5% Significance Level		
2172	**Detected Data appear Lognormal at 5% Significance Level**											
2173												
2174	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2175					Mean in Original Scale	0.7				Mean in Log Scale		-0.49
2176					SD in Original Scale	0.396				SD in Log Scale		0.546
2177					95% t UCL (assumes normality of ROS data)	0.965				95% Percentile Bootstrap UCL		0.934
2178					95% BCA Bootstrap UCL	0.958				95% Bootstrap t UCL		1.267
2179					95% H-UCL (Log ROS)	1.177						
2180												
2181	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2182					KM Mean (logged)	-0.479				KM Geo Mean		0.62
2183					KM SD (logged)	0.645				95% Critical H Value (KM-Log)		2.623
2184					KM Standard Error of Mean (logged)	0.352				95% H-UCL (KM -Log)		1.447

2185					KM SD (logged)	0.645				95% Critical H Value (KM-Log)		2.623
2186					KM Standard Error of Mean (logged)	0.352						
2187												
2188	**DL/2 Statistics**											
2189	**DL/2 Normal**						**DL/2 Log-Transformed**					
2190					Mean in Original Scale	1.05				Mean in Log Scale		-0.173
2191					SD in Original Scale	0.7				SD in Log Scale		0.745
2192					95% t UCL (Assumes normality)	1.519				95% H-Stat UCL		2.46
2193	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2194												
2195	**Nonparametric Distribution Free UCL Statistics**											
2196	**Detected Data appear Normal Distributed at 5% Significance Level**											
2197												
2198	**Suggested UCL to Use**											
2199					95% KM (t) UCL	1.16						
2200												
2201	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2202	Recommendations are based upon data size, data distribution, and skewness.											
2203	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2204	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2205												
2206	**Chromium (smw15)**											
2207												
2208	**General Statistics**											
2209					Total Number of Observations	9				Number of Distinct Observations		8
2210					Number of Detects	7				Number of Non-Detects		2
2211					Number of Distinct Detects	6				Number of Distinct Non-Detects		2
2212					Minimum Detect	0.3				Minimum Non-Detect		0.8
2213					Maximum Detect	5.3				Maximum Non-Detect		4.6
2214					Variance Detects	4.853				Percent Non-Detects		22.22%
2215					Mean Detects	1.86				SD Detects		2.203
2216					Median Detects	0.48				CV Detects		1.184
2217					Skewness Detects	1.18				Kurtosis Detects		-0.803
2218					Mean of Logged Detects	-0.00419				SD of Logged Detects		1.183
2219												
2220	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2221	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2222	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2223	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2224												
2225	**Normal GOF Test on Detects Only**											
2226					Shapiro Wilk Test Statistic	0.705	**Shapiro Wilk GOF Test**					
2227					5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level					
2228					Lilliefors Test Statistic	0.332	**Lilliefors GOF Test**					
2229					5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level					
2230	**Detected Data Not Normal at 5% Significance Level**											
2231												
2232	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2233					KM Mean	1.556				KM Standard Error of Mean		0.681
2234					KM SD	1.889				95% KM (BCA) UCL		2.533
2235					95% KM (t) UCL	2.823				95% KM (Percentile Bootstrap) UCL		2.607
2236					95% KM (z) UCL	2.677				95% KM Bootstrap t UCL		7.559

	A	B	C	D	E	F	G	H	I	J	K	L
2237					90% KM Chebyshev UCL	3.6					95% KM Chebyshev UCL	4.526
2238					97.5% KM Chebyshev UCL	5.811					99% KM Chebyshev UCL	8.336
2239												
2240	**Gamma GOF Tests on Detected Observations Only**											
2241					A-D Test Statistic	0.833	**Anderson-Darling GOF Test**					
2242					5% A-D Critical Value	0.73	Detected Data Not Gamma Distributed at 5% Significance Level					
2243					K-S Test Statistic	0.328	**Kolmogorov-Smirnov GOF**					
2244					5% K-S Critical Value	0.32	Detected Data Not Gamma Distributed at 5% Significance Level					
2245	**Detected Data Not Gamma Distributed at 5% Significance Level**											
2246												
2247	**Gamma Statistics on Detected Data Only**											
2248					k hat (MLE)	0.932					k star (bias corrected MLE)	0.628
2249					Theta hat (MLE)	1.996					Theta star (bias corrected MLE)	2.963
2250					nu hat (MLE)	13.04					nu star (bias corrected)	8.787
2251					Mean (detects)	1.86						
2252												
2253	**Gamma ROS Statistics using Imputed Non-Detects**											
2254	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2255	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2256	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2257	This is especially true when the sample size is small.											
2258	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2259					Minimum	0.3					Mean	1.544
2260					Maximum	5.3					Median	0.48
2261					SD	2.009					CV	1.301
2262					k hat (MLE)	0.927					k star (bias corrected MLE)	0.692
2263					Theta hat (MLE)	1.666					Theta star (bias corrected MLE)	2.231
2264					nu hat (MLE)	16.69					nu star (bias corrected)	12.46
2265					Adjusted Level of Significance (β)	0.0231						
2266					Approximate Chi Square Value (12.46, α)	5.53					Adjusted Chi Square Value (12.46, β)	4.595
2267					95% Gamma Approximate UCL (use when n>=50)	3.479					95% Gamma Adjusted UCL (use when n<50)	4.187
2268												
2269	**Estimates of Gamma Parameters using KM Estimates**											
2270					Mean (KM)	1.556					SD (KM)	1.889
2271					Variance (KM)	3.569					SE of Mean (KM)	0.681
2272					k hat (KM)	0.679					k star (KM)	0.527
2273					nu hat (KM)	12.22					nu star (KM)	9.48
2274					theta hat (KM)	2.293					theta star (KM)	2.955
2275					80% gamma percentile (KM)	2.561					90% gamma percentile (KM)	4.165
2276					95% gamma percentile (KM)	5.869					99% gamma percentile (KM)	10.04
2277												
2278	**Gamma Kaplan-Meier (KM) Statistics**											
2279					Approximate Chi Square Value (9.48, α)	3.619					Adjusted Chi Square Value (9.48, β)	2.897
2280					95% Gamma Approximate KM-UCL (use when n>=50)	4.077					95% Gamma Adjusted KM-UCL (use when n<50)	5.093
2281												
2282	**Lognormal GOF Test on Detected Observations Only**											
2283					Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk GOF Test**					
2284					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
2285					Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**					
2286					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
2287	**Detected Data appear Lognormal at 5% Significance Level**											
2288												

2289	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2290					Mean in Original Scale	1.566				Mean in Log Scale	-0.143	
2291					SD in Original Scale	1.995				SD in Log Scale	1.063	
2292				95% t UCL (assumes normality of ROS data)		2.802				95% Percentile Bootstrap UCL	2.607	
2293					95% BCA Bootstrap UCL	3.051				95% Bootstrap t UCL	9.395	
2294					95% H-UCL (Log ROS)	5.427						
2295												
2296	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2297					KM Mean (logged)	-0.175				KM Geo Mean	0.839	
2298					KM SD (logged)	1.031				95% Critical H Value (KM-Log)	3.308	
2299					KM Standard Error of Mean (logged)	0.377				95% H-UCL (KM -Log)	4.767	
2300					KM SD (logged)	1.031				95% Critical H Value (KM-Log)	3.308	
2301					KM Standard Error of Mean (logged)	0.377						
2302												
2303	**DL/2 Statistics**											
2304	**DL/2 Normal**									**DL/2 Log-Transformed**		
2305					Mean in Original Scale	1.747				Mean in Log Scale	-0.0125	
2306					SD in Original Scale	1.979				SD in Log Scale	1.114	
2307					95% t UCL (Assumes normality)	2.973				95% H-Stat UCL	7.293	
2308	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2309												
2310	**Nonparametric Distribution Free UCL Statistics**											
2311	**Detected Data appear Lognormal Distributed at 5% Significance Level**											
2312												
2313	**Suggested UCL to Use**											
2314					95% KM (Chebyshev) UCL	4.526						
2315												
2316	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2317	Recommendations are based upon data size, data distribution, and skewness.											
2318	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2319	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2320												
2321												
2322	**Chromium (smw16)**											
2323												
2324	**General Statistics**											
2325					Total Number of Observations	9				Number of Distinct Observations	9	
2326										Number of Missing Observations	0	
2327					Minimum	3.7				Mean	12.01	
2328					Maximum	24.1				Median	10.6	
2329					SD	5.894				Std. Error of Mean	1.965	
2330					Coefficient of Variation	0.491				Skewness	0.954	
2331												
2332	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2333	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2334	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2335	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2336												
2337	**Normal GOF Test**											
2338					Shapiro Wilk Test Statistic	0.935				**Shapiro Wilk GOF Test**		
2339					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
2340					Lilliefors Test Statistic	0.221				**Lilliefors GOF Test**		

2341				5% Lilliefors Critical Value		0.274		Data appear Normal at 5% Significance Level				
2342	**Data appear Normal at 5% Significance Level**											
2343												
2344	**Assuming Normal Distribution**											
2345	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2346				95% Student's-t UCL		15.66				95% Adjusted-CLT UCL (Chen-1995)		15.91
2347										95% Modified-t UCL (Johnson-1978)		15.77
2348												
2349	**Gamma GOF Test**											
2350				A-D Test Statistic		0.247	**Anderson-Darling Gamma GOF Test**					
2351				5% A-D Critical Value		0.724	Detected data appear Gamma Distributed at 5% Significance Level					
2352				K-S Test Statistic		0.163	**Kolmogorov-Smirnov Gamma GOF Test**					
2353				5% K-S Critical Value		0.28	Detected data appear Gamma Distributed at 5% Significance Level					
2354	**Detected data appear Gamma Distributed at 5% Significance Level**											
2355												
2356	**Gamma Statistics**											
2357				k hat (MLE)		4.57				k star (bias corrected MLE)		3.121
2358				Theta hat (MLE)		2.628				Theta star (bias corrected MLE)		3.849
2359				nu hat (MLE)		82.26				nu star (bias corrected)		56.17
2360				MLE Mean (bias corrected)		12.01				MLE Sd (bias corrected)		6.799
2361										Approximate Chi Square Value (0.05)		39.95
2362				Adjusted Level of Significance		0.0231				Adjusted Chi Square Value		37.08
2363												
2364	**Assuming Gamma Distribution**											
2365				95% Approximate Gamma UCL (use when n>=50))		16.89				95% Adjusted Gamma UCL (use when n<50)		18.2
2366												
2367	**Lognormal GOF Test**											
2368				Shapiro Wilk Test Statistic		0.951	**Shapiro Wilk Lognormal GOF Test**					
2369				5% Shapiro Wilk Critical Value		0.829	Data appear Lognormal at 5% Significance Level					
2370				Lilliefors Test Statistic		0.186	**Lilliefors Lognormal GOF Test**					
2371				5% Lilliefors Critical Value		0.274	Data appear Lognormal at 5% Significance Level					
2372	**Data appear Lognormal at 5% Significance Level**											
2373												
2374	**Lognormal Statistics**											
2375				Minimum of Logged Data		1.308				Mean of logged Data		2.372
2376				Maximum of Logged Data		3.182				SD of logged Data		0.527
2377												
2378	**Assuming Lognormal Distribution**											
2379				95% H-UCL		18.81				90% Chebyshev (MVUE) UCL		18.6
2380				95% Chebyshev (MVUE) UCL		21.53				97.5% Chebyshev (MVUE) UCL		25.61
2381				99% Chebyshev (MVUE) UCL		33.62						
2382												
2383	**Nonparametric Distribution Free UCL Statistics**											
2384	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2385												
2386	**Nonparametric Distribution Free UCLs**											
2387				95% CLT UCL		15.24				95% Jackknife UCL		15.66
2388				95% Standard Bootstrap UCL		15.04				95% Bootstrap-t UCL		17.15
2389				95% Hall's Bootstrap UCL		21.87				95% Percentile Bootstrap UCL		15.2
2390				95% BCA Bootstrap UCL		15.92						
2391				90% Chebyshev(Mean, Sd) UCL		17.9				95% Chebyshev(Mean, Sd) UCL		20.57
2392				97.5% Chebyshev(Mean, Sd) UCL		24.28				99% Chebyshev(Mean, Sd) UCL		31.56

	A	B	C	D	E	F	G	H	I	J	K	L
2393												
2394	**Suggested UCL to Use**											
2395					95% Student's-t UCL	15.66						
2396												
2397	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2398	Recommendations are based upon data size, data distribution, and skewness.											
2399	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2400	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2401												
2402	**Chromium (smw16d)**											
2403												
2404	**General Statistics**											
2405					Total Number of Observations	8			Number of Distinct Observations	8		
2406					Number of Detects	2			Number of Non-Detects	6		
2407					Number of Distinct Detects	2			Number of Distinct Non-Detects	6		
2408					Minimum Detect	0.32			Minimum Non-Detect	0.13		
2409					Maximum Detect	0.4			Maximum Non-Detect	3.2		
2410					Variance Detects	0.0032			Percent Non-Detects	75%		
2411					Mean Detects	0.36			SD Detects	0.0566		
2412					Median Detects	0.36			CV Detects	0.157		
2413					Skewness Detects	N/A			Kurtosis Detects	N/A		
2414					Mean of Logged Detects	-1.028			SD of Logged Detects	0.158		
2415												
2416	**Warning: Data set has only 2 Detected Values.**											
2417	**This is not enough to compute meaningful or reliable statistics and estimates.**											
2418												
2419												
2420	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2421	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2422	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2423	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2424												
2425	**Normal GOF Test on Detects Only**											
2426	**Not Enough Data to Perform GOF Test**											
2427												
2428	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2429					KM Mean	0.222			KM Standard Error of Mean	0.073		
2430					KM SD	0.115			95% KM (BCA) UCL	N/A		
2431					95% KM (t) UCL	0.36			95% KM (Percentile Bootstrap) UCL	N/A		
2432					95% KM (z) UCL	0.342			95% KM Bootstrap t UCL	N/A		
2433					90% KM Chebyshev UCL	0.441			95% KM Chebyshev UCL	0.54		
2434					97.5% KM Chebyshev UCL	0.678			99% KM Chebyshev UCL	0.949		
2435												
2436	**Gamma GOF Tests on Detected Observations Only**											
2437	**Not Enough Data to Perform GOF Test**											
2438												
2439	**Gamma Statistics on Detected Data Only**											
2440					k hat (MLE)	80.67			k star (bias corrected MLE)	N/A		
2441					Theta hat (MLE)	0.00446			Theta star (bias corrected MLE)	N/A		
2442					nu hat (MLE)	322.7			nu star (bias corrected)	N/A		
2443					Mean (detects)	0.36						
2444												

	A	B	C	D	E	F	G	H	I	J	K	L
2445	**Estimates of Gamma Parameters using KM Estimates**											
2446					Mean (KM)	0.222				SD (KM)		0.115
2447					Variance (KM)	0.0133				SE of Mean (KM)		0.073
2448					k hat (KM)	3.696				k star (KM)		2.393
2449					nu hat (KM)	59.13				nu star (KM)		38.29
2450					theta hat (KM)	0.0601				theta star (KM)		0.0928
2451					80% gamma percentile (KM)	0.325				90% gamma percentile (KM)		0.414
2452					95% gamma percentile (KM)	0.498				99% gamma percentile (KM)		0.682
2453												
2454	**Gamma Kaplan-Meier (KM) Statistics**											
2455										Adjusted Level of Significance (β)		0.0195
2456					Approximate Chi Square Value (38.29, α)	25.12				Adjusted Chi Square Value (38.29, β)		22.46
2457					95% Gamma Approximate KM-UCL (use when n>=50)	0.338				95% Gamma Adjusted KM-UCL (use when n<50)		0.379
2458												
2459	**Lognormal GOF Test on Detected Observations Only**											
2460	**Not Enough Data to Perform GOF Test**											
2461												
2462	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2463					Mean in Original Scale	0.251				Mean in Log Scale		-1.415
2464					SD in Original Scale	0.0743				SD in Log Scale		0.27
2465					95% t UCL (assumes normality of ROS data)	0.301				95% Percentile Bootstrap UCL		N/A
2466					95% BCA Bootstrap UCL	N/A				95% Bootstrap t UCL		N/A
2467					95% H-UCL (Log ROS)	0.31						
2468												
2469	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2470					KM Mean (logged)	-1.635				KM Geo Mean		0.195
2471					KM SD (logged)	0.501				95% Critical H Value (KM-Log)		2.356
2472					KM Standard Error of Mean (logged)	0.317				95% H-UCL (KM -Log)		0.345
2473					KM SD (logged)	0.501				95% Critical H Value (KM-Log)		2.356
2474					KM Standard Error of Mean (logged)	0.317						
2475												
2476	**DL/2 Statistics**											
2477	**DL/2 Normal**						**DL/2 Log-Transformed**					
2478					Mean in Original Scale	0.415				Mean in Log Scale		-1.38
2479					SD in Original Scale	0.503				SD in Log Scale		1.043
2480					95% t UCL (Assumes normality)	0.752				95% H-Stat UCL		1.748
2481	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2482												
2483	**Nonparametric Distribution Free UCL Statistics**											
2484	**Data do not follow a Discernible Distribution at 5% Significance Level**											
2485												
2486	**Suggested UCL to Use**											
2487					95% KM (t) UCL	0.36				KM H-UCL		0.345
2488					95% KM (BCA) UCL	N/A						
2489	**Warning: One or more Recommended UCL(s) not available!**											
2490												
2491	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2492	Recommendations are based upon data size, data distribution, and skewness.											
2493	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2494	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2495												
2496												

2497	**Chromium (smw17)**											
2498												
2499	**General Statistics**											
2500					Total Number of Observations	8			Number of Distinct Observations	7		
2501									Number of Missing Observations	0		
2502					Minimum	2.5			Mean	11.61		
2503					Maximum	15.6			Median	12.45		
2504					SD	4.061			Std. Error of Mean	1.436		
2505					Coefficient of Variation	0.35			Skewness	-1.863		
2506												
2507	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2508	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2509	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2510	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2511												
2512	**Normal GOF Test**											
2513					Shapiro Wilk Test Statistic	0.792			**Shapiro Wilk GOF Test**			
2514					5% Shapiro Wilk Critical Value	0.818			Data Not Normal at 5% Significance Level			
2515					Lilliefors Test Statistic	0.308			**Lilliefors GOF Test**			
2516					5% Lilliefors Critical Value	0.283			Data Not Normal at 5% Significance Level			
2517	**Data Not Normal at 5% Significance Level**											
2518												
2519	**Assuming Normal Distribution**											
2520					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
2521					95% Student's-t UCL	14.33			95% Adjusted-CLT UCL (Chen-1995)	12.96		
2522									95% Modified-t UCL (Johnson-1978)	14.18		
2523												
2524	**Gamma GOF Test**											
2525					A-D Test Statistic	1.236			**Anderson-Darling Gamma GOF Test**			
2526					5% A-D Critical Value	0.719			Data Not Gamma Distributed at 5% Significance Level			
2527					K-S Test Statistic	0.353			**Kolmogorov-Smirnov Gamma GOF Test**			
2528					5% K-S Critical Value	0.295			Data Not Gamma Distributed at 5% Significance Level			
2529	**Data Not Gamma Distributed at 5% Significance Level**											
2530												
2531	**Gamma Statistics**											
2532					k hat (MLE)	4.844			k star (bias corrected MLE)	3.111		
2533					Theta hat (MLE)	2.397			Theta star (bias corrected MLE)	3.733		
2534					nu hat (MLE)	77.5			nu star (bias corrected)	49.77		
2535					MLE Mean (bias corrected)	11.61			MLE Sd (bias corrected)	6.584		
2536									Approximate Chi Square Value (0.05)	34.57		
2537					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	31.4		
2538												
2539	**Assuming Gamma Distribution**											
2540					95% Approximate Gamma UCL (use when n>=50))	16.72			95% Adjusted Gamma UCL (use when n<50)	18.41		
2541												
2542	**Lognormal GOF Test**											
2543					Shapiro Wilk Test Statistic	0.626			**Shapiro Wilk Lognormal GOF Test**			
2544					5% Shapiro Wilk Critical Value	0.818			Data Not Lognormal at 5% Significance Level			
2545					Lilliefors Test Statistic	0.354			**Lilliefors Lognormal GOF Test**			
2546					5% Lilliefors Critical Value	0.283			Data Not Lognormal at 5% Significance Level			
2547	**Data Not Lognormal at 5% Significance Level**											
2548												

2549	**Lognormal Statistics**											
2550					Minimum of Logged Data	0.916			Mean of logged Data	2.345		
2551					Maximum of Logged Data	2.747			SD of logged Data	0.593		
2552												
2553	**Assuming Lognormal Distribution**											
2554					95% H-UCL	21.88			90% Chebyshev (MVUE) UCL	19.87		
2555					95% Chebyshev (MVUE) UCL	23.37			97.5% Chebyshev (MVUE) UCL	28.23		
2556					99% Chebyshev (MVUE) UCL	37.78						
2557												
2558	**Nonparametric Distribution Free UCL Statistics**											
2559	**Data do not follow a Discernible Distribution (0.05)**											
2560												
2561	**Nonparametric Distribution Free UCLs**											
2562					95% CLT UCL	13.97			95% Jackknife UCL	14.33		
2563					95% Standard Bootstrap UCL	13.83			95% Bootstrap-t UCL	13.54		
2564					95% Hall's Bootstrap UCL	13.28			95% Percentile Bootstrap UCL	13.59		
2565					95% BCA Bootstrap UCL	13.29						
2566					90% Chebyshev(Mean, Sd) UCL	15.92			95% Chebyshev(Mean, Sd) UCL	17.87		
2567					97.5% Chebyshev(Mean, Sd) UCL	20.58			99% Chebyshev(Mean, Sd) UCL	25.9		
2568												
2569	**Suggested UCL to Use**											
2570					95% Chebyshev (Mean, Sd) UCL	17.87						
2571												
2572	**Recommended UCL exceeds the maximum observation**											
2573												
2574	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2575	Recommendations are based upon data size, data distribution, and skewness.											
2576	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2577	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2578												
2579	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
2580	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
2581												
2582	**Chromium (smw17d)**											
2583												
2584	**General Statistics**											
2585					Total Number of Observations	8			Number of Distinct Observations	6		
2586					Number of Detects	1			Number of Non-Detects	7		
2587					Number of Distinct Detects	1			Number of Distinct Non-Detects	5		
2588												
2589	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
2590	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
2591												
2592	**The data set for variable Chromium (smw17d) was not processed!**											
2593												
2594												
2595	**Chromium (smw18)**											
2596												
2597	**General Statistics**											
2598					Total Number of Observations	8			Number of Distinct Observations	7		
2599					Number of Detects	7			Number of Non-Detects	1		
2600					Number of Distinct Detects	6			Number of Distinct Non-Detects	1		

2601					Minimum Detect	2.9					Minimum Non-Detect	3.2
2602					Maximum Detect	6.8					Maximum Non-Detect	3.2
2603					Variance Detects	1.736					Percent Non-Detects	12.5%
2604					Mean Detects	4.343					SD Detects	1.318
2605					Median Detects	4.3					CV Detects	0.303
2606					Skewness Detects	0.906					Kurtosis Detects	1.589
2607					Mean of Logged Detects	1.431					SD of Logged Detects	0.297
2608												
2609					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2610					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2611					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2612					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2613												
2614					**Normal GOF Test on Detects Only**							
2615					Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk GOF Test**					
2616					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level					
2617					Lilliefors Test Statistic	0.25	**Lilliefors GOF Test**					
2618					5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level					
2619					**Detected Data appear Normal at 5% Significance Level**							
2620												
2621					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
2622					KM Mean	4.163	KM Standard Error of Mean	0.472				
2623					KM SD	1.237	95% KM (BCA) UCL	4.975				
2624					95% KM (t) UCL	5.057	95% KM (Percentile Bootstrap) UCL	4.925				
2625					95% KM (z) UCL	4.939	95% KM Bootstrap t UCL	5.205				
2626					90% KM Chebyshev UCL	5.58	95% KM Chebyshev UCL	6.221				
2627					97.5% KM Chebyshev UCL	7.112	99% KM Chebyshev UCL	8.862				
2628												
2629					**Gamma GOF Tests on Detected Observations Only**							
2630					A-D Test Statistic	0.427	**Anderson-Darling GOF Test**					
2631					5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level					
2632					K-S Test Statistic	0.208	**Kolmogorov-Smirnov GOF**					
2633					5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level					
2634					**Detected data appear Gamma Distributed at 5% Significance Level**							
2635												
2636					**Gamma Statistics on Detected Data Only**							
2637					k hat (MLE)	13.32	k star (bias corrected MLE)	7.706				
2638					Theta hat (MLE)	0.326	Theta star (bias corrected MLE)	0.564				
2639					nu hat (MLE)	186.5	nu star (bias corrected)	107.9				
2640					Mean (detects)	4.343						
2641												
2642					**Gamma ROS Statistics using Imputed Non-Detects**							
2643					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2644					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2645					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2646					This is especially true when the sample size is small.							
2647					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2648					Minimum	2.871	Mean	4.159				
2649					Maximum	6.8	Median	4.25				
2650					SD	1.326	CV	0.319				
2651					k hat (MLE)	12.15	k star (bias corrected MLE)	7.678				
2652					Theta hat (MLE)	0.342	Theta star (bias corrected MLE)	0.542				

2653					nu hat (MLE)	194.4				nu star (bias corrected)		122.9
2654					Adjusted Level of Significance (β)	0.0195						
2655					Approximate Chi Square Value (122.86, α)	98.26				Adjusted Chi Square Value (122.86, β)		92.7
2656					95% Gamma Approximate UCL (use when n>=50)	5.2				95% Gamma Adjusted UCL (use when n<50)		5.512
2657												
2658					**Estimates of Gamma Parameters using KM Estimates**							
2659					Mean (KM)	4.163				SD (KM)		1.237
2660					Variance (KM)	1.53				SE of Mean (KM)		0.472
2661					k hat (KM)	11.33				k star (KM)		7.162
2662					nu hat (KM)	181.2				nu star (KM)		114.6
2663					theta hat (KM)	0.368				theta star (KM)		0.581
2664					80% gamma percentile (KM)	5.384				90% gamma percentile (KM)		6.238
2665					95% gamma percentile (KM)	7.007				99% gamma percentile (KM)		8.604
2666												
2667					**Gamma Kaplan-Meier (KM) Statistics**							
2668					Approximate Chi Square Value (114.59, α)	90.88				Adjusted Chi Square Value (114.59, β)		85.54
2669					95% Gamma Approximate KM-UCL (use when n>=50)	5.249				95% Gamma Adjusted KM-UCL (use when n<50)		5.576
2670												
2671					**Lognormal GOF Test on Detected Observations Only**							
2672					Shapiro Wilk Test Statistic	0.903				**Shapiro Wilk GOF Test**		
2673					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
2674					Lilliefors Test Statistic	0.22				**Lilliefors GOF Test**		
2675					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
2676					**Detected Data appear Lognormal at 5% Significance Level**							
2677												
2678					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2679					Mean in Original Scale	4.17				Mean in Log Scale		1.387
2680					SD in Original Scale	1.314				SD in Log Scale		0.301
2681					95% t UCL (assumes normality of ROS data)	5.05				95% Percentile Bootstrap UCL		4.92
2682					95% BCA Bootstrap UCL	4.99				95% Bootstrap t UCL		5.293
2683					95% H-UCL (Log ROS)	5.293						
2684												
2685					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2686					KM Mean (logged)	1.385				KM Geo Mean		3.994
2687					KM SD (logged)	0.284				95% Critical H Value (KM-Log)		2.038
2688					KM Standard Error of Mean (logged)	0.108				95% H-UCL (KM -Log)		5.175
2689					KM SD (logged)	0.284				95% Critical H Value (KM-Log)		2.038
2690					KM Standard Error of Mean (logged)	0.108						
2691												
2692					**DL/2 Statistics**							
2693					**DL/2 Normal**					**DL/2 Log-Transformed**		
2694					Mean in Original Scale	4				Mean in Log Scale		1.31
2695					SD in Original Scale	1.558				SD in Log Scale		0.437
2696					95% t UCL (Assumes normality)	5.044				95% H-Stat UCL		5.914
2697					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2698												
2699					**Nonparametric Distribution Free UCL Statistics**							
2700					**Detected Data appear Normal Distributed at 5% Significance Level**							
2701												
2702					**Suggested UCL to Use**							
2703					95% KM (t) UCL	5.057						
2704												

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium (smw18d)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	4	Number of Non-Detects	4
Number of Distinct Detects	4	Number of Distinct Non-Detects	4
Minimum Detect	0.36	Minimum Non-Detect	0.39
Maximum Detect	0.78	Maximum Non-Detect	4.6
Variance Detects	0.0343	Percent Non-Detects	50%
Mean Detects	0.51	SD Detects	0.185
Median Detects	0.45	CV Detects	0.363
Skewness Detects	1.665	Kurtosis Detects	3.11
Mean of Logged Detects	-0.717	SD of Logged Detects	0.33

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.829	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.356	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.48	KM Standard Error of Mean	0.0803
KM SD	0.155	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.632	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.612	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.721	95% KM Chebyshev UCL	0.83
97.5% KM Chebyshev UCL	0.981	99% KM Chebyshev UCL	1.279

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.452	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.348	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.395	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	11.64	k star (bias corrected MLE)	3.077
Theta hat (MLE)	0.0438	Theta star (bias corrected MLE)	0.166
nu hat (MLE)	93.14	nu star (bias corrected)	24.62
Mean (detects)	0.51		

	A	B	C	D	E	F	G	H	I	J	K	L
2757	**Gamma ROS Statistics using Imputed Non-Detects**											
2758	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2759	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2760	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2761	This is especially true when the sample size is small.											
2762	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2763					Minimum	0.304				Mean	0.465	
2764					Maximum	0.78				Median	0.458	
2765					SD	0.14				CV	0.301	
2766					k hat (MLE)	14.92				k star (bias corrected MLE)	9.408	
2767					Theta hat (MLE)	0.0311				Theta star (bias corrected MLE)	0.0494	
2768					nu hat (MLE)	238.7				nu star (bias corrected)	150.5	
2769					Adjusted Level of Significance (β)	0.0195						
2770					Approximate Chi Square Value (150.54, α)	123.2				Adjusted Chi Square Value (150.54, β)	116.9	
2771					95% Gamma Approximate UCL (use when n>=50)	0.568				95% Gamma Adjusted UCL (use when n<50)	N/A	
2772												
2773	**Estimates of Gamma Parameters using KM Estimates**											
2774					Mean (KM)	0.48				SD (KM)	0.155	
2775					Variance (KM)	0.0242				SE of Mean (KM)	0.0803	
2776					k hat (KM)	9.536				k star (KM)	6.044	
2777					nu hat (KM)	152.6				nu star (KM)	96.7	
2778					theta hat (KM)	0.0503				theta star (KM)	0.0794	
2779					80% gamma percentile (KM)	0.632				90% gamma percentile (KM)	0.741	
2780					95% gamma percentile (KM)	0.84				99% gamma percentile (KM)	1.046	
2781												
2782	**Gamma Kaplan-Meier (KM) Statistics**											
2783					Approximate Chi Square Value (96.70, α)	75.02				Adjusted Chi Square Value (96.70, β)	70.2	
2784					95% Gamma Approximate KM-UCL (use when n>=50)	0.619				95% Gamma Adjusted KM-UCL (use when n<50)	0.661	
2785												
2786	**Lognormal GOF Test on Detected Observations Only**											
2787					Shapiro Wilk Test Statistic	0.889				**Shapiro Wilk GOF Test**		
2788					5% Shapiro Wilk Critical Value	0.748				Detected Data appear Lognormal at 5% Significance Level		
2789					Lilliefors Test Statistic	0.322				**Lilliefors GOF Test**		
2790					5% Lilliefors Critical Value	0.375				Detected Data appear Lognormal at 5% Significance Level		
2791	**Detected Data appear Lognormal at 5% Significance Level**											
2792												
2793	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2794					Mean in Original Scale	0.466				Mean in Log Scale	-0.795	
2795					SD in Original Scale	0.136				SD in Log Scale	0.253	
2796					95% t UCL (assumes normality of ROS data)	0.557				95% Percentile Bootstrap UCL	0.548	
2797					95% BCA Bootstrap UCL	0.575				95% Bootstrap t UCL	0.644	
2798					95% H-UCL (Log ROS)	0.565						
2799												
2800	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2801					KM Mean (logged)	-0.778				KM Geo Mean	0.459	
2802					KM SD (logged)	0.283				95% Critical H Value (KM-Log)	2.037	
2803					KM Standard Error of Mean (logged)	0.146				95% H-UCL (KM -Log)	0.595	
2804					KM SD (logged)	0.283				95% Critical H Value (KM-Log)	2.037	
2805					KM Standard Error of Mean (logged)	0.146						
2806												
2807	**DL/2 Statistics**											
2808	**DL/2 Normal**									**DL/2 Log-Transformed**		

2809				Mean in Original Scale		0.829				Mean in Log Scale		-0.487
2810				SD in Original Scale		0.735				SD in Log Scale		0.807
2811				95% t UCL (Assumes normality)		1.321				95% H-Stat UCL		2.104
2812	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2813												
2814	**Nonparametric Distribution Free UCL Statistics**											
2815	**Detected Data appear Normal Distributed at 5% Significance Level**											
2816												
2817	**Suggested UCL to Use**											
2818				95% KM (t) UCL		0.632						
2819												
2820	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2821	Recommendations are based upon data size, data distribution, and skewness.											
2822	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2823	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2824												
2825	**Chromium (smw19)**											
2826												
2827	**General Statistics**											
2828				Total Number of Observations		8				Number of Distinct Observations		7
2829				Number of Detects		6				Number of Non-Detects		2
2830				Number of Distinct Detects		5				Number of Distinct Non-Detects		2
2831				Minimum Detect		0.69				Minimum Non-Detect		3.2
2832				Maximum Detect		1.4				Maximum Non-Detect		4.6
2833				Variance Detects		0.085				Percent Non-Detects		25%
2834				Mean Detects		1.047				SD Detects		0.292
2835				Median Detects		0.95				CV Detects		0.279
2836				Skewness Detects		0.433				Kurtosis Detects		-1.561
2837				Mean of Logged Detects		0.0133				SD of Logged Detects		0.278
2838												
2839	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2840	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2841	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2842	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2843												
2844	**Normal GOF Test on Detects Only**											
2845				Shapiro Wilk Test Statistic		0.871				**Shapiro Wilk GOF Test**		
2846				5% Shapiro Wilk Critical Value		0.788				Detected Data appear Normal at 5% Significance Level		
2847				Lilliefors Test Statistic		0.23				**Lilliefors GOF Test**		
2848				5% Lilliefors Critical Value		0.325				Detected Data appear Normal at 5% Significance Level		
2849	**Detected Data appear Normal at 5% Significance Level**											
2850												
2851	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2852				KM Mean		1.047				KM Standard Error of Mean		0.119
2853				KM SD		0.266				95% KM (BCA) UCL		1.23
2854				95% KM (t) UCL		1.272				95% KM (Percentile Bootstrap) UCL		1.248
2855				95% KM (z) UCL		1.242				95% KM Bootstrap t UCL		1.493
2856				90% KM Chebyshev UCL		1.404				95% KM Chebyshev UCL		1.566
2857				97.5% KM Chebyshev UCL		1.79				99% KM Chebyshev UCL		2.231
2858												
2859	**Gamma GOF Tests on Detected Observations Only**											
2860				A-D Test Statistic		0.428				**Anderson-Darling GOF Test**		

	A	B	C	D	E	F	G	H	I	J	K	L
2861				5% A-D Critical Value		0.698	Detected data appear Gamma Distributed at 5% Significance Level					
2862				K-S Test Statistic		0.235	**Kolmogorov-Smirnov GOF**					
2863				5% K-S Critical Value		0.332	Detected data appear Gamma Distributed at 5% Significance Level					
2864	**Detected data appear Gamma Distributed at 5% Significance Level**											
2865												
2866	**Gamma Statistics on Detected Data Only**											
2867				k hat (MLE)		15.65	k star (bias corrected MLE)					7.938
2868				Theta hat (MLE)		0.0669	Theta star (bias corrected MLE)					0.132
2869				nu hat (MLE)		187.9	nu star (bias corrected)					95.26
2870				Mean (detects)		1.047						
2871												
2872	**Gamma ROS Statistics using Imputed Non-Detects**											
2873	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2874	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2875	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2876	This is especially true when the sample size is small.											
2877	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2878				Minimum		0.69	Mean					1.043
2879				Maximum		1.4	Median					1.016
2880				SD		0.247	CV					0.236
2881				k hat (MLE)		20.8	k star (bias corrected MLE)					13.08
2882				Theta hat (MLE)		0.0501	Theta star (bias corrected MLE)					0.0797
2883				nu hat (MLE)		332.8	nu star (bias corrected)					209.3
2884				Adjusted Level of Significance (β)		0.0195						
2885				Approximate Chi Square Value (209.35, α)		176.9	Adjusted Chi Square Value (209.35, β)					169.3
2886				95% Gamma Approximate UCL (use when n>=50)		1.234	95% Gamma Adjusted UCL (use when n<50)					1.29
2887												
2888	**Estimates of Gamma Parameters using KM Estimates**											
2889				Mean (KM)		1.047	SD (KM)					0.266
2890				Variance (KM)		0.0709	SE of Mean (KM)					0.119
2891				k hat (KM)		15.46	k star (KM)					9.747
2892				nu hat (KM)		247.4	nu star (KM)					155.9
2893				theta hat (KM)		0.0677	theta star (KM)					0.107
2894				80% gamma percentile (KM)		1.313	90% gamma percentile (KM)					1.493
2895				95% gamma percentile (KM)		1.652	99% gamma percentile (KM)					1.98
2896												
2897	**Gamma Kaplan-Meier (KM) Statistics**											
2898				Approximate Chi Square Value (155.95, α)		128.1	Adjusted Chi Square Value (155.95, β)					121.7
2899				95% Gamma Approximate KM-UCL (use when n>=50)		1.274	95% Gamma Adjusted KM-UCL (use when n<50)					1.341
2900												
2901	**Lognormal GOF Test on Detected Observations Only**											
2902				Shapiro Wilk Test Statistic		0.902	**Shapiro Wilk GOF Test**					
2903				5% Shapiro Wilk Critical Value		0.788	Detected Data appear Lognormal at 5% Significance Level					
2904				Lilliefors Test Statistic		0.21	**Lilliefors GOF Test**					
2905				5% Lilliefors Critical Value		0.325	Detected Data appear Lognormal at 5% Significance Level					
2906	**Detected Data appear Lognormal at 5% Significance Level**											
2907												
2908	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2909				Mean in Original Scale		1.038	Mean in Log Scale					0.0133
2910				SD in Original Scale		0.247	SD in Log Scale					0.235
2911				95% t UCL (assumes normality of ROS data)		1.204	95% Percentile Bootstrap UCL					1.178
2912				95% BCA Bootstrap UCL		1.19	95% Bootstrap t UCL					1.31

	A	B	C	D	E	F	G	H	I	J	K	L
2913				95% H-UCL (Log ROS)		1.243						
2914												
2915	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2916				KM Mean (logged)		0.0133				KM Geo Mean		1.013
2917				KM SD (logged)		0.254				95% Critical H Value (KM-Log)		2.003
2918				KM Standard Error of Mean (logged)		0.114				95% H-UCL (KM -Log)		1.269
2919				KM SD (logged)		0.254				95% Critical H Value (KM-Log)		2.003
2920				KM Standard Error of Mean (logged)		0.114						
2921												
2922	**DL/2 Statistics**											
2923	**DL/2 Normal**						**DL/2 Log-Transformed**					
2924				Mean in Original Scale		1.273				Mean in Log Scale		0.173
2925				SD in Original Scale		0.52				SD in Log Scale		0.39
2926				95% t UCL (Assumes normality)		1.621				95% H-Stat UCL		1.769
2927	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2928												
2929	**Nonparametric Distribution Free UCL Statistics**											
2930	**Detected Data appear Normal Distributed at 5% Significance Level**											
2931												
2932	**Suggested UCL to Use**											
2933				95% KM (t) UCL		1.272						
2934												
2935	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2936	Recommendations are based upon data size, data distribution, and skewness.											
2937	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2938	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2939												
2940	**Chromium (smw7)**											
2941												
2942	**General Statistics**											
2943				Total Number of Observations		8				Number of Distinct Observations		7
2944				Number of Detects		3				Number of Non-Detects		5
2945				Number of Distinct Detects		2				Number of Distinct Non-Detects		5
2946				Minimum Detect		0.24				Minimum Non-Detect		0.13
2947				Maximum Detect		0.53				Maximum Non-Detect		3.2
2948				Variance Detects		0.028				Percent Non-Detects		62.5%
2949				Mean Detects		0.337				SD Detects		0.167
2950				Median Detects		0.24				CV Detects		0.497
2951				Skewness Detects		1.732				Kurtosis Detects		N/A
2952				Mean of Logged Detects		-1.163				SD of Logged Detects		0.457
2953												
2954	**Warning: Data set has only 3 Detected Values.**											
2955	**This is not enough to compute meaningful or reliable statistics and estimates.**											
2956												
2957												
2958	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2959	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2960	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2961	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2962												
2963	**Normal GOF Test on Detects Only**											
2964				Shapiro Wilk Test Statistic		0.75	**Shapiro Wilk GOF Test**					

2965	5% Shapiro Wilk Critical Value					0.767	Detected Data Not Normal at 5% Significance Level					
2966	Lilliefors Test Statistic					0.385	**Lilliefors GOF Test**					
2967	5% Lilliefors Critical Value					0.425	Detected Data appear Normal at 5% Significance Level					
2968	**Detected Data appear Approximate Normal at 5% Significance Level**											
2969												
2970	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2971	KM Mean					0.225	KM Standard Error of Mean					0.063
2972	KM SD					0.134	95% KM (BCA) UCL					N/A
2973	95% KM (t) UCL					0.344	95% KM (Percentile Bootstrap) UCL					N/A
2974	95% KM (z) UCL					0.328	95% KM Bootstrap t UCL					N/A
2975	90% KM Chebyshev UCL					0.414	95% KM Chebyshev UCL					0.499
2976	97.5% KM Chebyshev UCL					0.618	99% KM Chebyshev UCL					0.851
2977												
2978	**Gamma GOF Tests on Detected Observations Only**											
2979	**Not Enough Data to Perform GOF Test**											
2980												
2981	**Gamma Statistics on Detected Data Only**											
2982	k hat (MLE)					6.885	k star (bias corrected MLE)					N/A
2983	Theta hat (MLE)					0.0489	Theta star (bias corrected MLE)					N/A
2984	nu hat (MLE)					41.31	nu star (bias corrected)					N/A
2985	Mean (detects)					0.337						
2986												
2987	**Gamma ROS Statistics using Imputed Non-Detects**											
2988	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2989	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2990	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2991	This is especially true when the sample size is small.											
2992	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2993	Minimum					0.01	Mean					0.158
2994	Maximum					0.53	Median					0.111
2995	SD					0.178	CV					1.132
2996	k hat (MLE)					0.695	k star (bias corrected MLE)					0.518
2997	Theta hat (MLE)					0.227	Theta star (bias corrected MLE)					0.304
2998	nu hat (MLE)					11.12	nu star (bias corrected)					8.286
2999	Adjusted Level of Significance (β)					0.0195						
3000	Approximate Chi Square Value (8.29, α)					2.902	Adjusted Chi Square Value (8.29, β)					2.159
3001	95% Gamma Approximate UCL (use when n>=50)					0.45	95% Gamma Adjusted UCL (use when n<50)					N/A
3002												
3003	**Estimates of Gamma Parameters using KM Estimates**											
3004	Mean (KM)					0.225	SD (KM)					0.134
3005	Variance (KM)					0.018	SE of Mean (KM)					0.063
3006	k hat (KM)					2.808	k star (KM)					1.838
3007	nu hat (KM)					44.92	nu star (KM)					29.41
3008	theta hat (KM)					0.0801	theta star (KM)					0.122
3009	80% gamma percentile (KM)					0.34	90% gamma percentile (KM)					0.446
3010	95% gamma percentile (KM)					0.548	99% gamma percentile (KM)					0.775
3011												
3012	**Gamma Kaplan-Meier (KM) Statistics**											
3013	Approximate Chi Square Value (29.41, α)					18.03	Adjusted Chi Square Value (29.41, β)					15.82
3014	95% Gamma Approximate KM-UCL (use when n>=50)					0.367	95% Gamma Adjusted KM-UCL (use when n<50)					0.418
3015												
3016	**Lognormal GOF Test on Detected Observations Only**											

3017					Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**					
3018					5% Shapiro Wilk Critical Value	0.767	Detected Data Not Lognormal at 5% Significance Level					
3019					Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**					
3020					5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level					
3021	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
3022												
3023	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3024					Mean in Original Scale	0.205				Mean in Log Scale	-1.746	
3025					SD in Original Scale	0.143				SD in Log Scale	0.57	
3026					95% t UCL (assumes normality of ROS data)	0.301				95% Percentile Bootstrap UCL	0.294	
3027					95% BCA Bootstrap UCL	0.32				95% Bootstrap t UCL	0.408	
3028					95% H-UCL (Log ROS)	0.35						
3029												
3030	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3031					KM Mean (logged)	-1.629				KM Geo Mean	0.196	
3032					KM SD (logged)	0.492				95% Critical H Value (KM-Log)	2.341	
3033					KM Standard Error of Mean (logged)	0.235				95% H-UCL (KM -Log)	0.342	
3034					KM SD (logged)	0.492				95% Critical H Value (KM-Log)	2.341	
3035					KM Standard Error of Mean (logged)	0.235						
3036												
3037	**DL/2 Statistics**											
3038	**DL/2 Normal**						**DL/2 Log-Transformed**					
3039					Mean in Original Scale	0.388				Mean in Log Scale	-1.506	
3040					SD in Original Scale	0.512				SD in Log Scale	1.075	
3041					95% t UCL (Assumes normality)	0.731				95% H-Stat UCL	1.714	
3042	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3043												
3044	**Nonparametric Distribution Free UCL Statistics**											
3045	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
3046												
3047	**Suggested UCL to Use**											
3048					95% KM (t) UCL	0.344						
3049												
3050	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
3051	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
3052												
3053	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3054	Recommendations are based upon data size, data distribution, and skewness.											
3055	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3056	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3057												
3058	**Chromium (smw8)**											
3059												
3060	**General Statistics**											
3061					Total Number of Observations	8				Number of Distinct Observations	5	
3062					Number of Detects	2				Number of Non-Detects	6	
3063					Number of Distinct Detects	2				Number of Distinct Non-Detects	4	
3064					Minimum Detect	0.21				Minimum Non-Detect	0.13	
3065					Maximum Detect	0.28				Maximum Non-Detect	3.2	
3066					Variance Detects	0.00245				Percent Non-Detects	75%	
3067					Mean Detects	0.245				SD Detects	0.0495	
3068					Median Detects	0.245				CV Detects	0.202	

3069					Skewness Detects	N/A					Kurtosis Detects	N/A
3070					Mean of Logged Detects	-1.417					SD of Logged Detects	0.203
3071												
3072					**Warning: Data set has only 2 Detected Values.**							
3073					**This is not enough to compute meaningful or reliable statistics and estimates.**							
3074												
3075												
3076					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
3077					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
3078					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
3079					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
3080												
3081					**Normal GOF Test on Detects Only**							
3082					**Not Enough Data to Perform GOF Test**							
3083												
3084					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
3085					KM Mean	0.176					KM Standard Error of Mean	0.0383
3086					KM SD	0.0605					95% KM (BCA) UCL	N/A
3087					95% KM (t) UCL	0.249					95% KM (Percentile Bootstrap) UCL	N/A
3088					95% KM (z) UCL	0.239					95% KM Bootstrap t UCL	N/A
3089					90% KM Chebyshev UCL	0.291					95% KM Chebyshev UCL	0.343
3090					97.5% KM Chebyshev UCL	0.415					99% KM Chebyshev UCL	0.557
3091												
3092					**Gamma GOF Tests on Detected Observations Only**							
3093					**Not Enough Data to Perform GOF Test**							
3094												
3095					**Gamma Statistics on Detected Data Only**							
3096					k hat (MLE)	48.66					k star (bias corrected MLE)	N/A
3097					Theta hat (MLE)	0.00503					Theta star (bias corrected MLE)	N/A
3098					nu hat (MLE)	194.7					nu star (bias corrected)	N/A
3099					Mean (detects)	0.245						
3100												
3101					**Estimates of Gamma Parameters using KM Estimates**							
3102					Mean (KM)	0.176					SD (KM)	0.0605
3103					Variance (KM)	0.00366					SE of Mean (KM)	0.0383
3104					k hat (KM)	8.454					k star (KM)	5.367
3105					nu hat (KM)	135.3					nu star (KM)	85.87
3106					theta hat (KM)	0.0208					theta star (KM)	0.0328
3107					80% gamma percentile (KM)	0.235					90% gamma percentile (KM)	0.278
3108					95% gamma percentile (KM)	0.317					99% gamma percentile (KM)	0.399
3109												
3110					**Gamma Kaplan-Meier (KM) Statistics**							
3111											Adjusted Level of Significance (β)	0.0195
3112					Approximate Chi Square Value (85.87, α)	65.51					Adjusted Chi Square Value (85.87, β)	61.03
3113					95% Gamma Approximate KM-UCL (use when n>=50)	0.231					95% Gamma Adjusted KM-UCL (use when n<50)	0.248
3114												
3115					**Lognormal GOF Test on Detected Observations Only**							
3116					**Not Enough Data to Perform GOF Test**							
3117												
3118					**Lognormal ROS Statistics Using Imputed Non-Detects**							
3119					Mean in Original Scale	0.157					Mean in Log Scale	-1.92
3120					SD in Original Scale	0.0646					SD in Log Scale	0.389

3121				95% t UCL (assumes normality of ROS data)		0.2				95% Percentile Bootstrap UCL		0.193
3122				95% BCA Bootstrap UCL		0.199				95% Bootstrap t UCL		0.219
3123				95% H-UCL (Log ROS)		0.218						
3124												
3125												
3126				KM Mean (logged)		-1.791				KM Geo Mean		0.167
3127				KM SD (logged)		0.319				95% Critical H Value (KM-Log)		2.082
3128				KM Standard Error of Mean (logged)		0.202				95% H-UCL (KM -Log)		0.226
3129				KM SD (logged)		0.319				95% Critical H Value (KM-Log)		2.082
3130				KM Standard Error of Mean (logged)		0.202						
3131												
3132												
3133												
3134				Mean in Original Scale		0.358				Mean in Log Scale		-1.547
3135				SD in Original Scale		0.508				SD in Log Scale		0.971
3136				95% t UCL (Assumes normality)		0.699				95% H-Stat UCL		1.169
3137												
3138												
3139												
3140												
3141												
3142												
3143				95% KM (t) UCL		0.249				KM H-UCL		0.226
3144				95% KM (BCA) UCL		N/A						
3145												
3146												
3147												
3148												
3149												
3150												
3151												
3152												
3153												
3154												
3155				Total Number of Observations		9				Number of Distinct Observations		9
3156				Number of Detects		6				Number of Non-Detects		3
3157				Number of Distinct Detects		6				Number of Distinct Non-Detects		3
3158				Minimum Detect		0.38				Minimum Non-Detect		0.8
3159				Maximum Detect		0.72				Maximum Non-Detect		4.6
3160				Variance Detects		0.0143				Percent Non-Detects		33.33%
3161				Mean Detects		0.552				SD Detects		0.12
3162				Median Detects		0.555				CV Detects		0.217
3163				Skewness Detects		-0.052				Kurtosis Detects		-0.365
3164				Mean of Logged Detects		-0.615				SD of Logged Detects		0.225
3165												
3166												
3167												
3168												
3169												
3170												
3171												
3172				Shapiro Wilk Test Statistic		0.986						

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

DL/2 Statistics

DL/2 Normal | **DL/2 Log-Transformed**

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium (smw9)

General Statistics

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use

guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.

For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).

Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk GOF Test

	A	B	C	D	E	F	G	H	I	J	K	L
3173	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
3174	Lilliefors Test Statistic					0.157	**Lilliefors GOF Test**					
3175	5% Lilliefors Critical Value					0.325	Detected Data appear Normal at 5% Significance Level					
3176	**Detected Data appear Normal at 5% Significance Level**											
3177												
3178	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3179	KM Mean					0.552	KM Standard Error of Mean					0.0489
3180	KM SD					0.109	95% KM (BCA) UCL					0.63
3181	95% KM (t) UCL					0.643	95% KM (Percentile Bootstrap) UCL					0.63
3182	95% KM (z) UCL					0.632	95% KM Bootstrap t UCL					0.654
3183	90% KM Chebyshev UCL					0.698	95% KM Chebyshev UCL					0.765
3184	97.5% KM Chebyshev UCL					0.857	99% KM Chebyshev UCL					1.038
3185												
3186	**Gamma GOF Tests on Detected Observations Only**											
3187	A-D Test Statistic					0.195	**Anderson-Darling GOF Test**					
3188	5% A-D Critical Value					0.697	Detected data appear Gamma Distributed at 5% Significance Level					
3189	K-S Test Statistic					0.187	**Kolmogorov-Smirnov GOF**					
3190	5% K-S Critical Value					0.332	Detected data appear Gamma Distributed at 5% Significance Level					
3191	**Detected data appear Gamma Distributed at 5% Significance Level**											
3192												
3193	**Gamma Statistics on Detected Data Only**											
3194	k hat (MLE)					24.48	k star (bias corrected MLE)					12.35
3195	Theta hat (MLE)					0.0225	Theta star (bias corrected MLE)					0.0447
3196	nu hat (MLE)					293.7	nu star (bias corrected)					148.2
3197	Mean (detects)					0.552						
3198												
3199	**Gamma ROS Statistics using Imputed Non-Detects**											
3200	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3201	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3202	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3203	This is especially true when the sample size is small.											
3204	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3205	Minimum					0.38	Mean					0.55
3206	Maximum					0.72	Median					0.547
3207	SD					0.0947	CV					0.172
3208	k hat (MLE)					36.61	k star (bias corrected MLE)					24.48
3209	Theta hat (MLE)					0.015	Theta star (bias corrected MLE)					0.0225
3210	nu hat (MLE)					658.9	nu star (bias corrected)					440.6
3211	Adjusted Level of Significance (β)					0.0231						
3212	Approximate Chi Square Value (440.63, α)					393	Adjusted Chi Square Value (440.63, β)					383.4
3213	95% Gamma Approximate UCL (use when n>=50)					0.617	95% Gamma Adjusted UCL (use when n<50)					0.632
3214												
3215	**Estimates of Gamma Parameters using KM Estimates**											
3216	Mean (KM)					0.552	SD (KM)					0.109
3217	Variance (KM)					0.0119	SE of Mean (KM)					0.0489
3218	k hat (KM)					25.47	k star (KM)					17.06
3219	nu hat (KM)					458.5	nu star (KM)					307
3220	theta hat (KM)					0.0217	theta star (KM)					0.0323
3221	80% gamma percentile (KM)					0.66	90% gamma percentile (KM)					0.728
3222	95% gamma percentile (KM)					0.788	99% gamma percentile (KM)					0.909
3223												
3224	**Gamma Kaplan-Meier (KM) Statistics**											

3225	Approximate Chi Square Value (307.01, α)					267.4	Adjusted Chi Square Value (307.01, β)					259.6
3226	95% Gamma Approximate KM-UCL (use when n>=50)					0.633	95% Gamma Adjusted KM-UCL (use when n<50)					0.652
3227												
3228	**Lognormal GOF Test on Detected Observations Only**											
3229	Shapiro Wilk Test Statistic					0.974	**Shapiro Wilk GOF Test**					
3230	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Lognormal at 5% Significance Level					
3231	Lilliefors Test Statistic					0.179	**Lilliefors GOF Test**					
3232	5% Lilliefors Critical Value					0.325	Detected Data appear Lognormal at 5% Significance Level					
3233	**Detected Data appear Lognormal at 5% Significance Level**											
3234												
3235	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3236	Mean in Original Scale					0.548	Mean in Log Scale					-0.615
3237	SD in Original Scale					0.0948	SD in Log Scale					0.178
3238	95% t UCL (assumes normality of ROS data)					0.607	95% Percentile Bootstrap UCL					0.596
3239	95% BCA Bootstrap UCL					0.598	95% Bootstrap t UCL					0.61
3240	95% H-UCL (Log ROS)					0.618						
3241												
3242	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3243	KM Mean (logged)					-0.615	KM Geo Mean					0.54
3244	KM SD (logged)					0.206	95% Critical H Value (KM-Log)					1.913
3245	KM Standard Error of Mean (logged)					0.0919	95% H-UCL (KM -Log)					0.634
3246	KM SD (logged)					0.206	95% Critical H Value (KM-Log)					1.913
3247	KM Standard Error of Mean (logged)					0.0919						
3248												
3249	**DL/2 Statistics**											
3250	**DL/2 Normal**						**DL/2 Log-Transformed**					
3251	Mean in Original Scale					0.846	Mean in Log Scale					-0.367
3252	SD in Original Scale					0.659	SD in Log Scale					0.619
3253	95% t UCL (Assumes normality)					1.254	95% H-Stat UCL					1.442
3254	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3255												
3256	**Nonparametric Distribution Free UCL Statistics**											
3257	**Detected Data appear Normal Distributed at 5% Significance Level**											
3258												
3259	**Suggested UCL to Use**											
3260	95% KM (t) UCL					0.643						
3261												
3262	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3263	Recommendations are based upon data size, data distribution, and skewness.											
3264	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3265	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3266												
3267	**Chromium (tw2r)**											
3268												
3269	**General Statistics**											
3270	Total Number of Observations					9	Number of Distinct Observations					8
3271	Number of Detects					4	Number of Non-Detects					5
3272	Number of Distinct Detects					4	Number of Distinct Non-Detects					4
3273	Minimum Detect					0.22	Minimum Non-Detect					0.5
3274	Maximum Detect					2.5	Maximum Non-Detect					4.6
3275	Variance Detects					1.116	Percent Non-Detects					55.56%
3276	Mean Detects					0.928	SD Detects					1.056

3277					Median Detects	0.495					CV Detects	1.139
3278					Skewness Detects	1.907					Kurtosis Detects	3.725
3279					Mean of Logged Detects	-0.501					SD of Logged Detects	1.02
3280												
3281	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3282	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3283	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3284	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3285												
3286	**Normal GOF Test on Detects Only**											
3287					Shapiro Wilk Test Statistic	0.738	**Shapiro Wilk GOF Test**					
3288					5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level					
3289					Lilliefors Test Statistic	0.404	**Lilliefors GOF Test**					
3290					5% Lilliefors Critical Value	0.375	Detected Data Not Normal at 5% Significance Level					
3291	**Detected Data Not Normal at 5% Significance Level**											
3292												
3293	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3294					KM Mean	0.647					KM Standard Error of Mean	0.297
3295					KM SD	0.711					95% KM (BCA) UCL	N/A
3296					95% KM (t) UCL	1.199					95% KM (Percentile Bootstrap) UCL	N/A
3297					95% KM (z) UCL	1.135					95% KM Bootstrap t UCL	N/A
3298					90% KM Chebyshev UCL	1.537					95% KM Chebyshev UCL	1.941
3299					97.5% KM Chebyshev UCL	2.501					99% KM Chebyshev UCL	3.601
3300												
3301	**Gamma GOF Tests on Detected Observations Only**											
3302					A-D Test Statistic	0.498	**Anderson-Darling GOF Test**					
3303					5% A-D Critical Value	0.664	Detected data appear Gamma Distributed at 5% Significance Level					
3304					K-S Test Statistic	0.375	**Kolmogorov-Smirnov GOF**					
3305					5% K-S Critical Value	0.401	Detected data appear Gamma Distributed at 5% Significance Level					
3306	**Detected data appear Gamma Distributed at 5% Significance Level**											
3307												
3308	**Gamma Statistics on Detected Data Only**											
3309					k hat (MLE)	1.315					k star (bias corrected MLE)	0.496
3310					Theta hat (MLE)	0.705					Theta star (bias corrected MLE)	1.872
3311					nu hat (MLE)	10.52					nu star (bias corrected)	3.964
3312					Mean (detects)	0.928						
3313												
3314	**Gamma ROS Statistics using Imputed Non-Detects**											
3315	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3316	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3317	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3318	This is especially true when the sample size is small.											
3319	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3320					Minimum	0.0128					Mean	0.571
3321					Maximum	2.5					Median	0.363
3322					SD	0.739					CV	1.294
3323					k hat (MLE)	0.95					k star (bias corrected MLE)	0.707
3324					Theta hat (MLE)	0.601					Theta star (bias corrected MLE)	0.807
3325					nu hat (MLE)	17.09					nu star (bias corrected)	12.73
3326					Adjusted Level of Significance (β)	0.0231						
3327					Approximate Chi Square Value (12.73, α)	5.711					Adjusted Chi Square Value (12.73, β)	4.758
3328					95% Gamma Approximate UCL (use when n>=50)	1.272					95% Gamma Adjusted UCL (use when n<50)	N/A

	A	B	C	D	E	F	G	H	I	J	K	L
3329												
3330	**Estimates of Gamma Parameters using KM Estimates**											
3331					Mean (KM)	0.647				SD (KM)	0.711	
3332					Variance (KM)	0.506				SE of Mean (KM)	0.297	
3333					k hat (KM)	0.827				k star (KM)	0.625	
3334					nu hat (KM)	14.88				nu star (KM)	11.25	
3335					theta hat (KM)	0.782				theta star (KM)	1.035	
3336					80% gamma percentile (KM)	1.066				90% gamma percentile (KM)	1.667	
3337					95% gamma percentile (KM)	2.293				99% gamma percentile (KM)	3.803	
3338												
3339	**Gamma Kaplan-Meier (KM) Statistics**											
3340					Approximate Chi Square Value (11.25, α)	4.739				Adjusted Chi Square Value (11.25, β)	3.887	
3341					95% Gamma Approximate KM-UCL (use when n>=50)	1.536				95% Gamma Adjusted KM-UCL (use when n<50)	1.872	
3342												
3343	**Lognormal GOF Test on Detected Observations Only**											
3344					Shapiro Wilk Test Statistic	0.905				**Shapiro Wilk GOF Test**		
3345					5% Shapiro Wilk Critical Value	0.748				Detected Data appear Lognormal at 5% Significance Level		
3346					Lilliefors Test Statistic	0.317				**Lilliefors GOF Test**		
3347					5% Lilliefors Critical Value	0.375				Detected Data appear Lognormal at 5% Significance Level		
3348	**Detected Data appear Lognormal at 5% Significance Level**											
3349												
3350	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3351					Mean in Original Scale	0.607				Mean in Log Scale	-0.82	
3352					SD in Original Scale	0.717				SD in Log Scale	0.72	
3353					95% t UCL (assumes normality of ROS data)	1.051				95% Percentile Bootstrap UCL	1.075	
3354					95% BCA Bootstrap UCL	1.121				95% Bootstrap t UCL	2.752	
3355					95% H-UCL (Log ROS)	1.123						
3356												
3357	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3358					KM Mean (logged)	-0.79				KM Geo Mean	0.454	
3359					KM SD (logged)	0.742				95% Critical H Value (KM-Log)	2.698	
3360					KM Standard Error of Mean (logged)	0.355				95% H-UCL (KM -Log)	1.213	
3361					KM SD (logged)	0.742				95% Critical H Value (KM-Log)	2.698	
3362					KM Standard Error of Mean (logged)	0.355						
3363												
3364	**DL/2 Statistics**											
3365	**DL/2 Normal**						**DL/2 Log-Transformed**					
3366					Mean in Original Scale	0.829				Mean in Log Scale	-0.607	
3367					SD in Original Scale	0.9				SD in Log Scale	0.905	
3368					95% t UCL (Assumes normality)	1.387				95% H-Stat UCL	2.164	
3369	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3370												
3371	**Nonparametric Distribution Free UCL Statistics**											
3372	**Detected Data appear Gamma Distributed at 5% Significance Level**											
3373												
3374	**Suggested UCL to Use**											
3375					95% KM Bootstrap t UCL	N/A				a Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	1.872	
3376												
3377	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3378	Recommendations are based upon data size, data distribution, and skewness.											
3379	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3380	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

	A	B	C	D	E	F	G	H	I	J	K	L
3381												
3382	**Chromium (tw5r)**											
3383												
3384	**General Statistics**											
3385					Total Number of Observations	8			Number of Distinct Observations	8		
3386					Number of Detects	3			Number of Non-Detects	5		
3387					Number of Distinct Detects	3			Number of Distinct Non-Detects	5		
3388					Minimum Detect	0.3			Minimum Non-Detect	0.21		
3389					Maximum Detect	0.99			Maximum Non-Detect	4.6		
3390					Variance Detects	0.156			Percent Non-Detects	62.5%		
3391					Mean Detects	0.533			SD Detects	0.396		
3392					Median Detects	0.31			CV Detects	0.742		
3393					Skewness Detects	1.731			Kurtosis Detects	N/A		
3394					Mean of Logged Detects	-0.795			SD of Logged Detects	0.68		
3395												
3396	**Warning: Data set has only 3 Detected Values.**											
3397	**This is not enough to compute meaningful or reliable statistics and estimates.**											
3398												
3399												
3400	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3401	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3402	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3403	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3404												
3405	**Normal GOF Test on Detects Only**											
3406					Shapiro Wilk Test Statistic	0.761			**Shapiro Wilk GOF Test**			
3407					5% Shapiro Wilk Critical Value	0.767			Detected Data Not Normal at 5% Significance Level			
3408					Lilliefors Test Statistic	0.381			**Lilliefors GOF Test**			
3409					5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level			
3410	**Detected Data appear Approximate Normal at 5% Significance Level**											
3411												
3412	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3413					KM Mean	0.393			KM Standard Error of Mean	0.136		
3414					KM SD	0.27			95% KM (BCA) UCL	N/A		
3415					95% KM (t) UCL	0.651			95% KM (Percentile Bootstrap) UCL	N/A		
3416					95% KM (z) UCL	0.617			95% KM Bootstrap t UCL	N/A		
3417					90% KM Chebyshev UCL	0.801			95% KM Chebyshev UCL	0.986		
3418					97.5% KM Chebyshev UCL	1.243			99% KM Chebyshev UCL	1.747		
3419												
3420	**Gamma GOF Tests on Detected Observations Only**											
3421	**Not Enough Data to Perform GOF Test**											
3422												
3423	**Gamma Statistics on Detected Data Only**											
3424					k hat (MLE)	3.161			k star (bias corrected MLE)	N/A		
3425					Theta hat (MLE)	0.169			Theta star (bias corrected MLE)	N/A		
3426					nu hat (MLE)	18.96			nu star (bias corrected)	N/A		
3427					Mean (detects)	0.533						
3428												
3429	**Gamma ROS Statistics using Imputed Non-Detects**											
3430	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3431	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3432	For such situations, GROS method may yield incorrect values of UCLs and BTVs											

	A	B	C	D	E	F	G	H	I	J	K	L
3433	This is especially true when the sample size is small.											
3434	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3435					Minimum	0.01				Mean		0.31
3436					Maximum	0.99				Median		0.257
3437					SD	0.291				CV		0.94
3438					k hat (MLE)	1.193				k star (bias corrected MLE)		0.829
3439					Theta hat (MLE)	0.26				Theta star (bias corrected MLE)		0.374
3440					nu hat (MLE)	19.09				nu star (bias corrected)		13.26
3441					Adjusted Level of Significance (β)	0.0195						
3442					Approximate Chi Square Value (13.26, α)	6.071				Adjusted Chi Square Value (13.26, β)		4.896
3443					95% Gamma Approximate UCL (use when n>=50)	0.677				95% Gamma Adjusted UCL (use when n<50)		N/A
3444												
3445	**Estimates of Gamma Parameters using KM Estimates**											
3446					Mean (KM)	0.393				SD (KM)		0.27
3447					Variance (KM)	0.073				SE of Mean (KM)		0.136
3448					k hat (KM)	2.113				k star (KM)		1.404
3449					nu hat (KM)	33.8				nu star (KM)		22.46
3450					theta hat (KM)	0.186				theta star (KM)		0.28
3451					80% gamma percentile (KM)	0.612				90% gamma percentile (KM)		0.832
3452					95% gamma percentile (KM)	1.046				99% gamma percentile (KM)		1.532
3453												
3454	**Gamma Kaplan-Meier (KM) Statistics**											
3455					Approximate Chi Square Value (22.46, α)	12.68				Adjusted Chi Square Value (22.46, β)		10.87
3456					95% Gamma Approximate KM-UCL (use when n>=50)	0.696				95% Gamma Adjusted KM-UCL (use when n<50)		0.811
3457												
3458	**Lognormal GOF Test on Detected Observations Only**											
3459					Shapiro Wilk Test Statistic	0.771				**Shapiro Wilk GOF Test**		
3460					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
3461					Lilliefors Test Statistic	0.377				**Lilliefors GOF Test**		
3462					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
3463	**Detected Data appear Lognormal at 5% Significance Level**											
3464												
3465	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3466					Mean in Original Scale	0.342				Mean in Log Scale		-1.258
3467					SD in Original Scale	0.27				SD in Log Scale		0.605
3468					95% t UCL (assumes normality of ROS data)	0.522				95% Percentile Bootstrap UCL		0.521
3469					95% BCA Bootstrap UCL	0.544				95% Bootstrap t UCL		0.973
3470					95% H-UCL (Log ROS)	0.61						
3471												
3472	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3473					KM Mean (logged)	-1.095				KM Geo Mean		0.335
3474					KM SD (logged)	0.511				95% Critical H Value (KM-Log)		2.373
3475					KM Standard Error of Mean (logged)	0.264				95% H-UCL (KM -Log)		0.603
3476					KM SD (logged)	0.511				95% Critical H Value (KM-Log)		2.373
3477					KM Standard Error of Mean (logged)	0.264						
3478												
3479	**DL/2 Statistics**											
3480	**DL/2 Normal**						**DL/2 Log-Transformed**					
3481					Mean in Original Scale	0.753				Mean in Log Scale		-0.816
3482					SD in Original Scale	0.809				SD in Log Scale		1.112
3483					95% t UCL (Assumes normality)	1.295				95% H-Stat UCL		3.906
3484	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											

	A	B	C	D	E	F	G	H	I	J	K	L
3485												
3486	**Nonparametric Distribution Free UCL Statistics**											
3487	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
3488												
3489	**Suggested UCL to Use**											
3490	95% KM (t) UCL	0.651										
3491												
3492	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
3493	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
3494												
3495	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3496	Recommendations are based upon data size, data distribution, and skewness.											
3497	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3498	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3499												
3500												
3501	**Chromium (waste water clarifier well)**											
3502												
3503	**General Statistics**											
3504	Total Number of Observations	1				Number of Distinct Observations	1					
3505						Number of Missing Observations	0					
3506	Minimum	2.3				Mean	2.3					
3507	Maximum	2.3				Median	2.3					
3508												
3509	**Warning: This data set only has 1 observations!**											
3510	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
3511	**The data set for variable Chromium (waste water clarifier well) was not processed!**											
3512												
3513	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
3514	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
3515												
3516												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 10:54:20 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cobalt (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	7
Number of Detects	3	Number of Non-Detects	6
Number of Distinct Detects	3	Number of Distinct Non-Detects	5
Minimum Detect	0.12	Minimum Non-Detect	0.085
Maximum Detect	0.21	Maximum Non-Detect	0.5
Variance Detects	0.0021	Percent Non-Detects	66.67%
Mean Detects	0.16	SD Detects	0.0458
Median Detects	0.15	CV Detects	0.286
Skewness Detects	0.935	Kurtosis Detects	N/A
Mean of Logged Detects	-1.859	SD of Logged Detects	0.282

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.124	KM Standard Error of Mean	0.0228
KM SD	0.045	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.167	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.162	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.193	95% KM Chebyshev UCL	0.224
97.5% KM Chebyshev UCL	0.267	99% KM Chebyshev UCL	0.352

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

51	**Gamma Statistics on Detected Data Only**											
52					k hat (MLE)	18.85			k star (bias corrected MLE)		N/A	
53					Theta hat (MLE)	0.00849			Theta star (bias corrected MLE)		N/A	
54					nu hat (MLE)	113.1			nu star (bias corrected)		N/A	
55					Mean (detects)	0.16						
56												
57	**Gamma ROS Statistics using Imputed Non-Detects**											
58	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
59	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
60	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
61	This is especially true when the sample size is small.											
62	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
63					Minimum	0.0326			Mean		0.107	
64					Maximum	0.21			Median		0.104	
65					SD	0.0513			CV		0.48	
66					k hat (MLE)	4.572			k star (bias corrected MLE)		3.122	
67					Theta hat (MLE)	0.0234			Theta star (bias corrected MLE)		0.0342	
68					nu hat (MLE)	82.3			nu star (bias corrected)		56.2	
69					Adjusted Level of Significance (β)	0.0231						
70					Approximate Chi Square Value (56.20, α)	39.97			Adjusted Chi Square Value (56.20, β)		37.1	
71					95% Gamma Approximate UCL (use when n>=50)	0.15			95% Gamma Adjusted UCL (use when n<50)		N/A	
72												
73	**Estimates of Gamma Parameters using KM Estimates**											
74					Mean (KM)	0.124			SD (KM)		0.045	
75					Variance (KM)	0.00202			SE of Mean (KM)		0.0228	
76					k hat (KM)	7.649			k star (KM)		5.173	
77					nu hat (KM)	137.7			nu star (KM)		93.12	
78					theta hat (KM)	0.0163			theta star (KM)		0.0241	
79					80% gamma percentile (KM)	0.167			90% gamma percentile (KM)		0.198	
80					95% gamma percentile (KM)	0.226			99% gamma percentile (KM)		0.286	
81												
82	**Gamma Kaplan-Meier (KM) Statistics**											
83					Approximate Chi Square Value (93.12, α)	71.86			Adjusted Chi Square Value (93.12, β)		67.94	
84					95% Gamma Approximate KM-UCL (use when n>=50)	0.161			95% Gamma Adjusted KM-UCL (use when n<50)		0.171	
85												
86	**Lognormal GOF Test on Detected Observations Only**											
87					Shapiro Wilk Test Statistic	0.986			**Shapiro Wilk GOF Test**			
88					5% Shapiro Wilk Critical Value	0.767			Detected Data appear Lognormal at 5% Significance Level			
89					Lilliefors Test Statistic	0.22			**Lilliefors GOF Test**			
90					5% Lilliefors Critical Value	0.425			Detected Data appear Lognormal at 5% Significance Level			
91	**Detected Data appear Lognormal at 5% Significance Level**											
92												
93	**Lognormal ROS Statistics Using Imputed Non-Detects**											
94					Mean in Original Scale	0.116			Mean in Log Scale		-2.213	
95					SD in Original Scale	0.043			SD in Log Scale		0.345	
96					95% t UCL (assumes normality of ROS data)	0.142			95% Percentile Bootstrap UCL		0.14	
97					95% BCA Bootstrap UCL	0.144			95% Bootstrap t UCL		0.16	
98					95% H-UCL (Log ROS)	0.149						
99												
100	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
101					KM Mean (logged)	-2.143			KM Geo Mean		0.117	
102					KM SD (logged)	0.336			95% Critical H Value (KM-Log)		2.053	

103	KM Standard Error of Mean (logged)					0.172	95% H-UCL (KM -Log)					0.158
104	KM SD (logged)					0.336	95% Critical H Value (KM-Log)					2.053
105	KM Standard Error of Mean (logged)					0.172						
106												
107	**DL/2 Statistics**											
108	**DL/2 Normal**						**DL/2 Log-Transformed**					
109	Mean in Original Scale					0.137	Mean in Log Scale					-2.165
110	SD in Original Scale					0.0762	SD in Log Scale					0.671
111	95% t UCL (Assumes normality)					0.184	95% H-Stat UCL					0.264
112	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
113												
114	**Nonparametric Distribution Free UCL Statistics**											
115	**Detected Data appear Normal Distributed at 5% Significance Level**											
116												
117	**Suggested UCL to Use**											
118	95% KM (t) UCL					0.167						
119												
120	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
121	Recommendations are based upon data size, data distribution, and skewness.											
122	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
123	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
124												
125	**Cobalt (nfmw10)**											
126												
127	**General Statistics**											
128	Total Number of Observations					8	Number of Distinct Observations					8
129	Number of Detects					6	Number of Non-Detects					2
130	Number of Distinct Detects					6	Number of Distinct Non-Detects					2
131	Minimum Detect					0.35	Minimum Non-Detect					0.76
132	Maximum Detect					0.85	Maximum Non-Detect					1.7
133	Variance Detects					0.0331	Percent Non-Detects					25%
134	Mean Detects					0.545	SD Detects					0.182
135	Median Detects					0.535	CV Detects					0.334
136	Skewness Detects					0.84	Kurtosis Detects					0.71
137	Mean of Logged Detects					-0.652	SD of Logged Detects					0.327
138												
139	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
140	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
141	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
142	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
143												
144	**Normal GOF Test on Detects Only**											
145	Shapiro Wilk Test Statistic					0.935	**Shapiro Wilk GOF Test**					
146	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
147	Lilliefors Test Statistic					0.173	**Lilliefors GOF Test**					
148	5% Lilliefors Critical Value					0.325	Detected Data appear Normal at 5% Significance Level					
149	**Detected Data appear Normal at 5% Significance Level**											
150												
151	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
152	KM Mean					0.536	KM Standard Error of Mean					0.0686
153	KM SD					0.16	95% KM (BCA) UCL					0.636
154	95% KM (t) UCL					0.666	95% KM (Percentile Bootstrap) UCL					0.643

	A	B	C	D	E	F	G	H	I	J	K	L
155					95% KM (z) UCL	0.649				95% KM Bootstrap t UCL		0.694
156					90% KM Chebyshev UCL	0.742				95% KM Chebyshev UCL		0.835
157					97.5% KM Chebyshev UCL	0.965				99% KM Chebyshev UCL		1.219
158												
159					**Gamma GOF Tests on Detected Observations Only**							
160					A-D Test Statistic	0.231	**Anderson-Darling GOF Test**					
161					5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level					
162					K-S Test Statistic	0.185	**Kolmogorov-Smirnov GOF**					
163					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
164					**Detected data appear Gamma Distributed at 5% Significance Level**							
165												
166					**Gamma Statistics on Detected Data Only**							
167					k hat (MLE)	11.3	k star (bias corrected MLE)					5.763
168					Theta hat (MLE)	0.0482	Theta star (bias corrected MLE)					0.0946
169					nu hat (MLE)	135.6	nu star (bias corrected)					69.16
170					Mean (detects)	0.545						
171												
172					**Gamma ROS Statistics using Imputed Non-Detects**							
173					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
174					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
175					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
176					This is especially true when the sample size is small.							
177					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
178					Minimum	0.35	Mean					0.534
179					Maximum	0.85	Median					0.515
180					SD	0.155	CV					0.291
181					k hat (MLE)	14.69	k star (bias corrected MLE)					9.262
182					Theta hat (MLE)	0.0364	Theta star (bias corrected MLE)					0.0577
183					nu hat (MLE)	235	nu star (bias corrected)					148.2
184					Adjusted Level of Significance (β)	0.0195						
185					Approximate Chi Square Value (148.20, α)	121.1	Adjusted Chi Square Value (148.20, β)					114.9
186					95% Gamma Approximate UCL (use when n>=50)	0.654	95% Gamma Adjusted UCL (use when n<50)					0.689
187												
188					**Estimates of Gamma Parameters using KM Estimates**							
189					Mean (KM)	0.536	SD (KM)					0.16
190					Variance (KM)	0.0256	SE of Mean (KM)					0.0686
191					k hat (KM)	11.23	k star (KM)					7.102
192					nu hat (KM)	179.7	nu star (KM)					113.6
193					theta hat (KM)	0.0478	theta star (KM)					0.0755
194					80% gamma percentile (KM)	0.694	90% gamma percentile (KM)					0.805
195					95% gamma percentile (KM)	0.904	99% gamma percentile (KM)					1.111
196												
197					**Gamma Kaplan-Meier (KM) Statistics**							
198					Approximate Chi Square Value (113.63, α)	90.02	Adjusted Chi Square Value (113.63, β)					84.71
199					95% Gamma Approximate KM-UCL (use when n>=50)	0.677	95% Gamma Adjusted KM-UCL (use when n<50)					0.719
200												
201					**Lognormal GOF Test on Detected Observations Only**							
202					Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**					
203					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level					
204					Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**					
205					5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level					
206					**Detected Data appear Lognormal at 5% Significance Level**							

207												
208	**Lognormal ROS Statistics Using Imputed Non-Detects**											
209					Mean in Original Scale	0.532				Mean in Log Scale	-0.666	
210					SD in Original Scale	0.156				SD in Log Scale	0.278	
211					95% t UCL (assumes normality of ROS data)	0.636				95% Percentile Bootstrap UCL	0.625	
212					95% BCA Bootstrap UCL	0.637				95% Bootstrap t UCL	0.677	
213					95% H-UCL (Log ROS)	0.661						
214												
215	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
216					KM Mean (logged)	-0.666				KM Geo Mean	0.514	
217					KM SD (logged)	0.291				95% Critical H Value (KM-Log)	2.046	
218					KM Standard Error of Mean (logged)	0.126				95% H-UCL (KM -Log)	0.671	
219					KM SD (logged)	0.291				95% Critical H Value (KM-Log)	2.046	
220					KM Standard Error of Mean (logged)	0.126						
221												
222	**DL/2 Statistics**											
223					**DL/2 Normal**					**DL/2 Log-Transformed**		
224					Mean in Original Scale	0.563				Mean in Log Scale	-0.63	
225					SD in Original Scale	0.201				SD in Log Scale	0.352	
226					95% t UCL (Assumes normality)	0.697				95% H-Stat UCL	0.752	
227	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
228												
229	**Nonparametric Distribution Free UCL Statistics**											
230	**Detected Data appear Normal Distributed at 5% Significance Level**											
231												
232	**Suggested UCL to Use**											
233					95% KM (t) UCL	0.666						
234												
235	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
236	Recommendations are based upon data size, data distribution, and skewness.											
237	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
238	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
239												
240	**Cobalt (nfmw11)**											
241												
242	**General Statistics**											
243					Total Number of Observations	8				Number of Distinct Observations	8	
244					Number of Detects	6				Number of Non-Detects	2	
245					Number of Distinct Detects	6				Number of Distinct Non-Detects	2	
246					Minimum Detect	0.2				Minimum Non-Detect	0.43	
247					Maximum Detect	0.36				Maximum Non-Detect	1.7	
248					Variance Detects	0.00394				Percent Non-Detects	25%	
249					Mean Detects	0.268				SD Detects	0.0627	
250					Median Detects	0.255				CV Detects	0.234	
251					Skewness Detects	0.512				Kurtosis Detects	-1.409	
252					Mean of Logged Detects	-1.338				SD of Logged Detects	0.231	
253												
254	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
255	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
256	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
257	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
258												

259	**Normal GOF Test on Detects Only**											
260					Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**					
261					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
262					Lilliefors Test Statistic	0.229	**Lilliefors GOF Test**					
263					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
264	**Detected Data appear Normal at 5% Significance Level**											
265												
266	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
267					KM Mean	0.268			KM Standard Error of Mean	0.0256		
268					KM SD	0.0573			95% KM (BCA) UCL	0.305		
269					95% KM (t) UCL	0.317			95% KM (Percentile Bootstrap) UCL	0.31		
270					95% KM (z) UCL	0.31			95% KM Bootstrap t UCL	0.339		
271					90% KM Chebyshev UCL	0.345			95% KM Chebyshev UCL	0.38		
272					97.5% KM Chebyshev UCL	0.428			99% KM Chebyshev UCL	0.523		
273												
274	**Gamma GOF Tests on Detected Observations Only**											
275					A-D Test Statistic	0.292	**Anderson-Darling GOF Test**					
276					5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level					
277					K-S Test Statistic	0.24	**Kolmogorov-Smirnov GOF**					
278					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
279	**Detected data appear Gamma Distributed at 5% Significance Level**											
280												
281	**Gamma Statistics on Detected Data Only**											
282					k hat (MLE)	22.53			k star (bias corrected MLE)	11.38		
283					Theta hat (MLE)	0.0119			Theta star (bias corrected MLE)	0.0236		
284					nu hat (MLE)	270.4			nu star (bias corrected)	136.5		
285					Mean (detects)	0.268						
286												
287	**Gamma ROS Statistics using Imputed Non-Detects**											
288	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
289	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
290	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
291	This is especially true when the sample size is small.											
292	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
293					Minimum	0.2			Mean	0.268		
294					Maximum	0.36			Median	0.266		
295					SD	0.053			CV	0.198		
296					k hat (MLE)	29.97			k star (bias corrected MLE)	18.81		
297					Theta hat (MLE)	0.00893			Theta star (bias corrected MLE)	0.0142		
298					nu hat (MLE)	479.5			nu star (bias corrected)	301		
299					Adjusted Level of Significance (β)	0.0195						
300					Approximate Chi Square Value (301.00, α)	261.8			Adjusted Chi Square Value (301.00, β)	252.5		
301					95% Gamma Approximate UCL (use when n>=50)	0.308			95% Gamma Adjusted UCL (use when n<50)	0.319		
302												
303	**Estimates of Gamma Parameters using KM Estimates**											
304					Mean (KM)	0.268			SD (KM)	0.0573		
305					Variance (KM)	0.00328			SE of Mean (KM)	0.0256		
306					k hat (KM)	21.95			k star (KM)	13.8		
307					nu hat (KM)	351.2			nu star (KM)	220.8		
308					theta hat (KM)	0.0122			theta star (KM)	0.0194		
309					80% gamma percentile (KM)	0.326			90% gamma percentile (KM)	0.364		
310					95% gamma percentile (KM)	0.397			99% gamma percentile (KM)	0.464		

311												
312	**Gamma Kaplan-Meier (KM) Statistics**											
313	Approximate Chi Square Value (220.82, α)					187.4	Adjusted Chi Square Value (220.82, β)					179.6
314	95% Gamma Approximate KM-UCL (use when n>=50)					0.316	95% Gamma Adjusted KM-UCL (use when n<50)					0.33
315												
316	**Lognormal GOF Test on Detected Observations Only**											
317	Shapiro Wilk Test Statistic					0.942	**Shapiro Wilk GOF Test**					
318	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Lognormal at 5% Significance Level					
319	Lilliefors Test Statistic					0.216	**Lilliefors GOF Test**					
320	5% Lilliefors Critical Value					0.325	Detected Data appear Lognormal at 5% Significance Level					
321	**Detected Data appear Lognormal at 5% Significance Level**											
322												
323	**Lognormal ROS Statistics Using Imputed Non-Detects**											
324	Mean in Original Scale					0.267	Mean in Log Scale					-1.338
325	SD in Original Scale					0.0531	SD in Log Scale					0.195
326	95% t UCL (assumes normality of ROS data)					0.302	95% Percentile Bootstrap UCL					0.296
327	95% BCA Bootstrap UCL					0.298	95% Bootstrap t UCL					0.312
328	95% H-UCL (Log ROS)					0.308						
329												
330	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
331	KM Mean (logged)					-1.338	KM Geo Mean					0.262
332	KM SD (logged)					0.21	95% Critical H Value (KM-Log)					1.954
333	KM Standard Error of Mean (logged)					0.0941	95% H-UCL (KM -Log)					0.313
334	KM SD (logged)					0.21	95% Critical H Value (KM-Log)					1.954
335	KM Standard Error of Mean (logged)					0.0941						
336												
337	**DL/2 Statistics**											
338	**DL/2 Normal**						**DL/2 Log-Transformed**					
339	Mean in Original Scale					0.334	Mean in Log Scale					-1.216
340	SD in Original Scale					0.216	SD in Log Scale					0.473
341	95% t UCL (Assumes normality)					0.479	95% H-Stat UCL					0.501
342	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
343												
344	**Nonparametric Distribution Free UCL Statistics**											
345	**Detected Data appear Normal Distributed at 5% Significance Level**											
346												
347	**Suggested UCL to Use**											
348	95% KM (t) UCL					0.317						
349												
350	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
351	Recommendations are based upon data size, data distribution, and skewness.											
352	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
353	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
354												
355	**Cobalt (nfmw12)**											
356												
357	**General Statistics**											
358	Total Number of Observations					8	Number of Distinct Observations					7
359	Number of Detects					3	Number of Non-Detects					5
360	Number of Distinct Detects					3	Number of Distinct Non-Detects					4
361	Minimum Detect					0.12	Minimum Non-Detect					0.085
362	Maximum Detect					5	Maximum Non-Detect					0.5

363					Variance Detects	7.686					Percent Non-Detects	62.5%
364					Mean Detects	1.8					SD Detects	2.772
365					Median Detects	0.28					CV Detects	1.54
366					Skewness Detects	1.726					Kurtosis Detects	N/A
367					Mean of Logged Detects	-0.595					SD of Logged Detects	1.955
368												
369	**Warning: Data set has only 3 Detected Values.**											
370	**This is not enough to compute meaningful or reliable statistics and estimates.**											
371												
372												
373	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
374	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
375	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
376	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
377												
378	**Normal GOF Test on Detects Only**											
379					Shapiro Wilk Test Statistic	0.775	**Shapiro Wilk GOF Test**					
380					5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level					
381					Lilliefors Test Statistic	0.375	**Lilliefors GOF Test**					
382					5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level					
383	**Detected Data appear Normal at 5% Significance Level**											
384												
385	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
386					KM Mean	0.754					KM Standard Error of Mean	0.696
387					KM SD	1.607					95% KM (BCA) UCL	N/A
388					95% KM (t) UCL	2.073					95% KM (Percentile Bootstrap) UCL	N/A
389					95% KM (z) UCL	1.899					95% KM Bootstrap t UCL	N/A
390					90% KM Chebyshev UCL	2.842					95% KM Chebyshev UCL	3.789
391					97.5% KM Chebyshev UCL	5.102					99% KM Chebyshev UCL	7.681
392												
393	**Gamma GOF Tests on Detected Observations Only**											
394	**Not Enough Data to Perform GOF Test**											
395												
396	**Gamma Statistics on Detected Data Only**											
397					k hat (MLE)	0.532					k star (bias corrected MLE)	N/A
398					Theta hat (MLE)	3.383					Theta star (bias corrected MLE)	N/A
399					nu hat (MLE)	3.193					nu star (bias corrected)	N/A
400					Mean (detects)	1.8						
401												
402	**Gamma ROS Statistics using Imputed Non-Detects**											
403	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
404	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
405	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
406	This is especially true when the sample size is small.											
407	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
408					Minimum	0.01					Mean	0.681
409					Maximum	5					Median	0.01
410					SD	1.748					CV	2.565
411					k hat (MLE)	0.26					k star (bias corrected MLE)	0.246
412					Theta hat (MLE)	2.622					Theta star (bias corrected MLE)	2.773
413					nu hat (MLE)	4.156					nu star (bias corrected)	3.931
414					Adjusted Level of Significance (β)	0.0195						

415	Approximate Chi Square Value (3.93, α)					0.695	Adjusted Chi Square Value (3.93, β)					0.423
416	95% Gamma Approximate UCL (use when n>=50)					3.855	95% Gamma Adjusted UCL (use when n<50)					N/A
417												
418	**Estimates of Gamma Parameters using KM Estimates**											
419	Mean (KM)					0.754	SD (KM)					1.607
420	Variance (KM)					2.581	SE of Mean (KM)					0.696
421	k hat (KM)					0.22	k star (KM)					0.221
422	nu hat (KM)					3.519	nu star (KM)					3.533
423	theta hat (KM)					3.426	theta star (KM)					3.413
424	80% gamma percentile (KM)					1.042	90% gamma percentile (KM)					2.276
425	95% gamma percentile (KM)					3.78	99% gamma percentile (KM)					7.858
426												
427	**Gamma Kaplan-Meier (KM) Statistics**											
428	Approximate Chi Square Value (3.53, α)					0.546	Adjusted Chi Square Value (3.53, β)					0.323
429	95% Gamma Approximate KM-UCL (use when n>=50)					4.872	95% Gamma Adjusted KM-UCL (use when n<50)					8.235
430												
431	**Lognormal GOF Test on Detected Observations Only**											
432	Shapiro Wilk Test Statistic					0.91	**Shapiro Wilk GOF Test**					
433	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Lognormal at 5% Significance Level					
434	Lilliefors Test Statistic					0.302	**Lilliefors GOF Test**					
435	5% Lilliefors Critical Value					0.425	Detected Data appear Lognormal at 5% Significance Level					
436	**Detected Data appear Lognormal at 5% Significance Level**											
437												
438	**Lognormal ROS Statistics Using Imputed Non-Detects**											
439	Mean in Original Scale					0.71	Mean in Log Scale					-2.302
440	SD in Original Scale					1.736	SD in Log Scale					1.936
441	95% t UCL (assumes normality of ROS data)					1.872	95% Percentile Bootstrap UCL					1.927
442	95% BCA Bootstrap UCL					2.537	95% Bootstrap t UCL					22.03
443	95% H-UCL (Log ROS)					50.95						
444												
445	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
446	KM Mean (logged)					-1.582	KM Geo Mean					0.206
447	KM SD (logged)					1.283	95% Critical H Value (KM-Log)					4.154
448	KM Standard Error of Mean (logged)					0.582	95% H-UCL (KM -Log)					3.506
449	KM SD (logged)					1.283	95% Critical H Value (KM-Log)					4.154
450	KM Standard Error of Mean (logged)					0.582						
451												
452	**DL/2 Statistics**											
453	**DL/2 Normal**						**DL/2 Log-Transformed**					
454	Mean in Original Scale					0.779	Mean in Log Scale					-1.48
455	SD in Original Scale					1.708	SD in Log Scale					1.418
456	95% t UCL (Assumes normality)					1.923	95% H-Stat UCL					6.988
457	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
458												
459	**Nonparametric Distribution Free UCL Statistics**											
460	**Detected Data appear Normal Distributed at 5% Significance Level**											
461												
462	**Suggested UCL to Use**											
463	95% KM (t) UCL					2.073						
464												
465	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
466	Recommendations are based upon data size, data distribution, and skewness.											

	A	B	C	D	E	F	G	H	I	J	K	L
467	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
468	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
469												
470												
471	**Cobalt (nfmw19)**											
472												
473	**General Statistics**											
474						Total Number of Observations	8			Number of Distinct Observations	8	
475										Number of Missing Observations	0	
476						Minimum	0.44			Mean	20.62	
477						Maximum	98.4			Median	7.5	
478						SD	32.56			Std. Error of Mean	11.51	
479						Coefficient of Variation	1.579			Skewness	2.467	
480												
481	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
482	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
483	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
484	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
485												
486	**Normal GOF Test**											
487						Shapiro Wilk Test Statistic	0.642			**Shapiro Wilk GOF Test**		
488						5% Shapiro Wilk Critical Value	0.818			Data Not Normal at 5% Significance Level		
489						Lilliefors Test Statistic	0.353			**Lilliefors GOF Test**		
490						5% Lilliefors Critical Value	0.283			Data Not Normal at 5% Significance Level		
491	**Data Not Normal at 5% Significance Level**											
492												
493	**Assuming Normal Distribution**											
494						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
495						95% Student's-t UCL	42.43			95% Adjusted-CLT UCL (Chen-1995)	50.28	
496										95% Modified-t UCL (Johnson-1978)	44.1	
497												
498	**Gamma GOF Test**											
499						A-D Test Statistic	0.296			**Anderson-Darling Gamma GOF Test**		
500						5% A-D Critical Value	0.755			Detected data appear Gamma Distributed at 5% Significance Level		
501						K-S Test Statistic	0.185			**Kolmogorov-Smirnov Gamma GOF Test**		
502						5% K-S Critical Value	0.307			Detected data appear Gamma Distributed at 5% Significance Level		
503	**Detected data appear Gamma Distributed at 5% Significance Level**											
504												
505	**Gamma Statistics**											
506						k hat (MLE)	0.611			k star (bias corrected MLE)	0.465	
507						Theta hat (MLE)	33.75			Theta star (bias corrected MLE)	44.33	
508						nu hat (MLE)	9.773			nu star (bias corrected)	7.442	
509						MLE Mean (bias corrected)	20.62			MLE Sd (bias corrected)	30.23	
510										Approximate Chi Square Value (0.05)	2.416	
511						Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	1.756	
512												
513	**Assuming Gamma Distribution**											
514						95% Approximate Gamma UCL (use when n>=50)	63.5			95% Adjusted Gamma UCL (use when n<50)	87.36	
515												
516	**Lognormal GOF Test**											
517						Shapiro Wilk Test Statistic	0.984			**Shapiro Wilk Lognormal GOF Test**		
518						5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level		

519				Lilliefors Test Statistic	0.13	**Lilliefors Lognormal GOF Test**						
520				5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level						
521	**Data appear Lognormal at 5% Significance Level**											
522												
523	**Lognormal Statistics**											
524				Minimum of Logged Data	-0.821	Mean of logged Data	2.017					
525				Maximum of Logged Data	4.589	SD of logged Data	1.656					
526												
527	**Assuming Lognormal Distribution**											
528				95% H-UCL	751.7	90% Chebyshev (MVUE) UCL	60.45					
529				95% Chebyshev (MVUE) UCL	77.86	97.5% Chebyshev (MVUE) UCL	102					
530				99% Chebyshev (MVUE) UCL	149.5							
531												
532	**Nonparametric Distribution Free UCL Statistics**											
533	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
534												
535	**Nonparametric Distribution Free UCLs**											
536				95% CLT UCL	39.55	95% Jackknife UCL	42.43					
537				95% Standard Bootstrap UCL	38.76	95% Bootstrap-t UCL	86.91					
538				95% Hall's Bootstrap UCL	103.1	95% Percentile Bootstrap UCL	41.66					
539				95% BCA Bootstrap UCL	51.56							
540				90% Chebyshev(Mean, Sd) UCL	55.15	95% Chebyshev(Mean, Sd) UCL	70.79					
541				97.5% Chebyshev(Mean, Sd) UCL	92.51	99% Chebyshev(Mean, Sd) UCL	135.2					
542												
543	**Suggested UCL to Use**											
544				95% Adjusted Gamma UCL	87.36							
545												
546	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
547	Recommendations are based upon data size, data distribution, and skewness.											
548	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
549	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
550												
551	**Cobalt (nfmw1d)**											
552												
553	**General Statistics**											
554				Total Number of Observations	9	Number of Distinct Observations	7					
555				Number of Detects	7	Number of Non-Detects	2					
556				Number of Distinct Detects	6	Number of Distinct Non-Detects	1					
557				Minimum Detect	0.4	Minimum Non-Detect	1.7					
558				Maximum Detect	0.6	Maximum Non-Detect	1.7					
559				Variance Detects	0.00529	Percent Non-Detects	22.22%					
560				Mean Detects	0.473	SD Detects	0.0727					
561				Median Detects	0.46	CV Detects	0.154					
562				Skewness Detects	0.804	Kurtosis Detects	0.0447					
563				Mean of Logged Detects	-0.759	SD of Logged Detects	0.149					
564												
565	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
566	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
567	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
568	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
569												
570	**Normal GOF Test on Detects Only**											

571				Shapiro Wilk Test Statistic		0.919	**Shapiro Wilk GOF Test**					
572				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Normal at 5% Significance Level					
573				Lilliefors Test Statistic		0.158	**Lilliefors GOF Test**					
574				5% Lilliefors Critical Value		0.304	Detected Data appear Normal at 5% Significance Level					
575	**Detected Data appear Normal at 5% Significance Level**											
576												
577	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
578				KM Mean		0.473	KM Standard Error of Mean					0.0275
579				KM SD		0.0673	95% KM (BCA) UCL					0.517
580				95% KM (t) UCL		0.524	95% KM (Percentile Bootstrap) UCL					0.516
581				95% KM (z) UCL		0.518	95% KM Bootstrap t UCL					0.546
582				90% KM Chebyshev UCL		0.555	95% KM Chebyshev UCL					0.593
583				97.5% KM Chebyshev UCL		0.645	99% KM Chebyshev UCL					0.746
584												
585	**Gamma GOF Tests on Detected Observations Only**											
586				A-D Test Statistic		0.282	**Anderson-Darling GOF Test**					
587				5% A-D Critical Value		0.708	Detected data appear Gamma Distributed at 5% Significance Level					
588				K-S Test Statistic		0.162	**Kolmogorov-Smirnov GOF**					
589				5% K-S Critical Value		0.311	Detected data appear Gamma Distributed at 5% Significance Level					
590	**Detected data appear Gamma Distributed at 5% Significance Level**											
591												
592	**Gamma Statistics on Detected Data Only**											
593				k hat (MLE)		51.45	k star (bias corrected MLE)					29.5
594				Theta hat (MLE)		0.00919	Theta star (bias corrected MLE)					0.016
595				nu hat (MLE)		720.3	nu star (bias corrected)					412.9
596				Mean (detects)		0.473						
597												
598	**Gamma ROS Statistics using Imputed Non-Detects**											
599	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
600	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
601	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
602	This is especially true when the sample size is small.											
603	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
604				Minimum		0.4	Mean					0.473
605				Maximum		0.6	Median					0.46
606				SD		0.0659	CV					0.139
607				k hat (MLE)		60.23	k star (bias corrected MLE)					40.23
608				Theta hat (MLE)		0.00785	Theta star (bias corrected MLE)					0.0117
609				nu hat (MLE)		1084	nu star (bias corrected)					724.1
610				Adjusted Level of Significance (β)		0.0231						
611				Approximate Chi Square Value (724.05, α)		662.6	Adjusted Chi Square Value (724.05, β)					650.2
612				95% Gamma Approximate UCL (use when n>=50)		0.516	95% Gamma Adjusted UCL (use when n<50)					0.526
613												
614	**Estimates of Gamma Parameters using KM Estimates**											
615				Mean (KM)		0.473	SD (KM)					0.0673
616				Variance (KM)		0.00453	SE of Mean (KM)					0.0275
617				k hat (KM)		49.31	k star (KM)					32.95
618				nu hat (KM)		887.5	nu star (KM)					593
619				theta hat (KM)		0.00959	theta star (KM)					0.0144
620				80% gamma percentile (KM)		0.54	90% gamma percentile (KM)					0.581
621				95% gamma percentile (KM)		0.616	99% gamma percentile (KM)					0.685
622												

623	**Gamma Kaplan-Meier (KM) Statistics**											
624	Approximate Chi Square Value (593.02, α)				537.5	Adjusted Chi Square Value (593.02, β)					526.4	
625	95% Gamma Approximate KM-UCL (use when n>=50)				0.522	95% Gamma Adjusted KM-UCL (use when n<50)					0.533	
626												
627	**Lognormal GOF Test on Detected Observations Only**											
628	Shapiro Wilk Test Statistic				0.932	**Shapiro Wilk GOF Test**						
629	5% Shapiro Wilk Critical Value				0.803	Detected Data appear Lognormal at 5% Significance Level						
630	Lilliefors Test Statistic				0.146	**Lilliefors GOF Test**						
631	5% Lilliefors Critical Value				0.304	Detected Data appear Lognormal at 5% Significance Level						
632	**Detected Data appear Lognormal at 5% Significance Level**											
633												
634	**Lognormal ROS Statistics Using Imputed Non-Detects**											
635	Mean in Original Scale				0.472	Mean in Log Scale					-0.759	
636	SD in Original Scale				0.0657	SD in Log Scale					0.135	
637	95% t UCL (assumes normality of ROS data)				0.513	95% Percentile Bootstrap UCL					0.509	
638	95% BCA Bootstrap UCL				0.513	95% Bootstrap t UCL					0.526	
639	95% H-UCL (Log ROS)				0.516							
640												
641	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
642	KM Mean (logged)				-0.759	KM Geo Mean					0.468	
643	KM SD (logged)				0.138	95% Critical H Value (KM-Log)					1.853	
644	KM Standard Error of Mean (logged)				0.0565	95% H-UCL (KM -Log)					0.518	
645	KM SD (logged)				0.138	95% Critical H Value (KM-Log)					1.853	
646	KM Standard Error of Mean (logged)				0.0565							
647												
648	**DL/2 Statistics**											
649	**DL/2 Normal**					**DL/2 Log-Transformed**						
650	Mean in Original Scale				0.557	Mean in Log Scale					-0.626	
651	SD in Original Scale				0.178	SD in Log Scale					0.293	
652	95% t UCL (Assumes normality)				0.667	95% H-Stat UCL					0.687	
653	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
654												
655	**Nonparametric Distribution Free UCL Statistics**											
656	**Detected Data appear Normal Distributed at 5% Significance Level**											
657												
658	**Suggested UCL to Use**											
659	95% KM (t) UCL				0.524							
660												
661	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
662	Recommendations are based upon data size, data distribution, and skewness.											
663	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
664	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
665												
666												
667	**Cobalt (nfmw1s)**											
668												
669	**General Statistics**											
670	Total Number of Observations				7	Number of Distinct Observations					7	
671						Number of Missing Observations					0	
672	Minimum				0.42	Mean					1.429	
673	Maximum				4.7	Median					1	
674	SD				1.493	Std. Error of Mean					0.564	

675				Coefficient of Variation		1.045					Skewness	2.29
676												
677	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
678	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
679	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
680	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
681												
682	Normal GOF Test											
683				Shapiro Wilk Test Statistic		0.692	Shapiro Wilk GOF Test					
684				5% Shapiro Wilk Critical Value		0.803	Data Not Normal at 5% Significance Level					
685				Lilliefors Test Statistic		0.338	Lilliefors GOF Test					
686				5% Lilliefors Critical Value		0.304	Data Not Normal at 5% Significance Level					
687	Data Not Normal at 5% Significance Level											
688												
689	Assuming Normal Distribution											
690	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
691				95% Student's-t UCL		2.525	95% Adjusted-CLT UCL (Chen-1995)					2.879
692							95% Modified-t UCL (Johnson-1978)					2.607
693												
694	Gamma GOF Test											
695				A-D Test Statistic		0.498	Anderson-Darling Gamma GOF Test					
696				5% A-D Critical Value		0.719	Detected data appear Gamma Distributed at 5% Significance Level					
697				K-S Test Statistic		0.23	Kolmogorov-Smirnov Gamma GOF Test					
698				5% K-S Critical Value		0.316	Detected data appear Gamma Distributed at 5% Significance Level					
699	Detected data appear Gamma Distributed at 5% Significance Level											
700												
701	Gamma Statistics											
702				k hat (MLE)		1.667	k star (bias corrected MLE)					1.048
703				Theta hat (MLE)		0.857	Theta star (bias corrected MLE)					1.363
704				nu hat (MLE)		23.34	nu star (bias corrected)					14.67
705				MLE Mean (bias corrected)		1.429	MLE Sd (bias corrected)					1.396
706							Approximate Chi Square Value (0.05)					7.033
707				Adjusted Level of Significance		0.0158	Adjusted Chi Square Value					5.516
708												
709	Assuming Gamma Distribution											
710				95% Approximate Gamma UCL (use when n>=50)		2.98	95% Adjusted Gamma UCL (use when n<50)					3.799
711												
712	Lognormal GOF Test											
713				Shapiro Wilk Test Statistic		0.927	Shapiro Wilk Lognormal GOF Test					
714				5% Shapiro Wilk Critical Value		0.803	Data appear Lognormal at 5% Significance Level					
715				Lilliefors Test Statistic		0.178	Lilliefors Lognormal GOF Test					
716				5% Lilliefors Critical Value		0.304	Data appear Lognormal at 5% Significance Level					
717	Data appear Lognormal at 5% Significance Level											
718												
719	Lognormal Statistics											
720				Minimum of Logged Data		-0.868	Mean of logged Data					0.0277
721				Maximum of Logged Data		1.548	SD of logged Data					0.812
722												
723	Assuming Lognormal Distribution											
724				95% H-UCL		4.107	90% Chebyshev (MVUE) UCL					2.603
725				95% Chebyshev (MVUE) UCL		3.17	97.5% Chebyshev (MVUE) UCL					3.957
726				99% Chebyshev (MVUE) UCL		5.502						

727												
728	**Nonparametric Distribution Free UCL Statistics**											
729	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
730												
731	**Nonparametric Distribution Free UCLs**											
732					95% CLT UCL	2.357			95% Jackknife UCL	2.525		
733					95% Standard Bootstrap UCL	2.308			95% Bootstrap-t UCL	4.617		
734					95% Hall's Bootstrap UCL	6.196			95% Percentile Bootstrap UCL	2.457		
735					95% BCA Bootstrap UCL	2.646						
736					90% Chebyshev(Mean, Sd) UCL	3.122			95% Chebyshev(Mean, Sd) UCL	3.889		
737					97.5% Chebyshev(Mean, Sd) UCL	4.953			99% Chebyshev(Mean, Sd) UCL	7.044		
738												
739	**Suggested UCL to Use**											
740					95% Adjusted Gamma UCL	3.799						
741												
742	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
743	Recommendations are based upon data size, data distribution, and skewness.											
744	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
745	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
746												
747	**Cobalt (nfmw2)**											
748												
749	**General Statistics**											
750					Total Number of Observations	9			Number of Distinct Observations	8		
751					Number of Detects	7			Number of Non-Detects	2		
752					Number of Distinct Detects	7			Number of Distinct Non-Detects	1		
753					Minimum Detect	0.15			Minimum Non-Detect	1.7		
754					Maximum Detect	0.32			Maximum Non-Detect	1.7		
755					Variance Detects	0.004			Percent Non-Detects	22.22%		
756					Mean Detects	0.22			SD Detects	0.0632		
757					Median Detects	0.21			CV Detects	0.287		
758					Skewness Detects	0.747			Kurtosis Detects	-0.825		
759					Mean of Logged Detects	-1.548			SD of Logged Detects	0.278		
760												
761	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
762	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
763	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
764	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
765												
766	**Normal GOF Test on Detects Only**											
767					Shapiro Wilk Test Statistic	0.912			**Shapiro Wilk GOF Test**			
768					5% Shapiro Wilk Critical Value	0.803			Detected Data appear Normal at 5% Significance Level			
769					Lilliefors Test Statistic	0.214			**Lilliefors GOF Test**			
770					5% Lilliefors Critical Value	0.304			Detected Data appear Normal at 5% Significance Level			
771	**Detected Data appear Normal at 5% Significance Level**											
772												
773	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
774					KM Mean	0.22			KM Standard Error of Mean	0.0239		
775					KM SD	0.0586			95% KM (BCA) UCL	0.258		
776					95% KM (t) UCL	0.264			95% KM (Percentile Bootstrap) UCL	0.259		
777					95% KM (z) UCL	0.259			95% KM Bootstrap t UCL	0.295		
778					90% KM Chebyshev UCL	0.292			95% KM Chebyshev UCL	0.324		

779				97.5% KM Chebyshev UCL		0.369				99% KM Chebyshev UCL		0.458
780												
781	**Gamma GOF Tests on Detected Observations Only**											
782				A-D Test Statistic		0.305	**Anderson-Darling GOF Test**					
783				5% A-D Critical Value		0.708	Detected data appear Gamma Distributed at 5% Significance Level					
784				K-S Test Statistic		0.18	**Kolmogorov-Smirnov GOF**					
785				5% K-S Critical Value		0.312	Detected data appear Gamma Distributed at 5% Significance Level					
786	**Detected data appear Gamma Distributed at 5% Significance Level**											
787												
788	**Gamma Statistics on Detected Data Only**											
789				k hat (MLE)		14.93	k star (bias corrected MLE)					8.626
790				Theta hat (MLE)		0.0147	Theta star (bias corrected MLE)					0.0255
791				nu hat (MLE)		209	nu star (bias corrected)					120.8
792				Mean (detects)		0.22						
793												
794	**Gamma ROS Statistics using Imputed Non-Detects**											
795	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
796	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
797	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
798	This is especially true when the sample size is small.											
799	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
800				Minimum		0.15	Mean					0.219
801				Maximum		0.32	Median					0.21
802				SD		0.0573	CV					0.261
803				k hat (MLE)		17.41	k star (bias corrected MLE)					11.68
804				Theta hat (MLE)		0.0126	Theta star (bias corrected MLE)					0.0188
805				nu hat (MLE)		313.3	nu star (bias corrected)					210.2
806				Adjusted Level of Significance (β)		0.0231						
807				Approximate Chi Square Value (210.22, α)		177.7	Adjusted Chi Square Value (210.22, β)					171.3
808				95% Gamma Approximate UCL (use when n>=50)		0.26	95% Gamma Adjusted UCL (use when n<50)					0.269
809												
810	**Estimates of Gamma Parameters using KM Estimates**											
811				Mean (KM)		0.22	SD (KM)					0.0586
812				Variance (KM)		0.00343	SE of Mean (KM)					0.0239
813				k hat (KM)		14.12	k star (KM)					9.485
814				nu hat (KM)		254.1	nu star (KM)					170.7
815				theta hat (KM)		0.0156	theta star (KM)					0.0232
816				80% gamma percentile (KM)		0.277	90% gamma percentile (KM)					0.315
817				95% gamma percentile (KM)		0.349	99% gamma percentile (KM)					0.419
818												
819	**Gamma Kaplan-Meier (KM) Statistics**											
820				Approximate Chi Square Value (170.73, α)		141.5	Adjusted Chi Square Value (170.73, β)					135.9
821				95% Gamma Approximate KM-UCL (use when n>=50)		0.265	95% Gamma Adjusted KM-UCL (use when n<50)					0.276
822												
823	**Lognormal GOF Test on Detected Observations Only**											
824				Shapiro Wilk Test Statistic		0.945	**Shapiro Wilk GOF Test**					
825				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Lognormal at 5% Significance Level					
826				Lilliefors Test Statistic		0.166	**Lilliefors GOF Test**					
827				5% Lilliefors Critical Value		0.304	Detected Data appear Lognormal at 5% Significance Level					
828	**Detected Data appear Lognormal at 5% Significance Level**											
829												
830	**Lognormal ROS Statistics Using Imputed Non-Detects**											

	A	B	C	D	E	F	G	H	I	J	K	L
831					Mean in Original Scale	0.219					Mean in Log Scale	-1.548
832					SD in Original Scale	0.0571					SD in Log Scale	0.252
833					95% t UCL (assumes normality of ROS data)	0.254					95% Percentile Bootstrap UCL	0.25
834					95% BCA Bootstrap UCL	0.255					95% Bootstrap t UCL	0.262
835					95% H-UCL (Log ROS)	0.261						
836												
837	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
838					KM Mean (logged)	-1.548					KM Geo Mean	0.213
839					KM SD (logged)	0.258					95% Critical H Value (KM-Log)	1.965
840					KM Standard Error of Mean (logged)	0.105					95% H-UCL (KM -Log)	0.263
841					KM SD (logged)	0.258					95% Critical H Value (KM-Log)	1.965
842					KM Standard Error of Mean (logged)	0.105						
843												
844	**DL/2 Statistics**											
845	**DL/2 Normal**						**DL/2 Log-Transformed**					
846					Mean in Original Scale	0.36					Mean in Log Scale	-1.24
847					SD in Original Scale	0.283					SD in Log Scale	0.657
848					95% t UCL (Assumes normality)	0.536					95% H-Stat UCL	0.648
849	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
850												
851	**Nonparametric Distribution Free UCL Statistics**											
852	**Detected Data appear Normal Distributed at 5% Significance Level**											
853												
854	**Suggested UCL to Use**											
855					95% KM (t) UCL	0.264						
856												
857	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
858	Recommendations are based upon data size, data distribution, and skewness.											
859	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
860	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
861												
862	**Cobalt (nfmw20)**											
863												
864	**General Statistics**											
865					Total Number of Observations	8					Number of Distinct Observations	7
866					Number of Detects	5					Number of Non-Detects	3
867					Number of Distinct Detects	5					Number of Distinct Non-Detects	2
868					Minimum Detect	0.25					Minimum Non-Detect	0.43
869					Maximum Detect	1.1					Maximum Non-Detect	1.7
870					Variance Detects	0.115					Percent Non-Detects	37.5%
871					Mean Detects	0.588					SD Detects	0.339
872					Median Detects	0.62					CV Detects	0.577
873					Skewness Detects	0.797					Kurtosis Detects	0.3
874					Mean of Logged Detects	-0.671					SD of Logged Detects	0.602
875												
876	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
877	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
878	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
879	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
880												
881	**Normal GOF Test on Detects Only**											
882					Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk GOF Test**					

883				5% Shapiro Wilk Critical Value		0.762	Detected Data appear Normal at 5% Significance Level					
884				Lilliefors Test Statistic		0.216	**Lilliefors GOF Test**					
885				5% Lilliefors Critical Value		0.343	Detected Data appear Normal at 5% Significance Level					
886	**Detected Data appear Normal at 5% Significance Level**											
887												
888	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
889				KM Mean		0.5	KM Standard Error of Mean					0.124
890				KM SD		0.292	95% KM (BCA) UCL					0.724
891				95% KM (t) UCL		0.735	95% KM (Percentile Bootstrap) UCL					0.699
892				95% KM (z) UCL		0.704	95% KM Bootstrap t UCL					0.853
893				90% KM Chebyshev UCL		0.871	95% KM Chebyshev UCL					1.04
894				97.5% KM Chebyshev UCL		1.273	99% KM Chebyshev UCL					1.732
895												
896	**Gamma GOF Tests on Detected Observations Only**											
897				A-D Test Statistic		0.299	**Anderson-Darling GOF Test**					
898				5% A-D Critical Value		0.682	Detected data appear Gamma Distributed at 5% Significance Level					
899				K-S Test Statistic		0.225	**Kolmogorov-Smirnov GOF**					
900				5% K-S Critical Value		0.359	Detected data appear Gamma Distributed at 5% Significance Level					
901	**Detected data appear Gamma Distributed at 5% Significance Level**											
902												
903	**Gamma Statistics on Detected Data Only**											
904				k hat (MLE)		3.727	k star (bias corrected MLE)					1.624
905				Theta hat (MLE)		0.158	Theta star (bias corrected MLE)					0.362
906				nu hat (MLE)		37.27	nu star (bias corrected)					16.24
907				Mean (detects)		0.588						
908												
909	**Gamma ROS Statistics using Imputed Non-Detects**											
910	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
911	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
912	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
913	This is especially true when the sample size is small.											
914	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
915				Minimum		0.183	Mean					0.49
916				Maximum		1.1	Median					0.399
917				SD		0.299	CV					0.609
918				k hat (MLE)		3.482	k star (bias corrected MLE)					2.259
919				Theta hat (MLE)		0.141	Theta star (bias corrected MLE)					0.217
920				nu hat (MLE)		55.71	nu star (bias corrected)					36.15
921				Adjusted Level of Significance (β)		0.0195						
922				Approximate Chi Square Value (36.15, α)		23.39	Adjusted Chi Square Value (36.15, β)					20.83
923				95% Gamma Approximate UCL (use when n>=50)		0.757	95% Gamma Adjusted UCL (use when n<50)					0.85
924												
925	**Estimates of Gamma Parameters using KM Estimates**											
926				Mean (KM)		0.5	SD (KM)					0.292
927				Variance (KM)		0.0853	SE of Mean (KM)					0.124
928				k hat (KM)		2.93	k star (KM)					1.915
929				nu hat (KM)		46.89	nu star (KM)					30.64
930				theta hat (KM)		0.171	theta star (KM)					0.261
931				80% gamma percentile (KM)		0.752	90% gamma percentile (KM)					0.982
932				95% gamma percentile (KM)		1.202	99% gamma percentile (KM)					1.692
933												
934	**Gamma Kaplan-Meier (KM) Statistics**											

935	Approximate Chi Square Value (30.64, α)					18.99	Adjusted Chi Square Value (30.64, β)					16.72
936	95% Gamma Approximate KM-UCL (use when n>=50)					0.806	95% Gamma Adjusted KM-UCL (use when n<50)					0.916
937												
938	**Lognormal GOF Test on Detected Observations Only**											
939	Shapiro Wilk Test Statistic					0.938	**Shapiro Wilk GOF Test**					
940	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Lognormal at 5% Significance Level					
941	Lilliefors Test Statistic					0.226	**Lilliefors GOF Test**					
942	5% Lilliefors Critical Value					0.343	Detected Data appear Lognormal at 5% Significance Level					
943	**Detected Data appear Lognormal at 5% Significance Level**											
944												
945	**Lognormal ROS Statistics Using Imputed Non-Detects**											
946	Mean in Original Scale					0.492	Mean in Log Scale					-0.843
947	SD in Original Scale					0.293	SD in Log Scale					0.54
948	95% t UCL (assumes normality of ROS data)					0.689	95% Percentile Bootstrap UCL					0.661
949	95% BCA Bootstrap UCL					0.71	95% Bootstrap t UCL					0.823
950	95% H-UCL (Log ROS)					0.816						
951												
952	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
953	KM Mean (logged)					-0.845	KM Geo Mean					0.43
954	KM SD (logged)					0.535	95% Critical H Value (KM-Log)					2.414
955	KM Standard Error of Mean (logged)					0.229	95% H-UCL (KM -Log)					0.808
956	KM SD (logged)					0.535	95% Critical H Value (KM-Log)					2.414
957	KM Standard Error of Mean (logged)					0.229						
958												
959	**DL/2 Statistics**											
960	**DL/2 Normal**						**DL/2 Log-Transformed**					
961	Mean in Original Scale					0.528	Mean in Log Scale					-0.824
962	SD in Original Scale					0.333	SD in Log Scale					0.657
963	95% t UCL (Assumes normality)					0.751	95% H-Stat UCL					1.05
964	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
965												
966	**Nonparametric Distribution Free UCL Statistics**											
967	**Detected Data appear Normal Distributed at 5% Significance Level**											
968												
969	**Suggested UCL to Use**											
970	95% KM (t) UCL					0.735						
971												
972	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
973	Recommendations are based upon data size, data distribution, and skewness.											
974	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
975	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
976												
977	**Cobalt (nfmw22)**											
978												
979	**General Statistics**											
980	Total Number of Observations					4	Number of Distinct Observations					2
981	Number of Detects					3	Number of Non-Detects					1
982	Number of Distinct Detects					2	Number of Distinct Non-Detects					1
983	Minimum Detect					0.43	Minimum Non-Detect					0.43
984	Maximum Detect					0.45	Maximum Non-Detect					0.43
985	Variance Detects					1.3333E-4	Percent Non-Detects					25%
986	Mean Detects					0.437	SD Detects					0.0115

987					Median Detects	0.43					CV Detects	0.0264
988					Skewness Detects	1.732					Kurtosis Detects	N/A
989					Mean of Logged Detects	-0.829					SD of Logged Detects	0.0262
990												
991					**Warning: Data set has only 3 Detected Values.**							
992					**This is not enough to compute meaningful or reliable statistics and estimates.**							
993												
994												
995					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
996					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
997					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
998					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
999												
1000					**Normal GOF Test on Detects Only**							
1001					Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**					
1002					5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level					
1003					Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**					
1004					5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level					
1005					**Detected Data appear Approximate Normal at 5% Significance Level**							
1006												
1007					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
1008					KM Mean	0.435	KM Standard Error of Mean	0.0053				
1009					KM SD	0.00866	95% KM (BCA) UCL	N/A				
1010					95% KM (t) UCL	0.447	95% KM (Percentile Bootstrap) UCL	N/A				
1011					95% KM (z) UCL	0.444	95% KM Bootstrap t UCL	N/A				
1012					90% KM Chebyshev UCL	0.451	95% KM Chebyshev UCL	0.458				
1013					97.5% KM Chebyshev UCL	0.468	99% KM Chebyshev UCL	0.488				
1014												
1015					**Gamma GOF Tests on Detected Observations Only**							
1016					**Not Enough Data to Perform GOF Test**							
1017												
1018					**Gamma Statistics on Detected Data Only**							
1019					k hat (MLE)	2167	k star (bias corrected MLE)	N/A				
1020					Theta hat (MLE)	2.0154E-4	Theta star (bias corrected MLE)	N/A				
1021					nu hat (MLE)	13000	nu star (bias corrected)	N/A				
1022					Mean (detects)	0.437						
1023												
1024					**Gamma ROS Statistics using Imputed Non-Detects**							
1025					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1026					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1027					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1028					This is especially true when the sample size is small.							
1029					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1030					Minimum	0.407	Mean	0.429				
1031					Maximum	0.45	Median	0.43				
1032					SD	0.0174	CV	0.0405				
1033					k hat (MLE)	809.6	k star (bias corrected MLE)	202.6				
1034					Theta hat (MLE)	5.3034E-4	Theta star (bias corrected MLE)	0.00212				
1035					nu hat (MLE)	6477	nu star (bias corrected)	1621				
1036					Adjusted Level of Significance (β)	0.00498						
1037					Approximate Chi Square Value (N/A, α)	1528	Adjusted Chi Square Value (N/A, β)	N/A				
1038					95% Gamma Approximate UCL (use when n>=50)	0.455	95% Gamma Adjusted UCL (use when n<50)	N/A				

	A	B	C	D	E	F	G	H	I	J	K	L
1039												
1040	**Estimates of Gamma Parameters using KM Estimates**											
1041					Mean (KM)	0.435				SD (KM)		0.00866
1042					Variance (KM)	7.5000E-5				SE of Mean (KM)		0.0053
1043					k hat (KM)	2523				k star (KM)		630.9
1044					nu hat (KM)	20184				nu star (KM)		5047
1045					theta hat (KM)	1.7241E-4				theta star (KM)		6.8947E-4
1046					80% gamma percentile (KM)	0.45				90% gamma percentile (KM)		0.457
1047					95% gamma percentile (KM)	0.464				99% gamma percentile (KM)		0.476
1048												
1049	**Gamma Kaplan-Meier (KM) Statistics**											
1050					Approximate Chi Square Value (N/A, α)	4883				Adjusted Chi Square Value (N/A, β)		4792
1051					95% Gamma Approximate KM-UCL (use when n>=50)	0.45				95% Gamma Adjusted KM-UCL (use when n<50)		0.458
1052												
1053	**Lognormal GOF Test on Detected Observations Only**											
1054					Shapiro Wilk Test Statistic	0.75				**Shapiro Wilk GOF Test**		
1055					5% Shapiro Wilk Critical Value	0.767				Detected Data Not Lognormal at 5% Significance Level		
1056					Lilliefors Test Statistic	0.385				**Lilliefors GOF Test**		
1057					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
1058	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
1059												
1060	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1061					Mean in Original Scale	0.43				Mean in Log Scale		-0.846
1062					SD in Original Scale	0.017				SD in Log Scale		0.0398
1063					95% t UCL (assumes normality of ROS data)	0.45				95% Percentile Bootstrap UCL		N/A
1064					95% BCA Bootstrap UCL	N/A				95% Bootstrap t UCL		N/A
1065					95% H-UCL (Log ROS)	N/A						
1066												
1067	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1068					KM Mean (logged)	-0.833				KM Geo Mean		0.435
1069					KM SD (logged)	0.0197				95% Critical H Value (KM-Log)		N/A
1070					KM Standard Error of Mean (logged)	0.0121				95% H-UCL (KM -Log)		N/A
1071					KM SD (logged)	0.0197				95% Critical H Value (KM-Log)		N/A
1072					KM Standard Error of Mean (logged)	0.0121						
1073												
1074	**DL/2 Statistics**											
1075	**DL/2 Normal**						**DL/2 Log-Transformed**					
1076					Mean in Original Scale	0.381				Mean in Log Scale		-1.006
1077					SD in Original Scale	0.111				SD in Log Scale		0.355
1078					95% t UCL (Assumes normality)	0.512				95% H-Stat UCL		0.718
1079	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1080												
1081	**Nonparametric Distribution Free UCL Statistics**											
1082	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
1083												
1084	**Suggested UCL to Use**											
1085					95% KM (t) UCL	0.447						
1086												
1087	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
1088	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
1089												
1090	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
1091	Recommendations are based upon data size, data distribution, and skewness.											
1092	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1093	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1094												
1095												
1096	**Cobalt (nfmw23)**											
1097												
1098	**General Statistics**											
1099					Total Number of Observations	4			Number of Distinct Observations	4		
1100									Number of Missing Observations	0		
1101					Minimum	0.45			Mean	0.593		
1102					Maximum	0.73			Median	0.595		
1103					SD	0.118			Std. Error of Mean	0.0589		
1104					Coefficient of Variation	0.199			Skewness	-0.112		
1105												
1106	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1107	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1108	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1109	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1110												
1111	**Normal GOF Test**											
1112					Shapiro Wilk Test Statistic	N/A			**Shapiro Wilk GOF Test**			
1113					5% Shapiro Wilk Critical Value	0.748			Data Not Normal at 5% Significance Level			
1114					Lilliefors Test Statistic	0.141			**Lilliefors GOF Test**			
1115					5% Lilliefors Critical Value	0.375			Data appear Normal at 5% Significance Level			
1116	**Data appear Approximate Normal at 5% Significance Level**											
1117												
1118	**Assuming Normal Distribution**											
1119	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
1120					95% Student's-t UCL	0.731			95% Adjusted-CLT UCL (Chen-1995)	0.686		
1121									95% Modified-t UCL (Johnson-1978)	0.731		
1122												
1123	**Gamma GOF Test**											
1124					A-D Test Statistic	0.2			**Anderson-Darling Gamma GOF Test**			
1125					5% A-D Critical Value	0.657			Detected data appear Gamma Distributed at 5% Significance Level			
1126					K-S Test Statistic	0.176			**Kolmogorov-Smirnov Gamma GOF Test**			
1127					5% K-S Critical Value	0.394			Detected data appear Gamma Distributed at 5% Significance Level			
1128	**Detected data appear Gamma Distributed at 5% Significance Level**											
1129												
1130	**Gamma Statistics**											
1131					k hat (MLE)	32.71			k star (bias corrected MLE)	8.344		
1132					Theta hat (MLE)	0.0181			Theta star (bias corrected MLE)	0.071		
1133					nu hat (MLE)	261.7			nu star (bias corrected)	66.75		
1134					MLE Mean (bias corrected)	0.593			MLE Sd (bias corrected)	0.205		
1135									Approximate Chi Square Value (0.05)	48.95		
1136					Adjusted Level of Significance	N/A			Adjusted Chi Square Value	N/A		
1137												
1138	**Assuming Gamma Distribution**											
1139					95% Approximate Gamma UCL (use when n>=50))	0.808			95% Adjusted Gamma UCL (use when n<50)	N/A		
1140												
1141	**Lognormal GOF Test**											
1142					Shapiro Wilk Test Statistic	0.991			**Shapiro Wilk Lognormal GOF Test**			

1143	5% Shapiro Wilk Critical Value					0.748	Data appear Lognormal at 5% Significance Level					
1144	Lilliefors Test Statistic					0.17	**Lilliefors Lognormal GOF Test**					
1145	5% Lilliefors Critical Value					0.375	Data appear Lognormal at 5% Significance Level					
1146	**Data appear Lognormal at 5% Significance Level**											
1147												
1148	**Lognormal Statistics**											
1149	Minimum of Logged Data					-0.799	Mean of logged Data					-0.539
1150	Maximum of Logged Data					-0.315	SD of logged Data					0.204
1151												
1152	**Assuming Lognormal Distribution**											
1153	95% H-UCL					0.798	90% Chebyshev (MVUE) UCL					0.774
1154	95% Chebyshev (MVUE) UCL					0.856	97.5% Chebyshev (MVUE) UCL					0.97
1155	99% Chebyshev (MVUE) UCL					1.193						
1156												
1157	**Nonparametric Distribution Free UCL Statistics**											
1158	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1159												
1160	**Nonparametric Distribution Free UCLs**											
1161	95% CLT UCL					0.689	95% Jackknife UCL					0.731
1162	95% Standard Bootstrap UCL					N/A	95% Bootstrap-t UCL					N/A
1163	95% Hall's Bootstrap UCL					N/A	95% Percentile Bootstrap UCL					N/A
1164	95% BCA Bootstrap UCL					N/A						
1165	90% Chebyshev(Mean, Sd) UCL					0.769	95% Chebyshev(Mean, Sd) UCL					0.849
1166	97.5% Chebyshev(Mean, Sd) UCL					0.961	99% Chebyshev(Mean, Sd) UCL					1.179
1167												
1168	**Suggested UCL to Use**											
1169	95% Student's-t UCL					0.731						
1170												
1171	**Recommended UCL exceeds the maximum observation**											
1172												
1173	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
1174	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
1175												
1176	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1177	Recommendations are based upon data size, data distribution, and skewness.											
1178	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1179	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1180												
1181	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1182	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1183												
1184	**Cobalt (nfmw3)**											
1185												
1186	**General Statistics**											
1187	Total Number of Observations					9	Number of Distinct Observations					8
1188	Number of Detects					8	Number of Non-Detects					1
1189	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
1190	Minimum Detect					0.7	Minimum Non-Detect					1.7
1191	Maximum Detect					1.4	Maximum Non-Detect					1.7
1192	Variance Detects					0.0449	Percent Non-Detects					11.11%
1193	Mean Detects					0.968	SD Detects					0.212
1194	Median Detects					0.92	CV Detects					0.219

1195					Skewness Detects	1.179					Kurtosis Detects	2.111
1196					Mean of Logged Detects	-0.0525					SD of Logged Detects	0.208
1197												
1198	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1199	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1200	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1201	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1202												
1203	**Normal GOF Test on Detects Only**											
1204					Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk GOF Test**					
1205					5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level					
1206					Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**					
1207					5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level					
1208	**Detected Data appear Normal at 5% Significance Level**											
1209												
1210	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1211					KM Mean	0.968					KM Standard Error of Mean	0.0749
1212					KM SD	0.198					95% KM (BCA) UCL	1.087
1213					95% KM (t) UCL	1.107					95% KM (Percentile Bootstrap) UCL	1.09
1214					95% KM (z) UCL	1.091					95% KM Bootstrap t UCL	1.174
1215					90% KM Chebyshev UCL	1.192					95% KM Chebyshev UCL	1.294
1216					97.5% KM Chebyshev UCL	1.435					99% KM Chebyshev UCL	1.713
1217												
1218	**Gamma GOF Tests on Detected Observations Only**											
1219					A-D Test Statistic	0.301	**Anderson-Darling GOF Test**					
1220					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1221					K-S Test Statistic	0.199	**Kolmogorov-Smirnov GOF**					
1222					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1223	**Detected data appear Gamma Distributed at 5% Significance Level**											
1224												
1225	**Gamma Statistics on Detected Data Only**											
1226					k hat (MLE)	25.83					k star (bias corrected MLE)	16.23
1227					Theta hat (MLE)	0.0375					Theta star (bias corrected MLE)	0.0596
1228					nu hat (MLE)	413.3					nu star (bias corrected)	259.7
1229					Mean (detects)	0.968						
1230												
1231	**Gamma ROS Statistics using Imputed Non-Detects**											
1232	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1233	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1234	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1235	This is especially true when the sample size is small.											
1236	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1237					Minimum	0.7					Mean	0.966
1238					Maximum	1.4					Median	0.92
1239					SD	0.198					CV	0.205
1240					k hat (MLE)	29.03					k star (bias corrected MLE)	19.43
1241					Theta hat (MLE)	0.0333					Theta star (bias corrected MLE)	0.0497
1242					nu hat (MLE)	522.6					nu star (bias corrected)	349.7
1243					Adjusted Level of Significance (β)	0.0231						
1244					Approximate Chi Square Value (349.74, α)	307.4					Adjusted Chi Square Value (349.74, β)	299
1245					95% Gamma Approximate UCL (use when n>=50)	1.1					95% Gamma Adjusted UCL (use when n<50)	1.13
1246												

	A	B	C	D	E	F	G	H	I	J	K	L
1247	**Estimates of Gamma Parameters using KM Estimates**											
1248					Mean (KM)	0.968				SD (KM)		0.198
1249					Variance (KM)	0.0393				SE of Mean (KM)		0.0749
1250					k hat (KM)	23.82				k star (KM)		15.96
1251					nu hat (KM)	428.8				nu star (KM)		287.2
1252					theta hat (KM)	0.0406				theta star (KM)		0.0606
1253					80% gamma percentile (KM)	1.163				90% gamma percentile (KM)		1.288
1254					95% gamma percentile (KM)	1.397				99% gamma percentile (KM)		1.618
1255												
1256	**Gamma Kaplan-Meier (KM) Statistics**											
1257					Approximate Chi Square Value (287.20, α)	248.9				Adjusted Chi Square Value (287.20, β)		241.4
1258					95% Gamma Approximate KM-UCL (use when n>=50)	1.116				95% Gamma Adjusted KM-UCL (use when n<50)		1.151
1259												
1260	**Lognormal GOF Test on Detected Observations Only**											
1261					Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**					
1262					5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level					
1263					Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**					
1264					5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level					
1265	**Detected Data appear Lognormal at 5% Significance Level**											
1266												
1267	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1268					Mean in Original Scale	0.965				Mean in Log Scale		-0.0525
1269					SD in Original Scale	0.198				SD in Log Scale		0.194
1270					95% t UCL (assumes normality of ROS data)	1.088				95% Percentile Bootstrap UCL		1.074
1271					95% BCA Bootstrap UCL	1.096				95% Bootstrap t UCL		1.15
1272					95% H-UCL (Log ROS)	1.102						
1273												
1274	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1275					KM Mean (logged)	-0.0525				KM Geo Mean		0.949
1276					KM SD (logged)	0.194				95% Critical H Value (KM-Log)		1.903
1277					KM Standard Error of Mean (logged)	0.0735				95% H-UCL (KM -Log)		1.102
1278					KM SD (logged)	0.194				95% Critical H Value (KM-Log)		1.903
1279					KM Standard Error of Mean (logged)	0.0735						
1280												
1281	**DL/2 Statistics**											
1282					**DL/2 Normal**					**DL/2 Log-Transformed**		
1283					Mean in Original Scale	0.954				Mean in Log Scale		-0.0647
1284					SD in Original Scale	0.202				SD in Log Scale		0.198
1285					95% t UCL (Assumes normality)	1.08				95% H-Stat UCL		1.092
1286	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1287												
1288	**Nonparametric Distribution Free UCL Statistics**											
1289	**Detected Data appear Normal Distributed at 5% Significance Level**											
1290												
1291	**Suggested UCL to Use**											
1292					95% KM (t) UCL	1.107						
1293												
1294	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1295	Recommendations are based upon data size, data distribution, and skewness.											
1296	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1297	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1298												

	A	B	C	D	E	F	G	H	I	J	K	L
1299	**Cobalt (nfmw4)**											
1300												
1301	**General Statistics**											
1302	Total Number of Observations					9	Number of Distinct Observations					8
1303	Number of Detects					6	Number of Non-Detects					3
1304	Number of Distinct Detects					6	Number of Distinct Non-Detects					3
1305	Minimum Detect					0.13	Minimum Non-Detect					0.15
1306	Maximum Detect					0.39	Maximum Non-Detect					1.7
1307	Variance Detects					0.0095	Percent Non-Detects					33.33%
1308	Mean Detects					0.222	SD Detects					0.0975
1309	Median Detects					0.2	CV Detects					0.44
1310	Skewness Detects					1.121	Kurtosis Detects					0.865
1311	Mean of Logged Detects					-1.581	SD of Logged Detects					0.415
1312												
1313	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1314	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1315	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1316	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1317												
1318	**Normal GOF Test on Detects Only**											
1319	Shapiro Wilk Test Statistic					0.886	**Shapiro Wilk GOF Test**					
1320	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
1321	Lilliefors Test Statistic					0.237	**Lilliefors GOF Test**					
1322	5% Lilliefors Critical Value					0.325	Detected Data appear Normal at 5% Significance Level					
1323	**Detected Data appear Normal at 5% Significance Level**											
1324												
1325	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1326	KM Mean					0.203	KM Standard Error of Mean					0.0336
1327	KM SD					0.0853	95% KM (BCA) UCL					0.264
1328	95% KM (t) UCL					0.265	95% KM (Percentile Bootstrap) UCL					0.255
1329	95% KM (z) UCL					0.258	95% KM Bootstrap t UCL					0.293
1330	90% KM Chebyshev UCL					0.304	95% KM Chebyshev UCL					0.349
1331	97.5% KM Chebyshev UCL					0.413	99% KM Chebyshev UCL					0.537
1332												
1333	**Gamma GOF Tests on Detected Observations Only**											
1334	A-D Test Statistic					0.336	**Anderson-Darling GOF Test**					
1335	5% A-D Critical Value					0.698	Detected data appear Gamma Distributed at 5% Significance Level					
1336	K-S Test Statistic					0.252	**Kolmogorov-Smirnov GOF**					
1337	5% K-S Critical Value					0.333	Detected data appear Gamma Distributed at 5% Significance Level					
1338	**Detected data appear Gamma Distributed at 5% Significance Level**											
1339												
1340	**Gamma Statistics on Detected Data Only**											
1341	k hat (MLE)					6.885	k star (bias corrected MLE)					3.554
1342	Theta hat (MLE)					0.0322	Theta star (bias corrected MLE)					0.0624
1343	nu hat (MLE)					82.62	nu star (bias corrected)					42.64
1344	Mean (detects)					0.222						
1345												
1346	**Gamma ROS Statistics using Imputed Non-Detects**											
1347	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1348	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1349	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1350	This is especially true when the sample size is small.											

	A	B	C	D	E	F	G	H	I	J	K	L
1351	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1352					Minimum	0.0973				Mean		0.197
1353					Maximum	0.39				Median		0.16
1354					SD	0.0886				CV		0.45
1355					k hat (MLE)	6.461				k star (bias corrected MLE)		4.381
1356					Theta hat (MLE)	0.0305				Theta star (bias corrected MLE)		0.0449
1357					nu hat (MLE)	116.3				nu star (bias corrected)		78.86
1358					Adjusted Level of Significance (β)	0.0231						
1359					Approximate Chi Square Value (78.86, α)	59.4				Adjusted Chi Square Value (78.86, β)		55.85
1360					95% Gamma Approximate UCL (use when n>=50)	0.261				95% Gamma Adjusted UCL (use when n<50)		0.278
1361												
1362	**Estimates of Gamma Parameters using KM Estimates**											
1363					Mean (KM)	0.203				SD (KM)		0.0853
1364					Variance (KM)	0.00728				SE of Mean (KM)		0.0336
1365					k hat (KM)	5.647				k star (KM)		3.839
1366					nu hat (KM)	101.6				nu star (KM)		69.09
1367					theta hat (KM)	0.0359				theta star (KM)		0.0528
1368					80% gamma percentile (KM)	0.281				90% gamma percentile (KM)		0.341
1369					95% gamma percentile (KM)	0.397				99% gamma percentile (KM)		0.517
1370												
1371	**Gamma Kaplan-Meier (KM) Statistics**											
1372					Approximate Chi Square Value (69.09, α)	50.96				Adjusted Chi Square Value (69.09, β)		47.69
1373					95% Gamma Approximate KM-UCL (use when n>=50)	0.275				95% Gamma Adjusted KM-UCL (use when n<50)		0.294
1374												
1375	**Lognormal GOF Test on Detected Observations Only**											
1376					Shapiro Wilk Test Statistic	0.933				**Shapiro Wilk GOF Test**		
1377					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
1378					Lilliefors Test Statistic	0.228				**Lilliefors GOF Test**		
1379					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
1380	**Detected Data appear Lognormal at 5% Significance Level**											
1381												
1382	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1383					Mean in Original Scale	0.199				Mean in Log Scale		-1.688
1384					SD in Original Scale	0.0863				SD in Log Scale		0.385
1385					95% t UCL (assumes normality of ROS data)	0.252				95% Percentile Bootstrap UCL		0.244
1386					95% BCA Bootstrap UCL	0.255				95% Bootstrap t UCL		0.288
1387					95% H-UCL (Log ROS)	0.265						
1388												
1389	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1390					KM Mean (logged)	-1.672				KM Geo Mean		0.188
1391					KM SD (logged)	0.376				95% Critical H Value (KM-Log)		2.102
1392					KM Standard Error of Mean (logged)	0.149				95% H-UCL (KM -Log)		0.267
1393					KM SD (logged)	0.376				95% Critical H Value (KM-Log)		2.102
1394					KM Standard Error of Mean (logged)	0.149						
1395												
1396	**DL/2 Statistics**											
1397	**DL/2 Normal**						**DL/2 Log-Transformed**					
1398					Mean in Original Scale	0.264				Mean in Log Scale		-1.591
1399					SD in Original Scale	0.239				SD in Log Scale		0.719
1400					95% t UCL (Assumes normality)	0.413				95% H-Stat UCL		0.518
1401	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1402												

	A	B	C	D	E	F	G	H	I	J	K	L
1403	**Nonparametric Distribution Free UCL Statistics**											
1404	**Detected Data appear Normal Distributed at 5% Significance Level**											
1405												
1406	**Suggested UCL to Use**											
1407	95% KM (t) UCL	0.265										
1408												
1409	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1410	Recommendations are based upon data size, data distribution, and skewness.											
1411	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1412	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1413												
1414												
1415	**Cobalt (nfmw7)**											
1416												
1417	**General Statistics**											
1418	Total Number of Observations	9					Number of Distinct Observations	8				
1419							Number of Missing Observations	0				
1420	Minimum	0.62					Mean	1.223				
1421	Maximum	1.8					Median	1.2				
1422	SD	0.446					Std. Error of Mean	0.149				
1423	Coefficient of Variation	0.365					Skewness	-0.072				
1424												
1425	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1426	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1427	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1428	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1429												
1430	**Normal GOF Test**											
1431	Shapiro Wilk Test Statistic	0.914					**Shapiro Wilk GOF Test**					
1432	5% Shapiro Wilk Critical Value	0.829					Data appear Normal at 5% Significance Level					
1433	Lilliefors Test Statistic	0.191					**Lilliefors GOF Test**					
1434	5% Lilliefors Critical Value	0.274					Data appear Normal at 5% Significance Level					
1435	**Data appear Normal at 5% Significance Level**											
1436												
1437	**Assuming Normal Distribution**											
1438	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1439	95% Student's-t UCL	1.5					95% Adjusted-CLT UCL (Chen-1995)	1.464				
1440							95% Modified-t UCL (Johnson-1978)	1.499				
1441												
1442	**Gamma GOF Test**											
1443	A-D Test Statistic	0.385					**Anderson-Darling Gamma GOF Test**					
1444	5% A-D Critical Value	0.722					Detected data appear Gamma Distributed at 5% Significance Level					
1445	K-S Test Statistic	0.193					**Kolmogorov-Smirnov Gamma GOF Test**					
1446	5% K-S Critical Value	0.28					Detected data appear Gamma Distributed at 5% Significance Level					
1447	**Detected data appear Gamma Distributed at 5% Significance Level**											
1448												
1449	**Gamma Statistics**											
1450	k hat (MLE)	7.588					k star (bias corrected MLE)	5.133				
1451	Theta hat (MLE)	0.161					Theta star (bias corrected MLE)	0.238				
1452	nu hat (MLE)	136.6					nu star (bias corrected)	92.39				
1453	MLE Mean (bias corrected)	1.223					MLE Sd (bias corrected)	0.54				
1454							Approximate Chi Square Value (0.05)	71.22				

	A	B	C	D	E	F	G	H	I	J	K	L
1455	Adjusted Level of Significance					0.0231	Adjusted Chi Square Value					67.31
1456												
1457	**Assuming Gamma Distribution**											
1458	95% Approximate Gamma UCL (use when n>=50))					1.587	95% Adjusted Gamma UCL (use when n<50)					1.679
1459												
1460	**Lognormal GOF Test**											
1461	Shapiro Wilk Test Statistic					0.894	**Shapiro Wilk Lognormal GOF Test**					
1462	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
1463	Lilliefors Test Statistic					0.17	**Lilliefors Lognormal GOF Test**					
1464	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
1465	**Data appear Lognormal at 5% Significance Level**											
1466												
1467	**Lognormal Statistics**											
1468	Minimum of Logged Data					-0.478	Mean of logged Data					0.134
1469	Maximum of Logged Data					0.588	SD of logged Data					0.403
1470												
1471	**Assuming Lognormal Distribution**											
1472	95% H-UCL					1.683	90% Chebyshev (MVUE) UCL					1.729
1473	95% Chebyshev (MVUE) UCL					1.956	97.5% Chebyshev (MVUE) UCL					2.271
1474	99% Chebyshev (MVUE) UCL					2.889						
1475												
1476	**Nonparametric Distribution Free UCL Statistics**											
1477	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1478												
1479	**Nonparametric Distribution Free UCLs**											
1480	95% CLT UCL					1.468	95% Jackknife UCL					1.5
1481	95% Standard Bootstrap UCL					1.455	95% Bootstrap-t UCL					1.492
1482	95% Hall's Bootstrap UCL					1.445	95% Percentile Bootstrap UCL					1.451
1483	95% BCA Bootstrap UCL					1.447						
1484	90% Chebyshev(Mean, Sd) UCL					1.67	95% Chebyshev(Mean, Sd) UCL					1.872
1485	97.5% Chebyshev(Mean, Sd) UCL					2.153	99% Chebyshev(Mean, Sd) UCL					2.704
1486												
1487	**Suggested UCL to Use**											
1488	95% Student's-t UCL					1.5						
1489												
1490	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1491	Recommendations are based upon data size, data distribution, and skewness.											
1492	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1493	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1494												
1495	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1496	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1497												
1498	**Cobalt (nfmw8)**											
1499												
1500	**General Statistics**											
1501	Total Number of Observations					8	Number of Distinct Observations					6
1502	Number of Detects					6	Number of Non-Detects					2
1503	Number of Distinct Detects					5	Number of Distinct Non-Detects					1
1504	Minimum Detect					0.52	Minimum Non-Detect					1.7
1505	Maximum Detect					0.83	Maximum Non-Detect					1.7
1506	Variance Detects					0.019	Percent Non-Detects					25%

1507					Mean Detects	0.682					SD Detects	0.138
1508					Median Detects	0.69					CV Detects	0.202
1509					Skewness Detects	-0.13					Kurtosis Detects	-2.025
1510					Mean of Logged Detects	-0.401					SD of Logged Detects	0.208
1511												
1512	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1513	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1514	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1515	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1516												
1517	**Normal GOF Test on Detects Only**											
1518					Shapiro Wilk Test Statistic	0.877	**Shapiro Wilk GOF Test**					
1519					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
1520					Lilliefors Test Statistic	0.198	**Lilliefors GOF Test**					
1521					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
1522	**Detected Data appear Normal at 5% Significance Level**											
1523												
1524	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1525					KM Mean	0.682					KM Standard Error of Mean	0.0563
1526					KM SD	0.126					95% KM (BCA) UCL	0.759
1527					95% KM (t) UCL	0.788					95% KM (Percentile Bootstrap) UCL	0.763
1528					95% KM (z) UCL	0.774					95% KM Bootstrap t UCL	0.806
1529					90% KM Chebyshev UCL	0.851					95% KM Chebyshev UCL	0.927
1530					97.5% KM Chebyshev UCL	1.033					99% KM Chebyshev UCL	1.242
1531												
1532	**Gamma GOF Tests on Detected Observations Only**											
1533					A-D Test Statistic	0.419	**Anderson-Darling GOF Test**					
1534					5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level					
1535					K-S Test Statistic	0.223	**Kolmogorov-Smirnov GOF**					
1536					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
1537	**Detected data appear Gamma Distributed at 5% Significance Level**											
1538												
1539	**Gamma Statistics on Detected Data Only**											
1540					k hat (MLE)	28.42					k star (bias corrected MLE)	14.32
1541					Theta hat (MLE)	0.024					Theta star (bias corrected MLE)	0.0476
1542					nu hat (MLE)	341					nu star (bias corrected)	171.8
1543					Mean (detects)	0.682						
1544												
1545	**Gamma ROS Statistics using Imputed Non-Detects**											
1546	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1547	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1548	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1549	This is especially true when the sample size is small.											
1550	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1551					Minimum	0.52					Mean	0.681
1552					Maximum	0.83					Median	0.69
1553					SD	0.123					CV	0.181
1554					k hat (MLE)	34.06					k star (bias corrected MLE)	21.37
1555					Theta hat (MLE)	0.02					Theta star (bias corrected MLE)	0.0319
1556					nu hat (MLE)	544.9					nu star (bias corrected)	341.9
1557					Adjusted Level of Significance (β)	0.0195						
1558					Approximate Chi Square Value (341.92, α)	300.1					Adjusted Chi Square Value (341.92, β)	290.1

	A	B	C	D	E	F	G	H	I	J	K	L
1559	95% Gamma Approximate UCL (use when n>=50)					0.776	95% Gamma Adjusted UCL (use when n<50)					0.802
1560												
1561	**Estimates of Gamma Parameters using KM Estimates**											
1562	Mean (KM)					0.682	SD (KM)					0.126
1563	Variance (KM)					0.0158	SE of Mean (KM)					0.0563
1564	k hat (KM)					29.32	k star (KM)					18.41
1565	nu hat (KM)					469.1	nu star (KM)					294.6
1566	theta hat (KM)					0.0232	theta star (KM)					0.037
1567	80% gamma percentile (KM)					0.811	90% gamma percentile (KM)					0.892
1568	95% gamma percentile (KM)					0.962	99% gamma percentile (KM)					1.105
1569												
1570	**Gamma Kaplan-Meier (KM) Statistics**											
1571	Approximate Chi Square Value (294.55, α)					255.8	Adjusted Chi Square Value (294.55, β)					246.6
1572	95% Gamma Approximate KM-UCL (use when n>=50)					0.785	95% Gamma Adjusted KM-UCL (use when n<50)					0.814
1573												
1574	**Lognormal GOF Test on Detected Observations Only**											
1575	Shapiro Wilk Test Statistic					0.872	**Shapiro Wilk GOF Test**					
1576	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Lognormal at 5% Significance Level					
1577	Lilliefors Test Statistic					0.203	**Lilliefors GOF Test**					
1578	5% Lilliefors Critical Value					0.325	Detected Data appear Lognormal at 5% Significance Level					
1579	**Detected Data appear Lognormal at 5% Significance Level**											
1580												
1581	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1582	Mean in Original Scale					0.68	Mean in Log Scale					-0.401
1583	SD in Original Scale					0.123	SD in Log Scale					0.186
1584	95% t UCL (assumes normality of ROS data)					0.762	95% Percentile Bootstrap UCL					0.747
1585	95% BCA Bootstrap UCL					0.75	95% Bootstrap t UCL					0.759
1586	95% H-UCL (Log ROS)					0.78						
1587												
1588	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1589	KM Mean (logged)					-0.401	KM Geo Mean					0.67
1590	KM SD (logged)					0.19	95% Critical H Value (KM-Log)					1.933
1591	KM Standard Error of Mean (logged)					0.0849	95% H-UCL (KM -Log)					0.783
1592	KM SD (logged)					0.19	95% Critical H Value (KM-Log)					1.933
1593	KM Standard Error of Mean (logged)					0.0849						
1594												
1595	**DL/2 Statistics**											
1596	**DL/2 Normal**						**DL/2 Log-Transformed**					
1597	Mean in Original Scale					0.724	Mean in Log Scale					-0.341
1598	SD in Original Scale					0.14	SD in Log Scale					0.208
1599	95% t UCL (Assumes normality)					0.818	95% H-Stat UCL					0.846
1600	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1601												
1602	**Nonparametric Distribution Free UCL Statistics**											
1603	**Detected Data appear Normal Distributed at 5% Significance Level**											
1604												
1605	**Suggested UCL to Use**											
1606	95% KM (t) UCL					0.788						
1607												
1608	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1609	Recommendations are based upon data size, data distribution, and skewness.											
1610	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

1611	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1612												
1613	**Cobalt (nfmw9)**											
1614												
1615	**General Statistics**											
1616						Total Number of Observations	8			Number of Distinct Observations	8	
1617						Number of Detects	7			Number of Non-Detects	1	
1618						Number of Distinct Detects	7			Number of Distinct Non-Detects	1	
1619						Minimum Detect	1.6			Minimum Non-Detect	1.7	
1620						Maximum Detect	21.7			Maximum Non-Detect	1.7	
1621						Variance Detects	56.08			Percent Non-Detects	12.5%	
1622						Mean Detects	6.514			SD Detects	7.489	
1623						Median Detects	2.5			CV Detects	1.15	
1624						Skewness Detects	1.81			Kurtosis Detects	2.799	
1625						Mean of Logged Detects	1.414			SD of Logged Detects	0.971	
1626												
1627	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1628	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1629	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1630	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1631												
1632	**Normal GOF Test on Detects Only**											
1633						Shapiro Wilk Test Statistic	0.716			**Shapiro Wilk GOF Test**		
1634						5% Shapiro Wilk Critical Value	0.803			Detected Data Not Normal at 5% Significance Level		
1635						Lilliefors Test Statistic	0.346			**Lilliefors GOF Test**		
1636						5% Lilliefors Critical Value	0.304			Detected Data Not Normal at 5% Significance Level		
1637	**Detected Data Not Normal at 5% Significance Level**											
1638												
1639	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1640						KM Mean	5.9			KM Standard Error of Mean	2.553	
1641						KM SD	6.686			95% KM (BCA) UCL	10.53	
1642						95% KM (t) UCL	10.74			95% KM (Percentile Bootstrap) UCL	10.41	
1643						95% KM (z) UCL	10.1			95% KM Bootstrap t UCL	38.46	
1644						90% KM Chebyshev UCL	13.56			95% KM Chebyshev UCL	17.03	
1645						97.5% KM Chebyshev UCL	21.84			99% KM Chebyshev UCL	31.3	
1646												
1647	**Gamma GOF Tests on Detected Observations Only**											
1648						A-D Test Statistic	0.729			**Anderson-Darling GOF Test**		
1649						5% A-D Critical Value	0.725			Detected Data Not Gamma Distributed at 5% Significance Level		
1650						K-S Test Statistic	0.295			**Kolmogorov-Smirnov GOF**		
1651						5% K-S Critical Value	0.318			Detected data appear Gamma Distributed at 5% Significance Level		
1652	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
1653												
1654	**Gamma Statistics on Detected Data Only**											
1655						k hat (MLE)	1.226			k star (bias corrected MLE)	0.796	
1656						Theta hat (MLE)	5.313			Theta star (bias corrected MLE)	8.185	
1657						nu hat (MLE)	17.17			nu star (bias corrected)	11.14	
1658						Mean (detects)	6.514					
1659												
1660	**Gamma ROS Statistics using Imputed Non-Detects**											
1661	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1662	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											

1663	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1664	This is especially true when the sample size is small.											
1665	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1666					Minimum	0.01				Mean	5.701	
1667					Maximum	21.7				Median	2.4	
1668					SD	7.304				CV	1.281	
1669					k hat (MLE)	0.576				k star (bias corrected MLE)	0.443	
1670					Theta hat (MLE)	9.899				Theta star (bias corrected MLE)	12.86	
1671					nu hat (MLE)	9.215				nu star (bias corrected)	7.093	
1672					Adjusted Level of Significance (β)	0.0195						
1673					Approximate Chi Square Value (7.09, α)	2.222				Adjusted Chi Square Value (7.09, β)	1.597	
1674					95% Gamma Approximate UCL (use when n>=50)	18.2				95% Gamma Adjusted UCL (use when n<50)	25.32	
1675												
1676	**Estimates of Gamma Parameters using KM Estimates**											
1677					Mean (KM)	5.9				SD (KM)	6.686	
1678					Variance (KM)	44.7				SE of Mean (KM)	2.553	
1679					k hat (KM)	0.779				k star (KM)	0.57	
1680					nu hat (KM)	12.46				nu star (KM)	9.121	
1681					theta hat (KM)	7.576				theta star (KM)	10.35	
1682					80% gamma percentile (KM)	9.723				90% gamma percentile (KM)	15.52	
1683					95% gamma percentile (KM)	21.63				99% gamma percentile (KM)	36.46	
1684												
1685	**Gamma Kaplan-Meier (KM) Statistics**											
1686					Approximate Chi Square Value (9.12, α)	3.4				Adjusted Chi Square Value (9.12, β)	2.578	
1687					95% Gamma Approximate KM-UCL (use when n>=50)	15.83				95% Gamma Adjusted KM-UCL (use when n<50)	20.87	
1688												
1689	**Lognormal GOF Test on Detected Observations Only**											
1690					Shapiro Wilk Test Statistic	0.855				**Shapiro Wilk GOF Test**		
1691					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
1692					Lilliefors Test Statistic	0.267				**Lilliefors GOF Test**		
1693					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
1694	**Detected Data appear Lognormal at 5% Significance Level**											
1695												
1696	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1697					Mean in Original Scale	5.821				Mean in Log Scale	1.233	
1698					SD in Original Scale	7.205				SD in Log Scale	1.035	
1699					95% t UCL (assumes normality of ROS data)	10.65				95% Percentile Bootstrap UCL	10.26	
1700					95% BCA Bootstrap UCL	11.82				95% Bootstrap t UCL	34.62	
1701					95% H-UCL (Log ROS)	23.12						
1702												
1703	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1704					KM Mean (logged)	1.296				KM Geo Mean	3.654	
1705					KM SD (logged)	0.897				95% Critical H Value (KM-Log)	3.177	
1706					KM Standard Error of Mean (logged)	0.343				95% H-UCL (KM -Log)	16.04	
1707					KM SD (logged)	0.897				95% Critical H Value (KM-Log)	3.177	
1708					KM Standard Error of Mean (logged)	0.343						
1709												
1710	**DL/2 Statistics**											
1711	**DL/2 Normal**									**DL/2 Log-Transformed**		
1712					Mean in Original Scale	5.806				Mean in Log Scale	1.217	
1713					SD in Original Scale	7.216				SD in Log Scale	1.058	
1714					95% t UCL (Assumes normality)	10.64				95% H-Stat UCL	24.61	

	A	B	C	D	E	F	G	H	I	J	K	L
1715	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1716												
1717	**Nonparametric Distribution Free UCL Statistics**											
1718	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
1719												
1720	**Suggested UCL to Use**											
1721	95% KM Bootstrap t UCL					38.46	Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)					20.87
1722												
1723	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
1724	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
1725												
1726	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1727	Recommendations are based upon data size, data distribution, and skewness.											
1728	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1729	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1730												
1731	**Cobalt (smw10)**											
1732												
1733	**General Statistics**											
1734	Total Number of Observations					8	Number of Distinct Observations					6
1735	Number of Detects					7	Number of Non-Detects					1
1736	Number of Distinct Detects					5	Number of Distinct Non-Detects					1
1737	Minimum Detect					0.25	Minimum Non-Detect					1.7
1738	Maximum Detect					0.39	Maximum Non-Detect					1.7
1739	Variance Detects					0.0038	Percent Non-Detects					12.5%
1740	Mean Detects					0.324	SD Detects					0.0616
1741	Median Detects					0.33	CV Detects					0.19
1742	Skewness Detects					-0.23	Kurtosis Detects					-2.153
1743	Mean of Logged Detects					-1.142	SD of Logged Detects					0.196
1744												
1745	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1746	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1747	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1748	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1749												
1750	**Normal GOF Test on Detects Only**											
1751	Shapiro Wilk Test Statistic					0.852	**Shapiro Wilk GOF Test**					
1752	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Normal at 5% Significance Level					
1753	Lilliefors Test Statistic					0.246	**Lilliefors GOF Test**					
1754	5% Lilliefors Critical Value					0.304	Detected Data appear Normal at 5% Significance Level					
1755	**Detected Data appear Normal at 5% Significance Level**											
1756												
1757	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1758	KM Mean					0.324	KM Standard Error of Mean					0.0233
1759	KM SD					0.057	95% KM (BCA) UCL					0.359
1760	95% KM (t) UCL					0.368	95% KM (Percentile Bootstrap) UCL					0.36
1761	95% KM (z) UCL					0.363	95% KM Bootstrap t UCL					0.369
1762	90% KM Chebyshev UCL					0.394	95% KM Chebyshev UCL					0.426
1763	97.5% KM Chebyshev UCL					0.47	99% KM Chebyshev UCL					0.556
1764												
1765	**Gamma GOF Tests on Detected Observations Only**											
1766	A-D Test Statistic					0.542	**Anderson-Darling GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
1767				5% A-D Critical Value		0.707	Detected data appear Gamma Distributed at 5% Significance Level					
1768				K-S Test Statistic		0.262	**Kolmogorov-Smirnov GOF**					
1769				5% K-S Critical Value		0.311	Detected data appear Gamma Distributed at 5% Significance Level					
1770	**Detected data appear Gamma Distributed at 5% Significance Level**											
1771												
1772	**Gamma Statistics on Detected Data Only**											
1773				k hat (MLE)		31.14	k star (bias corrected MLE)					17.89
1774				Theta hat (MLE)		0.0104	Theta star (bias corrected MLE)					0.0181
1775				nu hat (MLE)		436	nu star (bias corrected)					250.5
1776				Mean (detects)		0.324						
1777												
1778	**Gamma ROS Statistics using Imputed Non-Detects**											
1779	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1780	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1781	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1782	This is especially true when the sample size is small.											
1783	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1784				Minimum		0.25	Mean					0.324
1785				Maximum		0.39	Median					0.326
1786				SD		0.057	CV					0.176
1787				k hat (MLE)		35.56	k star (bias corrected MLE)					22.31
1788				Theta hat (MLE)		0.00911	Theta star (bias corrected MLE)					0.0145
1789				nu hat (MLE)		569	nu star (bias corrected)					356.9
1790				Adjusted Level of Significance (β)		0.0195						
1791				Approximate Chi Square Value (356.93, α)		314.2	Adjusted Chi Square Value (356.93, β)					304
1792				95% Gamma Approximate UCL (use when n>=50)		0.368	95% Gamma Adjusted UCL (use when n<50)					0.38
1793												
1794	**Estimates of Gamma Parameters using KM Estimates**											
1795				Mean (KM)		0.324	SD (KM)					0.057
1796				Variance (KM)		0.00325	SE of Mean (KM)					0.0233
1797				k hat (KM)		32.33	k star (KM)					20.29
1798				nu hat (KM)		517.2	nu star (KM)					324.6
1799				theta hat (KM)		0.01	theta star (KM)					0.016
1800				80% gamma percentile (KM)		0.383	90% gamma percentile (KM)					0.419
1801				95% gamma percentile (KM)		0.451	99% gamma percentile (KM)					0.515
1802												
1803	**Gamma Kaplan-Meier (KM) Statistics**											
1804				Approximate Chi Square Value (324.60, α)		283.9	Adjusted Chi Square Value (324.60, β)					274.2
1805				95% Gamma Approximate KM-UCL (use when n>=50)		0.371	95% Gamma Adjusted KM-UCL (use when n<50)					0.384
1806												
1807	**Lognormal GOF Test on Detected Observations Only**											
1808				Shapiro Wilk Test Statistic		0.847	**Shapiro Wilk GOF Test**					
1809				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Lognormal at 5% Significance Level					
1810				Lilliefors Test Statistic		0.242	**Lilliefors GOF Test**					
1811				5% Lilliefors Critical Value		0.304	Detected Data appear Lognormal at 5% Significance Level					
1812	**Detected Data appear Lognormal at 5% Significance Level**											
1813												
1814	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1815				Mean in Original Scale		0.324	Mean in Log Scale					-1.142
1816				SD in Original Scale		0.0571	SD in Log Scale					0.182
1817				95% t UCL (assumes normality of ROS data)		0.362	95% Percentile Bootstrap UCL					0.354
1818				95% BCA Bootstrap UCL		0.355	95% Bootstrap t UCL					0.36

1819				95% H-UCL (Log ROS)		0.37						
1820												
1821	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1822				KM Mean (logged)		-1.142				KM Geo Mean		0.319
1823				KM SD (logged)		0.182				95% Critical H Value (KM-Log)		1.924
1824				KM Standard Error of Mean (logged)		0.0741				95% H-UCL (KM -Log)		0.37
1825				KM SD (logged)		0.182				95% Critical H Value (KM-Log)		1.924
1826				KM Standard Error of Mean (logged)		0.0741						
1827												
1828	**DL/2 Statistics**											
1829				**DL/2 Normal**						**DL/2 Log-Transformed**		
1830				Mean in Original Scale		0.39				Mean in Log Scale		-1.02
1831				SD in Original Scale		0.194				SD in Log Scale		0.391
1832				95% t UCL (Assumes normality)		0.52				95% H-Stat UCL		0.538
1833	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1834												
1835	**Nonparametric Distribution Free UCL Statistics**											
1836	**Detected Data appear Normal Distributed at 5% Significance Level**											
1837												
1838	**Suggested UCL to Use**											
1839				95% KM (t) UCL		0.368						
1840												
1841	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1842	Recommendations are based upon data size, data distribution, and skewness.											
1843	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1844	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1845												
1846	**Cobalt (smw11)**											
1847												
1848	**General Statistics**											
1849				Total Number of Observations		9				Number of Distinct Observations		9
1850				Number of Detects		8				Number of Non-Detects		1
1851				Number of Distinct Detects		8				Number of Distinct Non-Detects		1
1852				Minimum Detect		0.42				Minimum Non-Detect		0.76
1853				Maximum Detect		16.2				Maximum Non-Detect		0.76
1854				Variance Detects		30.31				Percent Non-Detects		11.11%
1855				Mean Detects		2.608				SD Detects		5.506
1856				Median Detects		0.55				CV Detects		2.112
1857				Skewness Detects		2.801				Kurtosis Detects		7.88
1858				Mean of Logged Detects		-0.105				SD of Logged Detects		1.242
1859												
1860	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1861	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1862	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1863	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1864												
1865	**Normal GOF Test on Detects Only**											
1866				Shapiro Wilk Test Statistic		0.466				**Shapiro Wilk GOF Test**		
1867				5% Shapiro Wilk Critical Value		0.818				Detected Data Not Normal at 5% Significance Level		
1868				Lilliefors Test Statistic		0.448				**Lilliefors GOF Test**		
1869				5% Lilliefors Critical Value		0.283				Detected Data Not Normal at 5% Significance Level		
1870	**Detected Data Not Normal at 5% Significance Level**											

1871												
1872	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1873				KM Mean	2.374			KM Standard Error of Mean	1.746			
1874				KM SD	4.9			95% KM (BCA) UCL	5.736			
1875				95% KM (t) UCL	5.622			95% KM (Percentile Bootstrap) UCL	5.764			
1876				95% KM (z) UCL	5.247			95% KM Bootstrap t UCL	141.5			
1877				90% KM Chebyshev UCL	7.613			95% KM Chebyshev UCL	9.986			
1878				97.5% KM Chebyshev UCL	13.28			99% KM Chebyshev UCL	19.75			
1879												
1880	**Gamma GOF Tests on Detected Observations Only**											
1881				A-D Test Statistic	1.725			**Anderson-Darling GOF Test**				
1882				5% A-D Critical Value	0.757			Detected Data Not Gamma Distributed at 5% Significance Level				
1883				K-S Test Statistic	0.419			**Kolmogorov-Smirnov GOF**				
1884				5% K-S Critical Value	0.307			Detected Data Not Gamma Distributed at 5% Significance Level				
1885	**Detected Data Not Gamma Distributed at 5% Significance Level**											
1886												
1887	**Gamma Statistics on Detected Data Only**											
1888				k hat (MLE)	0.583			k star (bias corrected MLE)	0.448			
1889				Theta hat (MLE)	4.469			Theta star (bias corrected MLE)	5.82			
1890				nu hat (MLE)	9.336			nu star (bias corrected)	7.168			
1891				Mean (detects)	2.608							
1892												
1893	**Gamma ROS Statistics using Imputed Non-Detects**											
1894	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1895	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1896	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1897	This is especially true when the sample size is small.											
1898	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1899				Minimum	0.01			Mean	2.319			
1900				Maximum	16.2			Median	0.52			
1901				SD	5.222			CV	2.252			
1902				k hat (MLE)	0.447			k star (bias corrected MLE)	0.372			
1903				Theta hat (MLE)	5.187			Theta star (bias corrected MLE)	6.232			
1904				nu hat (MLE)	8.047			nu star (bias corrected)	6.698			
1905				Adjusted Level of Significance (β)	0.0231							
1906				Approximate Chi Square Value (6.70, α)	2.006			Adjusted Chi Square Value (6.70, β)	1.511			
1907				95% Gamma Approximate UCL (use when n>=50)	7.741			95% Gamma Adjusted UCL (use when n<50)	10.28			
1908												
1909	**Estimates of Gamma Parameters using KM Estimates**											
1910				Mean (KM)	2.374			SD (KM)	4.9			
1911				Variance (KM)	24.01			SE of Mean (KM)	1.746			
1912				k hat (KM)	0.235			k star (KM)	0.231			
1913				nu hat (KM)	4.226			nu star (KM)	4.151			
1914				theta hat (KM)	10.11			theta star (KM)	10.3			
1915				80% gamma percentile (KM)	3.344			90% gamma percentile (KM)	7.161			
1916				95% gamma percentile (KM)	11.77			99% gamma percentile (KM)	24.17			
1917												
1918	**Gamma Kaplan-Meier (KM) Statistics**											
1919				Approximate Chi Square Value (4.15, α)	0.782			Adjusted Chi Square Value (4.15, β)	0.527			
1920				95% Gamma Approximate KM-UCL (use when n>=50)	12.6			95% Gamma Adjusted KM-UCL (use when n<50)	18.71			
1921												
1922	**Lognormal GOF Test on Detected Observations Only**											

1923					Shapiro Wilk Test Statistic	0.656	**Shapiro Wilk GOF Test**					
1924					5% Shapiro Wilk Critical Value	0.818	Detected Data Not Lognormal at 5% Significance Level					
1925					Lilliefors Test Statistic	0.378	**Lilliefors GOF Test**					
1926					5% Lilliefors Critical Value	0.283	Detected Data Not Lognormal at 5% Significance Level					
1927	**Detected Data Not Lognormal at 5% Significance Level**											
1928												
1929	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1930					Mean in Original Scale	2.386	Mean in Log Scale	-0.148				
1931					SD in Original Scale	5.193	SD in Log Scale	1.169				
1932					95% t UCL (assumes normality of ROS data)	5.604	95% Percentile Bootstrap UCL	5.836				
1933					95% BCA Bootstrap UCL	7.51	95% Bootstrap t UCL	139.7				
1934					95% H-UCL (Log ROS)	7.636						
1935												
1936	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1937					KM Mean (logged)	-0.169	KM Geo Mean	0.844				
1938					KM SD (logged)	1.111	95% Critical H Value (KM-Log)	3.49				
1939					KM Standard Error of Mean (logged)	0.396	95% H-UCL (KM -Log)	6.165				
1940					KM SD (logged)	1.111	95% Critical H Value (KM-Log)	3.49				
1941					KM Standard Error of Mean (logged)	0.396						
1942												
1943	**DL/2 Statistics**											
1944	**DL/2 Normal**						**DL/2 Log-Transformed**					
1945					Mean in Original Scale	2.36	Mean in Log Scale	-0.201				
1946					SD in Original Scale	5.203	SD in Log Scale	1.197				
1947					95% t UCL (Assumes normality)	5.585	95% H-Stat UCL	7.979				
1948	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1949												
1950	**Nonparametric Distribution Free UCL Statistics**											
1951	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1952												
1953	**Suggested UCL to Use**											
1954					95% KM (Chebyshev) UCL	9.986						
1955												
1956	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1957	Recommendations are based upon data size, data distribution, and skewness.											
1958	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1959	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1960												
1961	**Cobalt (smw12)**											
1962												
1963	**General Statistics**											
1964					Total Number of Observations	8	Number of Distinct Observations	8				
1965					Number of Detects	6	Number of Non-Detects	2				
1966					Number of Distinct Detects	6	Number of Distinct Non-Detects	2				
1967					Minimum Detect	0.25	Minimum Non-Detect	0.76				
1968					Maximum Detect	0.52	Maximum Non-Detect	1.7				
1969					Variance Detects	0.00858	Percent Non-Detects	25%				
1970					Mean Detects	0.398	SD Detects	0.0926				
1971					Median Detects	0.4	CV Detects	0.232				
1972					Skewness Detects	-0.484	Kurtosis Detects	0.604				
1973					Mean of Logged Detects	-0.946	SD of Logged Detects	0.253				
1974												

1975	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1976	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1977	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1978	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1979												
1980	Normal GOF Test on Detects Only											
1981					Shapiro Wilk Test Statistic			0.982	Shapiro Wilk GOF Test			
1982					5% Shapiro Wilk Critical Value			0.788	Detected Data appear Normal at 5% Significance Level			
1983					Lilliefors Test Statistic			0.173	Lilliefors GOF Test			
1984					5% Lilliefors Critical Value			0.325	Detected Data appear Normal at 5% Significance Level			
1985	Detected Data appear Normal at 5% Significance Level											
1986												
1987	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
1988					KM Mean			0.398	KM Standard Error of Mean			0.0378
1989					KM SD			0.0845	95% KM (BCA) UCL			0.454
1990					95% KM (t) UCL			0.47	95% KM (Percentile Bootstrap) UCL			0.454
1991					95% KM (z) UCL			0.461	95% KM Bootstrap t UCL			0.466
1992					90% KM Chebyshev UCL			0.512	95% KM Chebyshev UCL			0.563
1993					97.5% KM Chebyshev UCL			0.634	99% KM Chebyshev UCL			0.775
1994												
1995	Gamma GOF Tests on Detected Observations Only											
1996					A-D Test Statistic			0.239	Anderson-Darling GOF Test			
1997					5% A-D Critical Value			0.697	Detected data appear Gamma Distributed at 5% Significance Level			
1998					K-S Test Statistic			0.189	Kolmogorov-Smirnov GOF			
1999					5% K-S Critical Value			0.332	Detected data appear Gamma Distributed at 5% Significance Level			
2000	Detected data appear Gamma Distributed at 5% Significance Level											
2001												
2002	Gamma Statistics on Detected Data Only											
2003					k hat (MLE)			20.07	k star (bias corrected MLE)			10.15
2004					Theta hat (MLE)			0.0198	Theta star (bias corrected MLE)			0.0393
2005					nu hat (MLE)			240.9	nu star (bias corrected)			121.8
2006					Mean (detects)			0.398				
2007												
2008	Gamma ROS Statistics using Imputed Non-Detects											
2009	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2010	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2011	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2012	This is especially true when the sample size is small.											
2013	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2014					Minimum			0.25	Mean			0.397
2015					Maximum			0.52	Median			0.394
2016					SD			0.0783	CV			0.197
2017					k hat (MLE)			26.69	k star (bias corrected MLE)			16.77
2018					Theta hat (MLE)			0.0149	Theta star (bias corrected MLE)			0.0237
2019					nu hat (MLE)			427.1	nu star (bias corrected)			268.3
2020					Adjusted Level of Significance (β)			0.0195				
2021					Approximate Chi Square Value (268.28, α)			231.3	Adjusted Chi Square Value (268.28, β)			222.6
2022					95% Gamma Approximate UCL (use when n>=50)			0.461	95% Gamma Adjusted UCL (use when n<50)			0.479
2023												
2024	Estimates of Gamma Parameters using KM Estimates											
2025					Mean (KM)			0.398	SD (KM)			0.0845
2026					Variance (KM)			0.00715	SE of Mean (KM)			0.0378

	A	B	C	D	E	F	G	H	I	J	K	L
2027					k hat (KM)	22.2					k star (KM)	13.96
2028					nu hat (KM)	355.2					nu star (KM)	223.3
2029					theta hat (KM)	0.0179					theta star (KM)	0.0285
2030					80% gamma percentile (KM)	0.484					90% gamma percentile (KM)	0.54
2031					95% gamma percentile (KM)	0.588					99% gamma percentile (KM)	0.687
2032												
2033					**Gamma Kaplan-Meier (KM) Statistics**							
2034					Approximate Chi Square Value (223.33, α)	189.7					Adjusted Chi Square Value (223.33, β)	181.9
2035					95% Gamma Approximate KM-UCL (use when n>=50)	0.469					95% Gamma Adjusted KM-UCL (use when n<50)	0.489
2036												
2037					**Lognormal GOF Test on Detected Observations Only**							
2038					Shapiro Wilk Test Statistic	0.94					**Shapiro Wilk GOF Test**	
2039					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Lognormal at 5% Significance Level	
2040					Lilliefors Test Statistic	0.215					**Lilliefors GOF Test**	
2041					5% Lilliefors Critical Value	0.325					Detected Data appear Lognormal at 5% Significance Level	
2042					**Detected Data appear Lognormal at 5% Significance Level**							
2043												
2044					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2045					Mean in Original Scale	0.396					Mean in Log Scale	-0.946
2046					SD in Original Scale	0.0784					SD in Log Scale	0.214
2047					95% t UCL (assumes normality of ROS data)	0.448					95% Percentile Bootstrap UCL	0.436
2048					95% BCA Bootstrap UCL	0.437					95% Bootstrap t UCL	0.446
2049					95% H-UCL (Log ROS)	0.466						
2050												
2051					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2052					KM Mean (logged)	-0.946					KM Geo Mean	0.388
2053					KM SD (logged)	0.231					95% Critical H Value (KM-Log)	1.976
2054					KM Standard Error of Mean (logged)	0.103					95% H-UCL (KM -Log)	0.474
2055					KM SD (logged)	0.231					95% Critical H Value (KM-Log)	1.976
2056					KM Standard Error of Mean (logged)	0.103						
2057												
2058					**DL/2 Statistics**							
2059					**DL/2 Normal**						**DL/2 Log-Transformed**	
2060					Mean in Original Scale	0.453					Mean in Log Scale	-0.85
2061					SD in Original Scale	0.179					SD in Log Scale	0.351
2062					95% t UCL (Assumes normality)	0.572					95% H-Stat UCL	0.602
2063					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2064												
2065					**Nonparametric Distribution Free UCL Statistics**							
2066					**Detected Data appear Normal Distributed at 5% Significance Level**							
2067												
2068					**Suggested UCL to Use**							
2069					95% KM (t) UCL	0.47						
2070												
2071					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2072					Recommendations are based upon data size, data distribution, and skewness.							
2073					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2074					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2075												
2076	**Cobalt (smw13)**											
2077												
2078					**General Statistics**							

2079	Total Number of Observations					8	Number of Distinct Observations					7
2080	Number of Detects					4	Number of Non-Detects					4
2081	Number of Distinct Detects					4	Number of Distinct Non-Detects					3
2082	Minimum Detect					0.51	Minimum Non-Detect					0.43
2083	Maximum Detect					7.9	Maximum Non-Detect					1.7
2084	Variance Detects					12.34	Percent Non-Detects					50%
2085	Mean Detects					2.66	SD Detects					3.513
2086	Median Detects					1.115	CV Detects					1.321
2087	Skewness Detects					1.935	Kurtosis Detects					3.775
2088	Mean of Logged Detects					0.386	SD of Logged Detects					1.194
2089												
2090	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2091	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2092	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2093	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2094												
2095	**Normal GOF Test on Detects Only**											
2096	Shapiro Wilk Test Statistic					0.723	**Shapiro Wilk GOF Test**					
2097	5% Shapiro Wilk Critical Value					0.748	Detected Data Not Normal at 5% Significance Level					
2098	Lilliefors Test Statistic					0.39	**Lilliefors GOF Test**					
2099	5% Lilliefors Critical Value					0.375	Detected Data Not Normal at 5% Significance Level					
2100	**Detected Data Not Normal at 5% Significance Level**											
2101												
2102	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2103	KM Mean					1.579	KM Standard Error of Mean					0.986
2104	KM SD					2.412	95% KM (BCA) UCL					N/A
2105	95% KM (t) UCL					3.447	95% KM (Percentile Bootstrap) UCL					N/A
2106	95% KM (z) UCL					3.201	95% KM Bootstrap t UCL					N/A
2107	90% KM Chebyshev UCL					4.538	95% KM Chebyshev UCL					5.878
2108	97.5% KM Chebyshev UCL					7.738	99% KM Chebyshev UCL					11.39
2109												
2110	**Gamma GOF Tests on Detected Observations Only**											
2111	A-D Test Statistic					0.483	**Anderson-Darling GOF Test**					
2112	5% A-D Critical Value					0.667	Detected data appear Gamma Distributed at 5% Significance Level					
2113	K-S Test Statistic					0.337	**Kolmogorov-Smirnov GOF**					
2114	5% K-S Critical Value					0.403	Detected data appear Gamma Distributed at 5% Significance Level					
2115	**Detected data appear Gamma Distributed at 5% Significance Level**											
2116												
2117	**Gamma Statistics on Detected Data Only**											
2118	k hat (MLE)					0.977	k star (bias corrected MLE)					0.411
2119	Theta hat (MLE)					2.723	Theta star (bias corrected MLE)					6.473
2120	nu hat (MLE)					7.816	nu star (bias corrected)					3.287
2121	Mean (detects)					2.66						
2122												
2123	**Gamma ROS Statistics using Imputed Non-Detects**											
2124	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2125	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2126	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2127	This is especially true when the sample size is small.											
2128	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2129	Minimum					0.01	Mean					1.335
2130	Maximum					7.9	Median					0.26

2131					SD	2.701			CV	2.023		
2132					k hat (MLE)	0.289			k star (bias corrected MLE)	0.264		
2133					Theta hat (MLE)	4.616			Theta star (bias corrected MLE)	5.055		
2134					nu hat (MLE)	4.627			nu star (bias corrected)	4.225		
2135					Adjusted Level of Significance (β)	0.0195						
2136					Approximate Chi Square Value (4.23, α)	0.813			Adjusted Chi Square Value (4.23, β)	0.506		
2137					95% Gamma Approximate UCL (use when n>=50)	6.941			95% Gamma Adjusted UCL (use when n<50)	N/A		
2138												
2139					**Estimates of Gamma Parameters using KM Estimates**							
2140					Mean (KM)	1.579			SD (KM)	2.412		
2141					Variance (KM)	5.816			SE of Mean (KM)	0.986		
2142					k hat (KM)	0.429			k star (KM)	0.351		
2143					nu hat (KM)	6.859			nu star (KM)	5.62		
2144					theta hat (KM)	3.683			theta star (KM)	4.495		
2145					80% gamma percentile (KM)	2.502			90% gamma percentile (KM)	4.557		
2146					95% gamma percentile (KM)	6.858			99% gamma percentile (KM)	12.73		
2147												
2148					**Gamma Kaplan-Meier (KM) Statistics**							
2149					Approximate Chi Square Value (5.62, α)	1.449			Adjusted Chi Square Value (5.62, β)	0.982		
2150					95% Gamma Approximate KM-UCL (use when n>=50)	6.125			95% Gamma Adjusted KM-UCL (use when n<50)	9.041		
2151												
2152					**Lognormal GOF Test on Detected Observations Only**							
2153					Shapiro Wilk Test Statistic	0.908			**Shapiro Wilk GOF Test**			
2154					5% Shapiro Wilk Critical Value	0.748			Detected Data appear Lognormal at 5% Significance Level			
2155					Lilliefors Test Statistic	0.267			**Lilliefors GOF Test**			
2156					5% Lilliefors Critical Value	0.375			Detected Data appear Lognormal at 5% Significance Level			
2157					**Detected Data appear Lognormal at 5% Significance Level**							
2158												
2159					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2160					Mean in Original Scale	1.416			Mean in Log Scale	-0.779		
2161					SD in Original Scale	2.658			SD in Log Scale	1.543		
2162					95% t UCL (assumes normality of ROS data)	3.196			95% Percentile Bootstrap UCL	3.205		
2163					95% BCA Bootstrap UCL	3.655			95% Bootstrap t UCL	12.34		
2164					95% H-UCL (Log ROS)	25.61						
2165												
2166					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2167					KM Mean (logged)	-0.179			KM Geo Mean	0.836		
2168					KM SD (logged)	0.943			95% Critical H Value (KM-Log)	3.286		
2169					KM Standard Error of Mean (logged)	0.391			95% H-UCL (KM -Log)	4.205		
2170					KM SD (logged)	0.943			95% Critical H Value (KM-Log)	3.286		
2171					KM Standard Error of Mean (logged)	0.391						
2172												
2173					**DL/2 Statistics**							
2174					**DL/2 Normal**				**DL/2 Log-Transformed**			
2175					Mean in Original Scale	1.538			Mean in Log Scale	-0.333		
2176					SD in Original Scale	2.601			SD in Log Scale	1.176		
2177					95% t UCL (Assumes normality)	3.28			95% H-Stat UCL	7.998		
2178					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2179												
2180					**Nonparametric Distribution Free UCL Statistics**							
2181					**Detected Data appear Gamma Distributed at 5% Significance Level**							
2182												

2183	**Suggested UCL to Use**											
2184					95% KM Bootstrap t UCL	N/A			Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)			9.041
2185												
2186	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2187	Recommendations are based upon data size, data distribution, and skewness.											
2188	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2189	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2190												
2191	**Cobalt (smw14)**											
2192												
2193	**General Statistics**											
2194					Total Number of Observations	8			Number of Distinct Observations			8
2195					Number of Detects	6			Number of Non-Detects			2
2196					Number of Distinct Detects	6			Number of Distinct Non-Detects			2
2197					Minimum Detect	0.42			Minimum Non-Detect			0.43
2198					Maximum Detect	1.1			Maximum Non-Detect			1.7
2199					Variance Detects	0.066			Percent Non-Detects			25%
2200					Mean Detects	0.597			SD Detects			0.257
2201					Median Detects	0.5			CV Detects			0.431
2202					Skewness Detects	2.048			Kurtosis Detects			4.354
2203					Mean of Logged Detects	-0.577			SD of Logged Detects			0.358
2204												
2205	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2206	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2207	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2208	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2209												
2210	**Normal GOF Test on Detects Only**											
2211					Shapiro Wilk Test Statistic	0.736			**Shapiro Wilk GOF Test**			
2212					5% Shapiro Wilk Critical Value	0.788			Detected Data Not Normal at 5% Significance Level			
2213					Lilliefors Test Statistic	0.297			**Lilliefors GOF Test**			
2214					5% Lilliefors Critical Value	0.325			Detected Data appear Normal at 5% Significance Level			
2215	**Detected Data appear Approximate Normal at 5% Significance Level**											
2216												
2217	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2218					KM Mean	0.571			KM Standard Error of Mean			0.0935
2219					KM SD	0.226			95% KM (BCA) UCL			0.734
2220					95% KM (t) UCL	0.749			95% KM (Percentile Bootstrap) UCL			0.724
2221					95% KM (z) UCL	0.725			95% KM Bootstrap t UCL			1.185
2222					90% KM Chebyshev UCL	0.852			95% KM Chebyshev UCL			0.979
2223					97.5% KM Chebyshev UCL	1.155			99% KM Chebyshev UCL			1.502
2224												
2225	**Gamma GOF Tests on Detected Observations Only**											
2226					A-D Test Statistic	0.645			**Anderson-Darling GOF Test**			
2227					5% A-D Critical Value	0.698			Detected data appear Gamma Distributed at 5% Significance Level			
2228					K-S Test Statistic	0.254			**Kolmogorov-Smirnov GOF**			
2229					5% K-S Critical Value	0.333			Detected data appear Gamma Distributed at 5% Significance Level			
2230	**Detected data appear Gamma Distributed at 5% Significance Level**											
2231												
2232	**Gamma Statistics on Detected Data Only**											
2233					k hat (MLE)	8.434			k star (bias corrected MLE)			4.328
2234					Theta hat (MLE)	0.0707			Theta star (bias corrected MLE)			0.138

	A	B	C	D	E	F	G	H	I	J	K	L
2235					nu hat (MLE)	101.2				nu star (bias corrected)		51.94
2236					Mean (detects)	0.597						
2237												
2238	**Gamma ROS Statistics using Imputed Non-Detects**											
2239	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2240	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2241	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2242	This is especially true when the sample size is small.											
2243	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2244					Minimum	0.278				Mean		0.549
2245					Maximum	1.1				Median		0.5
2246					SD	0.244				CV		0.445
2247					k hat (MLE)	7.158				k star (bias corrected MLE)		4.557
2248					Theta hat (MLE)	0.0767				Theta star (bias corrected MLE)		0.12
2249					nu hat (MLE)	114.5				nu star (bias corrected)		72.92
2250					Adjusted Level of Significance (β)	0.0195						
2251					Approximate Chi Square Value (72.92, α)	54.25				Adjusted Chi Square Value (72.92, β)		50.2
2252					95% Gamma Approximate UCL (use when n>=50)	0.738				95% Gamma Adjusted UCL (use when n<50)		0.797
2253												
2254	**Estimates of Gamma Parameters using KM Estimates**											
2255					Mean (KM)	0.571				SD (KM)		0.226
2256					Variance (KM)	0.051				SE of Mean (KM)		0.0935
2257					k hat (KM)	6.405				k star (KM)		4.086
2258					nu hat (KM)	102.5				nu star (KM)		65.38
2259					theta hat (KM)	0.0892				theta star (KM)		0.14
2260					80% gamma percentile (KM)	0.786				90% gamma percentile (KM)		0.95
2261					95% gamma percentile (KM)	1.101				99% gamma percentile (KM)		1.424
2262												
2263	**Gamma Kaplan-Meier (KM) Statistics**											
2264					Approximate Chi Square Value (65.38, α)	47.77				Adjusted Chi Square Value (65.38, β)		43.99
2265					95% Gamma Approximate KM-UCL (use when n>=50)	0.782				95% Gamma Adjusted KM-UCL (use when n<50)		0.849
2266												
2267	**Lognormal GOF Test on Detected Observations Only**											
2268					Shapiro Wilk Test Statistic	0.822	**Shapiro Wilk GOF Test**					
2269					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level					
2270					Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**					
2271					5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level					
2272	**Detected Data appear Lognormal at 5% Significance Level**											
2273												
2274	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2275					Mean in Original Scale	0.556				Mean in Log Scale		-0.646
2276					SD in Original Scale	0.235				SD in Log Scale		0.347
2277					95% t UCL (assumes normality of ROS data)	0.714				95% Percentile Bootstrap UCL		0.695
2278					95% BCA Bootstrap UCL	0.748				95% Bootstrap t UCL		0.936
2279					95% H-UCL (Log ROS)	0.735						
2280												
2281	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2282					KM Mean (logged)	-0.618				KM Geo Mean		0.539
2283					KM SD (logged)	0.319				95% Critical H Value (KM-Log)		2.083
2284					KM Standard Error of Mean (logged)	0.132				95% H-UCL (KM -Log)		0.729
2285					KM SD (logged)	0.319				95% Critical H Value (KM-Log)		2.083
2286					KM Standard Error of Mean (logged)	0.132						

2287												
2288	**DL/2 Statistics**											
2289	**DL/2 Normal**						**DL/2 Log-Transformed**					
2290					Mean in Original Scale	0.581				Mean in Log Scale	-0.645	
2291					SD in Original Scale	0.277				SD in Log Scale	0.492	
2292					95% t UCL (Assumes normality)	0.766				95% H-Stat UCL	0.916	
2293	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2294												
2295	**Nonparametric Distribution Free UCL Statistics**											
2296	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
2297												
2298	**Suggested UCL to Use**											
2299						0.749						
2300												
2301	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2302	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2303												
2304	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2305	Recommendations are based upon data size, data distribution, and skewness.											
2306	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2307	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2308												
2309												
2310	**Cobalt (smw15)**											
2311												
2312	**General Statistics**											
2313					Total Number of Observations	9				Number of Distinct Observations	9	
2314										Number of Missing Observations	0	
2315					Minimum	1.4				Mean	80.89	
2316					Maximum	264				Median	63.8	
2317					SD	82.1				Std. Error of Mean	27.37	
2318					Coefficient of Variation	1.015				Skewness	1.588	
2319												
2320	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2321	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2322	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2323	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2324												
2325	**Normal GOF Test**											
2326					Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk GOF Test**					
2327					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
2328					Lilliefors Test Statistic	0.313	**Lilliefors GOF Test**					
2329					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
2330	**Data Not Normal at 5% Significance Level**											
2331												
2332	**Assuming Normal Distribution**											
2333	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2334					95% Student's-t UCL	131.8				95% Adjusted-CLT UCL (Chen-1995)	141.4	
2335										95% Modified-t UCL (Johnson-1978)	134.2	
2336												
2337	**Gamma GOF Test**											
2338					A-D Test Statistic	0.498	**Anderson-Darling Gamma GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
2339				5% A-D Critical Value		0.751	Detected data appear Gamma Distributed at 5% Significance Level					
2340				K-S Test Statistic		0.224	**Kolmogorov-Smirnov Gamma GOF Test**					
2341				5% K-S Critical Value		0.289	Detected data appear Gamma Distributed at 5% Significance Level					
2342	**Detected data appear Gamma Distributed at 5% Significance Level**											
2343												
2344	**Gamma Statistics**											
2345				k hat (MLE)		0.755	k star (bias corrected MLE)					0.577
2346				Theta hat (MLE)		107.1	Theta star (bias corrected MLE)					140.1
2347				nu hat (MLE)		13.59	nu star (bias corrected)					10.39
2348				MLE Mean (bias corrected)		80.89	MLE Sd (bias corrected)					106.4
2349							Approximate Chi Square Value (0.05)					4.189
2350				Adjusted Level of Significance		0.0231	Adjusted Chi Square Value					3.399
2351												
2352	**Assuming Gamma Distribution**											
2353			95% Approximate Gamma UCL (use when n>=50)			200.7	95% Adjusted Gamma UCL (use when n<50)					247.3
2354												
2355	**Lognormal GOF Test**											
2356				Shapiro Wilk Test Statistic		0.826	**Shapiro Wilk Lognormal GOF Test**					
2357				5% Shapiro Wilk Critical Value		0.829	Data Not Lognormal at 5% Significance Level					
2358				Lilliefors Test Statistic		0.301	**Lilliefors Lognormal GOF Test**					
2359				5% Lilliefors Critical Value		0.274	Data Not Lognormal at 5% Significance Level					
2360	**Data Not Lognormal at 5% Significance Level**											
2361												
2362	**Lognormal Statistics**											
2363				Minimum of Logged Data		0.336	Mean of logged Data					3.601
2364				Maximum of Logged Data		5.576	SD of logged Data					1.763
2365												
2366	**Assuming Lognormal Distribution**											
2367				95% H-UCL		4148	90% Chebyshev (MVUE) UCL					351
2368				95% Chebyshev (MVUE) UCL		453.1	97.5% Chebyshev (MVUE) UCL					594.7
2369				99% Chebyshev (MVUE) UCL		873						
2370												
2371	**Nonparametric Distribution Free UCL Statistics**											
2372	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2373												
2374	**Nonparametric Distribution Free UCLs**											
2375				95% CLT UCL		125.9	95% Jackknife UCL					131.8
2376				95% Standard Bootstrap UCL		123	95% Bootstrap-t UCL					189.9
2377				95% Hall's Bootstrap UCL		424.6	95% Percentile Bootstrap UCL					124.7
2378				95% BCA Bootstrap UCL		137.1						
2379				90% Chebyshev(Mean, Sd) UCL		163	95% Chebyshev(Mean, Sd) UCL					200.2
2380				97.5% Chebyshev(Mean, Sd) UCL		251.8	99% Chebyshev(Mean, Sd) UCL					353.2
2381												
2382	**Suggested UCL to Use**											
2383				95% Adjusted Gamma UCL		247.3						
2384												
2385	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2386	Recommendations are based upon data size, data distribution, and skewness.											
2387	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2388	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2389												
2390	**Cobalt (smw16)**											

2391												
2392	**General Statistics**											
2393					Total Number of Observations	9			Number of Distinct Observations	9		
2394					Number of Detects	8			Number of Non-Detects	1		
2395					Number of Distinct Detects	8			Number of Distinct Non-Detects	1		
2396					Minimum Detect	0.33			Minimum Non-Detect	1.7		
2397					Maximum Detect	1.8			Maximum Non-Detect	1.7		
2398					Variance Detects	0.193			Percent Non-Detects	11.11%		
2399					Mean Detects	1.065			SD Detects	0.44		
2400					Median Detects	0.985			CV Detects	0.413		
2401					Skewness Detects	0.0623			Kurtosis Detects	0.655		
2402					Mean of Logged Detects	-0.0324			SD of Logged Detects	0.508		
2403												
2404	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2405	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2406	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2407	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2408												
2409	**Normal GOF Test on Detects Only**											
2410					Shapiro Wilk Test Statistic	0.973			**Shapiro Wilk GOF Test**			
2411					5% Shapiro Wilk Critical Value	0.818			Detected Data appear Normal at 5% Significance Level			
2412					Lilliefors Test Statistic	0.184			**Lilliefors GOF Test**			
2413					5% Lilliefors Critical Value	0.283			Detected Data appear Normal at 5% Significance Level			
2414	**Detected Data appear Normal at 5% Significance Level**											
2415												
2416	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2417					KM Mean	1.053			KM Standard Error of Mean	0.15		
2418					KM SD	0.404			95% KM (BCA) UCL	1.271		
2419					95% KM (t) UCL	1.332			95% KM (Percentile Bootstrap) UCL	1.287		
2420					95% KM (z) UCL	1.299			95% KM Bootstrap t UCL	1.343		
2421					90% KM Chebyshev UCL	1.502			95% KM Chebyshev UCL	1.706		
2422					97.5% KM Chebyshev UCL	1.988			99% KM Chebyshev UCL	2.542		
2423												
2424	**Gamma GOF Tests on Detected Observations Only**											
2425					A-D Test Statistic	0.336			**Anderson-Darling GOF Test**			
2426					5% A-D Critical Value	0.719			Detected data appear Gamma Distributed at 5% Significance Level			
2427					K-S Test Statistic	0.188			**Kolmogorov-Smirnov GOF**			
2428					5% K-S Critical Value	0.295			Detected data appear Gamma Distributed at 5% Significance Level			
2429	**Detected data appear Gamma Distributed at 5% Significance Level**											
2430												
2431	**Gamma Statistics on Detected Data Only**											
2432					k hat (MLE)	5.405			k star (bias corrected MLE)	3.461		
2433					Theta hat (MLE)	0.197			Theta star (bias corrected MLE)	0.308		
2434					nu hat (MLE)	86.48			nu star (bias corrected)	55.38		
2435					Mean (detects)	1.065						
2436												
2437	**Gamma ROS Statistics using Imputed Non-Detects**											
2438	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2439	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2440	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2441	This is especially true when the sample size is small.											
2442	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											

	A	B	C	D	E	F	G	H	I	J	K	L
2443					Minimum	0.33					Mean	1.051
2444					Maximum	1.8					Median	0.97
2445					SD	0.413					CV	0.393
2446					k hat (MLE)	6.007					k star (bias corrected MLE)	4.079
2447					Theta hat (MLE)	0.175					Theta star (bias corrected MLE)	0.258
2448					nu hat (MLE)	108.1					nu star (bias corrected)	73.42
2449					Adjusted Level of Significance (β)	0.0231						
2450					Approximate Chi Square Value (73.42, α)	54.68					Adjusted Chi Square Value (73.42, β)	51.29
2451					95% Gamma Approximate UCL (use when n>=50)	1.411					95% Gamma Adjusted UCL (use when n<50)	1.504
2452												
2453					**Estimates of Gamma Parameters using KM Estimates**							
2454					Mean (KM)	1.053					SD (KM)	0.404
2455					Variance (KM)	0.163					SE of Mean (KM)	0.15
2456					k hat (KM)	6.806					k star (KM)	4.611
2457					nu hat (KM)	122.5					nu star (KM)	83
2458					theta hat (KM)	0.155					theta star (KM)	0.228
2459					80% gamma percentile (KM)	1.429					90% gamma percentile (KM)	1.71
2460					95% gamma percentile (KM)	1.968					99% gamma percentile (KM)	2.514
2461												
2462					**Gamma Kaplan-Meier (KM) Statistics**							
2463					Approximate Chi Square Value (83.00, α)	63.01					Adjusted Chi Square Value (83.00, β)	59.35
2464					95% Gamma Approximate KM-UCL (use when n>=50)	1.388					95% Gamma Adjusted KM-UCL (use when n<50)	1.473
2465												
2466					**Lognormal GOF Test on Detected Observations Only**							
2467					Shapiro Wilk Test Statistic	0.887					**Shapiro Wilk GOF Test**	
2468					5% Shapiro Wilk Critical Value	0.818					Detected Data appear Lognormal at 5% Significance Level	
2469					Lilliefors Test Statistic	0.229					**Lilliefors GOF Test**	
2470					5% Lilliefors Critical Value	0.283					Detected Data appear Lognormal at 5% Significance Level	
2471					**Detected Data appear Lognormal at 5% Significance Level**							
2472												
2473					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2474					Mean in Original Scale	1.044					Mean in Log Scale	-0.0431
2475					SD in Original Scale	0.416					SD in Log Scale	0.476
2476					95% t UCL (assumes normality of ROS data)	1.302					95% Percentile Bootstrap UCL	1.26
2477					95% BCA Bootstrap UCL	1.271					95% Bootstrap t UCL	1.332
2478					95% H-UCL (Log ROS)	1.556						
2479												
2480					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2481					KM Mean (logged)	-0.0422					KM Geo Mean	0.959
2482					KM SD (logged)	0.472					95% Critical H Value (KM-Log)	2.204
2483					KM Standard Error of Mean (logged)	0.177					95% H-UCL (KM -Log)	1.549
2484					KM SD (logged)	0.472					95% Critical H Value (KM-Log)	2.204
2485					KM Standard Error of Mean (logged)	0.177						
2486												
2487					**DL/2 Statistics**							
2488					**DL/2 Normal**						**DL/2 Log-Transformed**	
2489					Mean in Original Scale	1.041					Mean in Log Scale	-0.0468
2490					SD in Original Scale	0.417					SD in Log Scale	0.477
2491					95% t UCL (Assumes normality)	1.3					95% H-Stat UCL	1.552
2492					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2493												
2494					**Nonparametric Distribution Free UCL Statistics**							

	A	B	C	D	E	F	G	H	I	J	K	L
2495	**Detected Data appear Normal Distributed at 5% Significance Level**											
2496												
2497	**Suggested UCL to Use**											
2498					95% KM (t) UCL	1.332						
2499												
2500	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2501	Recommendations are based upon data size, data distribution, and skewness.											
2502	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2503	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2504												
2505	**Cobalt (smw16d)**											
2506												
2507	**General Statistics**											
2508					Total Number of Observations	8				Number of Distinct Observations	7	
2509					Number of Detects	7				Number of Non-Detects	1	
2510					Number of Distinct Detects	6				Number of Distinct Non-Detects	1	
2511					Minimum Detect	0.32				Minimum Non-Detect	1.7	
2512					Maximum Detect	0.45				Maximum Non-Detect	1.7	
2513					Variance Detects	0.00268				Percent Non-Detects	12.5%	
2514					Mean Detects	0.371				SD Detects	0.0518	
2515					Median Detects	0.35				CV Detects	0.139	
2516					Skewness Detects	0.521				Kurtosis Detects	-1.535	
2517					Mean of Logged Detects	-0.999				SD of Logged Detects	0.137	
2518												
2519	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2520	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2521	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2522	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2523												
2524	**Normal GOF Test on Detects Only**											
2525					Shapiro Wilk Test Statistic	0.891				**Shapiro Wilk GOF Test**		
2526					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Normal at 5% Significance Level		
2527					Lilliefors Test Statistic	0.232				**Lilliefors GOF Test**		
2528					5% Lilliefors Critical Value	0.304				Detected Data appear Normal at 5% Significance Level		
2529	**Detected Data appear Normal at 5% Significance Level**											
2530												
2531	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2532					KM Mean	0.371				KM Standard Error of Mean	0.0196	
2533					KM SD	0.0479				95% KM (BCA) UCL	0.404	
2534					95% KM (t) UCL	0.409				95% KM (Percentile Bootstrap) UCL	0.401	
2535					95% KM (z) UCL	0.404				95% KM Bootstrap t UCL	0.414	
2536					90% KM Chebyshev UCL	0.43				95% KM Chebyshev UCL	0.457	
2537					97.5% KM Chebyshev UCL	0.494				99% KM Chebyshev UCL	0.566	
2538												
2539	**Gamma GOF Tests on Detected Observations Only**											
2540					A-D Test Statistic	0.418				**Anderson-Darling GOF Test**		
2541					5% A-D Critical Value	0.708				Detected data appear Gamma Distributed at 5% Significance Level		
2542					K-S Test Statistic	0.234				**Kolmogorov-Smirnov GOF**		
2543					5% K-S Critical Value	0.311				Detected data appear Gamma Distributed at 5% Significance Level		
2544	**Detected data appear Gamma Distributed at 5% Significance Level**											
2545												
2546	**Gamma Statistics on Detected Data Only**											

	A	B	C	D	E	F	G	H	I	J	K	L
2547					k hat (MLE)	61.56				k star (bias corrected MLE)		35.27
2548					Theta hat (MLE)	0.00603				Theta star (bias corrected MLE)		0.0105
2549					nu hat (MLE)	861.8				nu star (bias corrected)		493.8
2550					Mean (detects)	0.371						
2551												
2552	**Gamma ROS Statistics using Imputed Non-Detects**											
2553	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2554	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2555	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2556	This is especially true when the sample size is small.											
2557	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2558					Minimum	0.32				Mean		0.371
2559					Maximum	0.45				Median		0.36
2560					SD	0.0479				CV		0.129
2561					k hat (MLE)	70.32				k star (bias corrected MLE)		44.04
2562					Theta hat (MLE)	0.00528				Theta star (bias corrected MLE)		0.00843
2563					nu hat (MLE)	1125				nu star (bias corrected)		704.6
2564					Adjusted Level of Significance (β)	0.0195						
2565					Approximate Chi Square Value (704.57, α)	644				Adjusted Chi Square Value (704.57, β)		629.2
2566					95% Gamma Approximate UCL (use when n>=50)	0.406				95% Gamma Adjusted UCL (use when n<50)		0.416
2567												
2568	**Estimates of Gamma Parameters using KM Estimates**											
2569					Mean (KM)	0.371				SD (KM)		0.0479
2570					Variance (KM)	0.0023				SE of Mean (KM)		0.0196
2571					k hat (KM)	60.04				k star (KM)		37.61
2572					nu hat (KM)	960.6				nu star (KM)		601.7
2573					theta hat (KM)	0.00619				theta star (KM)		0.00988
2574					80% gamma percentile (KM)	0.421				90% gamma percentile (KM)		0.451
2575					95% gamma percentile (KM)	0.476				99% gamma percentile (KM)		0.527
2576												
2577	**Gamma Kaplan-Meier (KM) Statistics**											
2578					Approximate Chi Square Value (601.69, α)	545.8				Adjusted Chi Square Value (601.69, β)		532.2
2579					95% Gamma Approximate KM-UCL (use when n>=50)	0.409				95% Gamma Adjusted KM-UCL (use when n<50)		0.42
2580												
2581	**Lognormal GOF Test on Detected Observations Only**											
2582					Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk GOF Test**					
2583					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
2584					Lilliefors Test Statistic	0.217	**Lilliefors GOF Test**					
2585					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
2586	**Detected Data appear Lognormal at 5% Significance Level**											
2587												
2588	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2589					Mean in Original Scale	0.371				Mean in Log Scale		-0.999
2590					SD in Original Scale	0.0479				SD in Log Scale		0.127
2591					95% t UCL (assumes normality of ROS data)	0.403				95% Percentile Bootstrap UCL		0.399
2592					95% BCA Bootstrap UCL	0.399				95% Bootstrap t UCL		0.412
2593					95% H-UCL (Log ROS)	0.406						
2594												
2595	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2596					KM Mean (logged)	-0.999				KM Geo Mean		0.368
2597					KM SD (logged)	0.127				95% Critical H Value (KM-Log)		1.872
2598					KM Standard Error of Mean (logged)	0.0518				95% H-UCL (KM -Log)		0.406

2599				KM SD (logged)		0.127			95% Critical H Value (KM-Log)			1.872
2600				KM Standard Error of Mean (logged)		0.0518						
2601												
2602	**DL/2 Statistics**											
2603	**DL/2 Normal**						**DL/2 Log-Transformed**					
2604				Mean in Original Scale		0.431			Mean in Log Scale			-0.894
2605				SD in Original Scale		0.176			SD in Log Scale			0.322
2606				95% t UCL (Assumes normality)		0.549			95% H-Stat UCL			0.555
2607	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2608												
2609	**Nonparametric Distribution Free UCL Statistics**											
2610	**Detected Data appear Normal Distributed at 5% Significance Level**											
2611												
2612	**Suggested UCL to Use**											
2613				95% KM (t) UCL		0.409						
2614												
2615	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2616	Recommendations are based upon data size, data distribution, and skewness.											
2617	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2618	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2619												
2620	**Cobalt (smw17)**											
2621												
2622	**General Statistics**											
2623				Total Number of Observations		8			Number of Distinct Observations			6
2624				Number of Detects		6			Number of Non-Detects			2
2625				Number of Distinct Detects		6			Number of Distinct Non-Detects			1
2626				Minimum Detect		0.84			Minimum Non-Detect			1.7
2627				Maximum Detect		1.7			Maximum Non-Detect			1.7
2628				Variance Detects		0.106			Percent Non-Detects			25%
2629				Mean Detects		1.27			SD Detects			0.325
2630				Median Detects		1.3			CV Detects			0.256
2631				Skewness Detects		-0.0905			Kurtosis Detects			-1.33
2632				Mean of Logged Detects		0.21			SD of Logged Detects			0.268
2633												
2634	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2635	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2636	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2637	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2638												
2639	**Normal GOF Test on Detects Only**											
2640				Shapiro Wilk Test Statistic		0.971	**Shapiro Wilk GOF Test**					
2641				5% Shapiro Wilk Critical Value		0.788	Detected Data appear Normal at 5% Significance Level					
2642				Lilliefors Test Statistic		0.155	**Lilliefors GOF Test**					
2643				5% Lilliefors Critical Value		0.325	Detected Data appear Normal at 5% Significance Level					
2644	**Detected Data appear Normal at 5% Significance Level**											
2645												
2646	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2647				KM Mean		1.249			KM Standard Error of Mean			0.125
2648				KM SD		0.288			95% KM (BCA) UCL			1.438
2649				95% KM (t) UCL		1.485			95% KM (Percentile Bootstrap) UCL			1.446
2650				95% KM (z) UCL		1.454			95% KM Bootstrap t UCL			1.481

2651				90% KM Chebyshev UCL		1.624				95% KM Chebyshev UCL		1.794
2652				97.5% KM Chebyshev UCL		2.03				99% KM Chebyshev UCL		2.493
2653												
2654					**Gamma GOF Tests on Detected Observations Only**							
2655					A-D Test Statistic	0.22			**Anderson-Darling GOF Test**			
2656					5% A-D Critical Value	0.697			Detected data appear Gamma Distributed at 5% Significance Level			
2657					K-S Test Statistic	0.189			**Kolmogorov-Smirnov GOF**			
2658					5% K-S Critical Value	0.332			Detected data appear Gamma Distributed at 5% Significance Level			
2659					**Detected data appear Gamma Distributed at 5% Significance Level**							
2660												
2661					**Gamma Statistics on Detected Data Only**							
2662					k hat (MLE)	17.43			k star (bias corrected MLE)			8.826
2663					Theta hat (MLE)	0.0729			Theta star (bias corrected MLE)			0.144
2664					nu hat (MLE)	209.2			nu star (bias corrected)			105.9
2665					Mean (detects)	1.27						
2666												
2667					**Gamma ROS Statistics using Imputed Non-Detects**							
2668					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2669					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2670					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2671					This is especially true when the sample size is small.							
2672					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2673					Minimum	0.84			Mean			1.244
2674					Maximum	1.7			Median			1.245
2675					SD	0.286			CV			0.23
2676					k hat (MLE)	21.22			k star (bias corrected MLE)			13.34
2677					Theta hat (MLE)	0.0587			Theta star (bias corrected MLE)			0.0933
2678					nu hat (MLE)	339.4			nu star (bias corrected)			213.5
2679					Adjusted Level of Significance (β)	0.0195						
2680					Approximate Chi Square Value (213.49, α)	180.7			Adjusted Chi Square Value (213.49, β)			173
2681					95% Gamma Approximate UCL (use when n>=50)	1.47			95% Gamma Adjusted UCL (use when n<50)			1.535
2682												
2683					**Estimates of Gamma Parameters using KM Estimates**							
2684					Mean (KM)	1.249			SD (KM)			0.288
2685					Variance (KM)	0.0828			SE of Mean (KM)			0.125
2686					k hat (KM)	18.83			k star (KM)			11.85
2687					nu hat (KM)	301.2			nu star (KM)			189.6
2688					theta hat (KM)	0.0663			theta star (KM)			0.105
2689					80% gamma percentile (KM)	1.539			90% gamma percentile (KM)			1.73
2690					95% gamma percentile (KM)	1.899			99% gamma percentile (KM)			2.243
2691												
2692					**Gamma Kaplan-Meier (KM) Statistics**							
2693					Approximate Chi Square Value (189.59, α)	158.7			Adjusted Chi Square Value (189.59, β)			151.6
2694					95% Gamma Approximate KM-UCL (use when n>=50)	1.491			95% Gamma Adjusted KM-UCL (use when n<50)			1.562
2695												
2696					**Lognormal GOF Test on Detected Observations Only**							
2697					Shapiro Wilk Test Statistic	0.959			**Shapiro Wilk GOF Test**			
2698					5% Shapiro Wilk Critical Value	0.788			Detected Data appear Lognormal at 5% Significance Level			
2699					Lilliefors Test Statistic	0.182			**Lilliefors GOF Test**			
2700					5% Lilliefors Critical Value	0.325			Detected Data appear Lognormal at 5% Significance Level			
2701					**Detected Data appear Lognormal at 5% Significance Level**							
2702												

2703	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2704					Mean in Original Scale	1.24				Mean in Log Scale	0.191	
2705					SD in Original Scale	0.288				SD in Log Scale	0.236	
2706				95% t UCL (assumes normality of ROS data)		1.433				95% Percentile Bootstrap UCL	1.403	
2707					95% BCA Bootstrap UCL	1.396				95% Bootstrap t UCL	1.443	
2708					95% H-UCL (Log ROS)	1.486						
2709												
2710	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2711					KM Mean (logged)	0.194				KM Geo Mean	1.214	
2712					KM SD (logged)	0.239				95% Critical H Value (KM-Log)	1.986	
2713					KM Standard Error of Mean (logged)	0.105				95% H-UCL (KM -Log)	1.495	
2714					KM SD (logged)	0.239				95% Critical H Value (KM-Log)	1.986	
2715					KM Standard Error of Mean (logged)	0.105						
2716												
2717	**DL/2 Statistics**											
2718					**DL/2 Normal**					**DL/2 Log-Transformed**		
2719					Mean in Original Scale	1.165				Mean in Log Scale	0.117	
2720					SD in Original Scale	0.337				SD in Log Scale	0.285	
2721					95% t UCL (Assumes normality)	1.39				95% H-Stat UCL	1.457	
2722	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2723												
2724	**Nonparametric Distribution Free UCL Statistics**											
2725	**Detected Data appear Normal Distributed at 5% Significance Level**											
2726												
2727	**Suggested UCL to Use**											
2728					95% KM (t) UCL	1.485						
2729												
2730	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2731	Recommendations are based upon data size, data distribution, and skewness.											
2732	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2733	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2734												
2735	**Cobalt (smw17d)**											
2736												
2737	**General Statistics**											
2738					Total Number of Observations	8				Number of Distinct Observations	7	
2739					Number of Detects	7				Number of Non-Detects	1	
2740					Number of Distinct Detects	6				Number of Distinct Non-Detects	1	
2741					Minimum Detect	0.32				Minimum Non-Detect	1.7	
2742					Maximum Detect	0.46				Maximum Non-Detect	1.7	
2743					Variance Detects	0.00266				Percent Non-Detects	12.5%	
2744					Mean Detects	0.374				SD Detects	0.0516	
2745					Median Detects	0.36				CV Detects	0.138	
2746					Skewness Detects	0.95				Kurtosis Detects	-0.454	
2747					Mean of Logged Detects	-0.99				SD of Logged Detects	0.133	
2748												
2749	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2750	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2751	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2752	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2753												
2754	**Normal GOF Test on Detects Only**											

2755				Shapiro Wilk Test Statistic		0.883	**Shapiro Wilk GOF Test**					
2756				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Normal at 5% Significance Level					
2757				Lilliefors Test Statistic		0.247	**Lilliefors GOF Test**					
2758				5% Lilliefors Critical Value		0.304	Detected Data appear Normal at 5% Significance Level					
2759	**Detected Data appear Normal at 5% Significance Level**											
2760												
2761	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2762				KM Mean		0.374	KM Standard Error of Mean					0.0195
2763				KM SD		0.0478	95% KM (BCA) UCL					0.406
2764				95% KM (t) UCL		0.411	95% KM (Percentile Bootstrap) UCL					0.406
2765				95% KM (z) UCL		0.406	95% KM Bootstrap t UCL					0.456
2766				90% KM Chebyshev UCL		0.433	95% KM Chebyshev UCL					0.459
2767				97.5% KM Chebyshev UCL		0.496	99% KM Chebyshev UCL					0.568
2768												
2769	**Gamma GOF Tests on Detected Observations Only**											
2770				A-D Test Statistic		0.45	**Anderson-Darling GOF Test**					
2771				5% A-D Critical Value		0.708	Detected data appear Gamma Distributed at 5% Significance Level					
2772				K-S Test Statistic		0.235	**Kolmogorov-Smirnov GOF**					
2773				5% K-S Critical Value		0.311	Detected data appear Gamma Distributed at 5% Significance Level					
2774	**Detected data appear Gamma Distributed at 5% Significance Level**											
2775												
2776	**Gamma Statistics on Detected Data Only**											
2777				k hat (MLE)		64.62	k star (bias corrected MLE)					37.02
2778				Theta hat (MLE)		0.00579	Theta star (bias corrected MLE)					0.0101
2779				nu hat (MLE)		904.6	nu star (bias corrected)					518.3
2780				Mean (detects)		0.374						
2781												
2782	**Gamma ROS Statistics using Imputed Non-Detects**											
2783	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2784	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2785	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2786	This is especially true when the sample size is small.											
2787	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2788				Minimum		0.32	Mean					0.374
2789				Maximum		0.46	Median					0.365
2790				SD		0.0478	CV					0.128
2791				k hat (MLE)		73.82	k star (bias corrected MLE)					46.22
2792				Theta hat (MLE)		0.00507	Theta star (bias corrected MLE)					0.00809
2793				nu hat (MLE)		1181	nu star (bias corrected)					739.5
2794				Adjusted Level of Significance (β)		0.0195						
2795				Approximate Chi Square Value (739.49, α)		677.4	Adjusted Chi Square Value (739.49, β)					662.3
2796				95% Gamma Approximate UCL (use when n>=50)		0.408	95% Gamma Adjusted UCL (use when n<50)					0.418
2797												
2798	**Estimates of Gamma Parameters using KM Estimates**											
2799				Mean (KM)		0.374	SD (KM)					0.0478
2800				Variance (KM)		0.00228	SE of Mean (KM)					0.0195
2801				k hat (KM)		61.4	k star (KM)					38.46
2802				nu hat (KM)		982.4	nu star (KM)					615.3
2803				theta hat (KM)		0.0061	theta star (KM)					0.00973
2804				80% gamma percentile (KM)		0.424	90% gamma percentile (KM)					0.453
2805				95% gamma percentile (KM)		0.479	99% gamma percentile (KM)					0.529
2806												

	A	B	C	D	E	F	G	H	I	J	K	L
2807	**Gamma Kaplan-Meier (KM) Statistics**											
2808	Approximate Chi Square Value (615.32, α)					558.8	Adjusted Chi Square Value (615.32, β)					545.1
2809	95% Gamma Approximate KM-UCL (use when n>=50)					0.412	95% Gamma Adjusted KM-UCL (use when n<50)					0.423
2810												
2811	**Lognormal GOF Test on Detected Observations Only**											
2812	Shapiro Wilk Test Statistic					0.902	**Shapiro Wilk GOF Test**					
2813	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Lognormal at 5% Significance Level					
2814	Lilliefors Test Statistic					0.226	**Lilliefors GOF Test**					
2815	5% Lilliefors Critical Value					0.304	Detected Data appear Lognormal at 5% Significance Level					
2816	**Detected Data appear Lognormal at 5% Significance Level**											
2817												
2818	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2819	Mean in Original Scale					0.374	Mean in Log Scale					-0.99
2820	SD in Original Scale					0.0478	SD in Log Scale					0.123
2821	95% t UCL (assumes normality of ROS data)					0.406	95% Percentile Bootstrap UCL					0.401
2822	95% BCA Bootstrap UCL					0.406	95% Bootstrap t UCL					0.434
2823	95% H-UCL (Log ROS)					0.408						
2824												
2825	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2826	KM Mean (logged)					-0.99	KM Geo Mean					0.371
2827	KM SD (logged)					0.123	95% Critical H Value (KM-Log)					1.869
2828	KM Standard Error of Mean (logged)					0.0502	95% H-UCL (KM -Log)					0.408
2829	KM SD (logged)					0.123	95% Critical H Value (KM-Log)					1.869
2830	KM Standard Error of Mean (logged)					0.0502						
2831												
2832	**DL/2 Statistics**											
2833	**DL/2 Normal**						**DL/2 Log-Transformed**					
2834	Mean in Original Scale					0.434	Mean in Log Scale					-0.887
2835	SD in Original Scale					0.175	SD in Log Scale					0.318
2836	95% t UCL (Assumes normality)					0.551	95% H-Stat UCL					0.556
2837	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2838												
2839	**Nonparametric Distribution Free UCL Statistics**											
2840	**Detected Data appear Normal Distributed at 5% Significance Level**											
2841												
2842	**Suggested UCL to Use**											
2843	95% KM (t) UCL					0.411						
2844												
2845	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2846	Recommendations are based upon data size, data distribution, and skewness.											
2847	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2848	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2849												
2850	**Cobalt (smw18)**											
2851												
2852	**General Statistics**											
2853	Total Number of Observations					8	Number of Distinct Observations					7
2854	Number of Detects					6	Number of Non-Detects					2
2855	Number of Distinct Detects					6	Number of Distinct Non-Detects					1
2856	Minimum Detect					0.3	Minimum Non-Detect					1.7
2857	Maximum Detect					1.5	Maximum Non-Detect					1.7
2858	Variance Detects					0.242	Percent Non-Detects					25%

	A	B	C	D	E	F	G	H	I	J	K	L
2859					Mean Detects	0.755					SD Detects	0.491
2860					Median Detects	0.575					CV Detects	0.651
2861					Skewness Detects	0.81					Kurtosis Detects	-1.197
2862					Mean of Logged Detects	-0.459					SD of Logged Detects	0.654
2863												
2864					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2865					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2866					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2867					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2868												
2869					**Normal GOF Test on Detects Only**							
2870					Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**					
2871					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
2872					Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**					
2873					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
2874					**Detected Data appear Normal at 5% Significance Level**							
2875												
2876					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
2877					KM Mean	0.755	KM Standard Error of Mean	0.201				
2878					KM SD	0.449	95% KM (BCA) UCL	1.092				
2879					95% KM (t) UCL	1.135	95% KM (Percentile Bootstrap) UCL	1.06				
2880					95% KM (z) UCL	1.085	95% KM Bootstrap t UCL	1.61				
2881					90% KM Chebyshev UCL	1.357	95% KM Chebyshev UCL	1.63				
2882					97.5% KM Chebyshev UCL	2.008	99% KM Chebyshev UCL	2.751				
2883												
2884					**Gamma GOF Tests on Detected Observations Only**							
2885					A-D Test Statistic	0.367	**Anderson-Darling GOF Test**					
2886					5% A-D Critical Value	0.701	Detected data appear Gamma Distributed at 5% Significance Level					
2887					K-S Test Statistic	0.253	**Kolmogorov-Smirnov GOF**					
2888					5% K-S Critical Value	0.335	Detected data appear Gamma Distributed at 5% Significance Level					
2889					**Detected data appear Gamma Distributed at 5% Significance Level**							
2890												
2891					**Gamma Statistics on Detected Data Only**							
2892					k hat (MLE)	2.96	k star (bias corrected MLE)	1.591				
2893					Theta hat (MLE)	0.255	Theta star (bias corrected MLE)	0.475				
2894					nu hat (MLE)	35.52	nu star (bias corrected)	19.09				
2895					Mean (detects)	0.755						
2896												
2897					**Gamma ROS Statistics using Imputed Non-Detects**							
2898					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2899					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2900					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2901					This is especially true when the sample size is small.							
2902					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2903					Minimum	0.3	Mean	0.745				
2904					Maximum	1.5	Median	0.587				
2905					SD	0.439	CV	0.589				
2906					k hat (MLE)	3.447	k star (bias corrected MLE)	2.238				
2907					Theta hat (MLE)	0.216	Theta star (bias corrected MLE)	0.333				
2908					nu hat (MLE)	55.16	nu star (bias corrected)	35.81				
2909					Adjusted Level of Significance (β)	0.0195						
2910					Approximate Chi Square Value (35.81, α)	23.11	Adjusted Chi Square Value (35.81, β)	20.57				

	A	B	C	D	E	F	G	H	I	J	K	L
2911	95% Gamma Approximate UCL (use when n>=50)					1.155	95% Gamma Adjusted UCL (use when n<50)					1.297
2912												
2913	**Estimates of Gamma Parameters using KM Estimates**											
2914	Mean (KM)					0.755	SD (KM)					0.449
2915	Variance (KM)					0.201	SE of Mean (KM)					0.201
2916	k hat (KM)					2.832	k star (KM)					1.854
2917	nu hat (KM)					45.32	nu star (KM)					29.66
2918	theta hat (KM)					0.267	theta star (KM)					0.407
2919	80% gamma percentile (KM)					1.14	90% gamma percentile (KM)					1.495
2920	95% gamma percentile (KM)					1.835	99% gamma percentile (KM)					2.592
2921												
2922	**Gamma Kaplan-Meier (KM) Statistics**											
2923	Approximate Chi Square Value (29.66, α)					18.22	Adjusted Chi Square Value (29.66, β)					16
2924	95% Gamma Approximate KM-UCL (use when n>=50)					1.229	95% Gamma Adjusted KM-UCL (use when n<50)					1.4
2925												
2926	**Lognormal GOF Test on Detected Observations Only**											
2927	Shapiro Wilk Test Statistic					0.921	**Shapiro Wilk GOF Test**					
2928	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Lognormal at 5% Significance Level					
2929	Lilliefors Test Statistic					0.222	**Lilliefors GOF Test**					
2930	5% Lilliefors Critical Value					0.325	Detected Data appear Lognormal at 5% Significance Level					
2931	**Detected Data appear Lognormal at 5% Significance Level**											
2932												
2933	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2934	Mean in Original Scale					0.734	Mean in Log Scale					-0.459
2935	SD in Original Scale					0.435	SD in Log Scale					0.584
2936	95% t UCL (assumes normality of ROS data)					1.025	95% Percentile Bootstrap UCL					0.983
2937	95% BCA Bootstrap UCL					1.016	95% Bootstrap t UCL					1.129
2938	95% H-UCL (Log ROS)					1.303						
2939												
2940	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2941	KM Mean (logged)					-0.459	KM Geo Mean					0.632
2942	KM SD (logged)					0.597	95% Critical H Value (KM-Log)					2.528
2943	KM Standard Error of Mean (logged)					0.267	95% H-UCL (KM -Log)					1.335
2944	KM SD (logged)					0.597	95% Critical H Value (KM-Log)					2.528
2945	KM Standard Error of Mean (logged)					0.267						
2946												
2947	**DL/2 Statistics**											
2948	**DL/2 Normal**						**DL/2 Log-Transformed**					
2949	Mean in Original Scale					0.779	Mean in Log Scale					-0.385
2950	SD in Original Scale					0.418	SD in Log Scale					0.569
2951	95% t UCL (Assumes normality)					1.059	95% H-Stat UCL					1.363
2952	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2953												
2954	**Nonparametric Distribution Free UCL Statistics**											
2955	**Detected Data appear Normal Distributed at 5% Significance Level**											
2956												
2957	**Suggested UCL to Use**											
2958	95% KM (t) UCL					1.135						
2959												
2960	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2961	Recommendations are based upon data size, data distribution, and skewness.											
2962	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

2963	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2964												
2965	**Cobalt (smw18d)**											
2966												
2967	**General Statistics**											
2968						Total Number of Observations	8			Number of Distinct Observations	6	
2969						Number of Detects	7			Number of Non-Detects	1	
2970						Number of Distinct Detects	5			Number of Distinct Non-Detects	1	
2971						Minimum Detect	0.75			Minimum Non-Detect	1.7	
2972						Maximum Detect	1.2			Maximum Non-Detect	1.7	
2973						Variance Detects	0.0361			Percent Non-Detects	12.5%	
2974						Mean Detects	1.036			SD Detects	0.19	
2975						Median Detects	1.1			CV Detects	0.183	
2976						Skewness Detects	-0.68			Kurtosis Detects	-1.438	
2977						Mean of Logged Detects	0.0194			SD of Logged Detects	0.195	
2978												
2979	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2980	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2981	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2982	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2983												
2984	**Normal GOF Test on Detects Only**											
2985						Shapiro Wilk Test Statistic	0.841			**Shapiro Wilk GOF Test**		
2986						5% Shapiro Wilk Critical Value	0.803			Detected Data appear Normal at 5% Significance Level		
2987						Lilliefors Test Statistic	0.235			**Lilliefors GOF Test**		
2988						5% Lilliefors Critical Value	0.304			Detected Data appear Normal at 5% Significance Level		
2989	**Detected Data appear Normal at 5% Significance Level**											
2990												
2991	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2992						KM Mean	1.036			KM Standard Error of Mean	0.0718	
2993						KM SD	0.176			95% KM (BCA) UCL	1.133	
2994						95% KM (t) UCL	1.172			95% KM (Percentile Bootstrap) UCL	1.14	
2995						95% KM (z) UCL	1.154			95% KM Bootstrap t UCL	1.153	
2996						90% KM Chebyshev UCL	1.251			95% KM Chebyshev UCL	1.349	
2997						97.5% KM Chebyshev UCL	1.484			99% KM Chebyshev UCL	1.75	
2998												
2999	**Gamma GOF Tests on Detected Observations Only**											
3000						A-D Test Statistic	0.59			**Anderson-Darling GOF Test**		
3001						5% A-D Critical Value	0.707			Detected data appear Gamma Distributed at 5% Significance Level		
3002						K-S Test Statistic	0.248			**Kolmogorov-Smirnov GOF**		
3003						5% K-S Critical Value	0.311			Detected data appear Gamma Distributed at 5% Significance Level		
3004	**Detected data appear Gamma Distributed at 5% Significance Level**											
3005												
3006	**Gamma Statistics on Detected Data Only**											
3007						k hat (MLE)	32.07			k star (bias corrected MLE)	18.42	
3008						Theta hat (MLE)	0.0323			Theta star (bias corrected MLE)	0.0562	
3009						nu hat (MLE)	449			nu star (bias corrected)	257.9	
3010						Mean (detects)	1.036					
3011												
3012	**Gamma ROS Statistics using Imputed Non-Detects**											
3013	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3014	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											

	A	B	C	D	E	F	G	H	I	J	K	L
3015	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3016	This is especially true when the sample size is small.											
3017	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3018					Minimum	0.75				Mean	1.035	
3019					Maximum	1.2				Median	1.064	
3020					SD	0.176				CV	0.17	
3021					k hat (MLE)	36.62				k star (bias corrected MLE)	22.97	
3022					Theta hat (MLE)	0.0283				Theta star (bias corrected MLE)	0.045	
3023					nu hat (MLE)	586				nu star (bias corrected)	367.6	
3024					Adjusted Level of Significance (β)	0.0195						
3025					Approximate Chi Square Value (367.56, α)	324.1				Adjusted Chi Square Value (367.56, β)	313.8	
3026					95% Gamma Approximate UCL (use when n>=50)	1.173				95% Gamma Adjusted UCL (use when n<50)	1.212	
3027												
3028	**Estimates of Gamma Parameters using KM Estimates**											
3029					Mean (KM)	1.036				SD (KM)	0.176	
3030					Variance (KM)	0.0309				SE of Mean (KM)	0.0718	
3031					k hat (KM)	34.7				k star (KM)	21.77	
3032					nu hat (KM)	555.3				nu star (KM)	348.4	
3033					theta hat (KM)	0.0298				theta star (KM)	0.0476	
3034					80% gamma percentile (KM)	1.216				90% gamma percentile (KM)	1.328	
3035					95% gamma percentile (KM)	1.426				99% gamma percentile (KM)	1.621	
3036												
3037	**Gamma Kaplan-Meier (KM) Statistics**											
3038					Approximate Chi Square Value (348.37, α)	306.1				Adjusted Chi Square Value (348.37, β)	296.1	
3039					95% Gamma Approximate KM-UCL (use when n>=50)	1.179				95% Gamma Adjusted KM-UCL (use when n<50)	1.219	
3040												
3041	**Lognormal GOF Test on Detected Observations Only**											
3042					Shapiro Wilk Test Statistic	0.834				**Shapiro Wilk GOF Test**		
3043					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
3044					Lilliefors Test Statistic	0.227				**Lilliefors GOF Test**		
3045					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
3046	**Detected Data appear Lognormal at 5% Significance Level**											
3047												
3048	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3049					Mean in Original Scale	1.034				Mean in Log Scale	0.0194	
3050					SD in Original Scale	0.176				SD in Log Scale	0.181	
3051					95% t UCL (assumes normality of ROS data)	1.152				95% Percentile Bootstrap UCL	1.125	
3052					95% BCA Bootstrap UCL	1.112				95% Bootstrap t UCL	1.138	
3053					95% H-UCL (Log ROS)	1.182						
3054												
3055	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3056					KM Mean (logged)	0.0194				KM Geo Mean	1.02	
3057					KM SD (logged)	0.181				95% Critical H Value (KM-Log)	1.923	
3058					KM Standard Error of Mean (logged)	0.0738				95% H-UCL (KM -Log)	1.182	
3059					KM SD (logged)	0.181				95% Critical H Value (KM-Log)	1.923	
3060					KM Standard Error of Mean (logged)	0.0738						
3061												
3062	**DL/2 Statistics**											
3063	**DL/2 Normal**									**DL/2 Log-Transformed**		
3064					Mean in Original Scale	1.013				Mean in Log Scale	-0.00332	
3065					SD in Original Scale	0.188				SD in Log Scale	0.192	
3066					95% t UCL (Assumes normality)	1.138				95% H-Stat UCL	1.168	

	A	B	C	D	E	F	G	H	I	J	K	L
3067	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3068												
3069	**Nonparametric Distribution Free UCL Statistics**											
3070	**Detected Data appear Normal Distributed at 5% Significance Level**											
3071												
3072	**Suggested UCL to Use**											
3073					95% KM (t) UCL	1.172						
3074												
3075	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3076	Recommendations are based upon data size, data distribution, and skewness.											
3077	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3078	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3079												
3080	**Cobalt (smw19)**											
3081												
3082	**General Statistics**											
3083					Total Number of Observations	8				Number of Distinct Observations	7	
3084					Number of Detects	5				Number of Non-Detects	3	
3085					Number of Distinct Detects	5				Number of Distinct Non-Detects	2	
3086					Minimum Detect	0.23				Minimum Non-Detect	0.43	
3087					Maximum Detect	8				Maximum Non-Detect	1.7	
3088					Variance Detects	11.72				Percent Non-Detects	37.5%	
3089					Mean Detects	1.878				SD Detects	3.424	
3090					Median Detects	0.4				CV Detects	1.823	
3091					Skewness Detects	2.232				Kurtosis Detects	4.985	
3092					Mean of Logged Detects	-0.46				SD of Logged Detects	1.446	
3093												
3094	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3095	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3096	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3097	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3098												
3099	**Normal GOF Test on Detects Only**											
3100					Shapiro Wilk Test Statistic	0.578				**Shapiro Wilk GOF Test**		
3101					5% Shapiro Wilk Critical Value	0.762				Detected Data Not Normal at 5% Significance Level		
3102					Lilliefors Test Statistic	0.46				**Lilliefors GOF Test**		
3103					5% Lilliefors Critical Value	0.343				Detected Data Not Normal at 5% Significance Level		
3104	**Detected Data Not Normal at 5% Significance Level**											
3105												
3106	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3107					KM Mean	1.292				KM Standard Error of Mean	1.003	
3108					KM SD	2.537				95% KM (BCA) UCL	3.212	
3109					95% KM (t) UCL	3.192				95% KM (Percentile Bootstrap) UCL	3.181	
3110					95% KM (z) UCL	2.942				95% KM Bootstrap t UCL	33.73	
3111					90% KM Chebyshev UCL	4.301				95% KM Chebyshev UCL	5.664	
3112					97.5% KM Chebyshev UCL	7.556				99% KM Chebyshev UCL	11.27	
3113												
3114	**Gamma GOF Tests on Detected Observations Only**											
3115					A-D Test Statistic	0.988				**Anderson-Darling GOF Test**		
3116					5% A-D Critical Value	0.707				Detected Data Not Gamma Distributed at 5% Significance Level		
3117					K-S Test Statistic	0.449				**Kolmogorov-Smirnov GOF**		
3118					5% K-S Critical Value	0.37				Detected Data Not Gamma Distributed at 5% Significance Level		

	A	B	C	D	E	F	G	H	I	J	K	L
3119	**Detected Data Not Gamma Distributed at 5% Significance Level**											
3120												
3121	**Gamma Statistics on Detected Data Only**											
3122					k hat (MLE)	0.571			k star (bias corrected MLE)	0.362		
3123					Theta hat (MLE)	3.289			Theta star (bias corrected MLE)	5.192		
3124					nu hat (MLE)	5.71			nu star (bias corrected)	3.617		
3125					Mean (detects)	1.878						
3126												
3127	**Gamma ROS Statistics using Imputed Non-Detects**											
3128	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3129	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3130	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3131	This is especially true when the sample size is small.											
3132	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3133					Minimum	0.01			Mean	1.209		
3134					Maximum	8			Median	0.267		
3135					SD	2.749			CV	2.273		
3136					k hat (MLE)	0.395			k star (bias corrected MLE)	0.33		
3137					Theta hat (MLE)	3.058			Theta star (bias corrected MLE)	3.659		
3138					nu hat (MLE)	6.327			nu star (bias corrected)	5.288		
3139					Adjusted Level of Significance (β)	0.0195						
3140					Approximate Chi Square Value (5.29, α)	1.287			Adjusted Chi Square Value (5.29, β)	0.857		
3141					95% Gamma Approximate UCL (use when n>=50)	4.967			95% Gamma Adjusted UCL (use when n<50)	7.458		
3142												
3143	**Estimates of Gamma Parameters using KM Estimates**											
3144					Mean (KM)	1.292			SD (KM)	2.537		
3145					Variance (KM)	6.435			SE of Mean (KM)	1.003		
3146					k hat (KM)	0.259			k star (KM)	0.246		
3147					nu hat (KM)	4.152			nu star (KM)	3.928		
3148					theta hat (KM)	4.98			theta star (KM)	5.263		
3149					80% gamma percentile (KM)	1.864			90% gamma percentile (KM)	3.883		
3150					95% gamma percentile (KM)	6.288			99% gamma percentile (KM)	12.71		
3151												
3152	**Gamma Kaplan-Meier (KM) Statistics**											
3153					Approximate Chi Square Value (3.93, α)	0.693			Adjusted Chi Square Value (3.93, β)	0.422		
3154					95% Gamma Approximate KM-UCL (use when n>=50)	7.319			95% Gamma Adjusted KM-UCL (use when n<50)	12.01		
3155												
3156	**Lognormal GOF Test on Detected Observations Only**											
3157					Shapiro Wilk Test Statistic	0.732			**Shapiro Wilk GOF Test**			
3158					5% Shapiro Wilk Critical Value	0.762			Detected Data Not Lognormal at 5% Significance Level			
3159					Lilliefors Test Statistic	0.381			**Lilliefors GOF Test**			
3160					5% Lilliefors Critical Value	0.343			Detected Data Not Lognormal at 5% Significance Level			
3161	**Detected Data Not Lognormal at 5% Significance Level**											
3162												
3163	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3164					Mean in Original Scale	1.299			Mean in Log Scale	-0.723		
3165					SD in Original Scale	2.71			SD in Log Scale	1.177		
3166					95% t UCL (assumes normality of ROS data)	3.114			95% Percentile Bootstrap UCL	3.177		
3167					95% BCA Bootstrap UCL	4.128			95% Bootstrap t UCL	33.46		
3168					95% H-UCL (Log ROS)	5.442						
3169												
3170	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											

	A	B	C	D	E	F	G	H	I	J	K	L
3171					KM Mean (logged)	-0.731					KM Geo Mean	0.481
3172					KM SD (logged)	1.091					95% Critical H Value (KM-Log)	3.654
3173					KM Standard Error of Mean (logged)	0.438					95% H-UCL (KM -Log)	3.942
3174					KM SD (logged)	1.091					95% Critical H Value (KM-Log)	3.654
3175					KM Standard Error of Mean (logged)	0.438						
3176												
3177					**DL/2 Statistics**							
3178					**DL/2 Normal**						**DL/2 Log-Transformed**	
3179					Mean in Original Scale	1.334					Mean in Log Scale	-0.692
3180					SD in Original Scale	2.702					SD in Log Scale	1.216
3181					95% t UCL (Assumes normality)	3.144					95% H-Stat UCL	6.518
3182					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
3183												
3184					**Nonparametric Distribution Free UCL Statistics**							
3185					**Data do not follow a Discernible Distribution at 5% Significance Level**							
3186												
3187					**Suggested UCL to Use**							
3188					95% KM (Chebyshev) UCL	5.664						
3189												
3190					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
3191					Recommendations are based upon data size, data distribution, and skewness.							
3192					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
3193					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
3194												
3195	**Cobalt (smw7)**											
3196												
3197					**General Statistics**							
3198					Total Number of Observations	8					Number of Distinct Observations	7
3199					Number of Detects	7					Number of Non-Detects	1
3200					Number of Distinct Detects	6					Number of Distinct Non-Detects	1
3201					Minimum Detect	0.38					Minimum Non-Detect	1.7
3202					Maximum Detect	4.2					Maximum Non-Detect	1.7
3203					Variance Detects	2.401					Percent Non-Detects	12.5%
3204					Mean Detects	1.804					SD Detects	1.55
3205					Median Detects	1.1					CV Detects	0.859
3206					Skewness Detects	1.01					Kurtosis Detects	-0.877
3207					Mean of Logged Detects	0.257					SD of Logged Detects	0.9
3208												
3209					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
3210					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
3211					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
3212					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
3213												
3214					**Normal GOF Test on Detects Only**							
3215					Shapiro Wilk Test Statistic	0.813					**Shapiro Wilk GOF Test**	
3216					5% Shapiro Wilk Critical Value	0.803					Detected Data appear Normal at 5% Significance Level	
3217					Lilliefors Test Statistic	0.292					**Lilliefors GOF Test**	
3218					5% Lilliefors Critical Value	0.304					Detected Data appear Normal at 5% Significance Level	
3219					**Detected Data appear Normal at 5% Significance Level**							
3220												
3221					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
3222					KM Mean	1.695					KM Standard Error of Mean	0.531

3223					KM SD	1.381				95% KM (BCA) UCL		2.592
3224					95% KM (t) UCL	2.7				95% KM (Percentile Bootstrap) UCL		2.567
3225					95% KM (z) UCL	2.567				95% KM Bootstrap t UCL		4.177
3226					90% KM Chebyshev UCL	3.287				95% KM Chebyshev UCL		4.008
3227					97.5% KM Chebyshev UCL	5.009				99% KM Chebyshev UCL		6.975
3228												
3229					**Gamma GOF Tests on Detected Observations Only**							
3230					A-D Test Statistic	0.4				**Anderson-Darling GOF Test**		
3231					5% A-D Critical Value	0.719				Detected data appear Gamma Distributed at 5% Significance Level		
3232					K-S Test Statistic	0.2				**Kolmogorov-Smirnov GOF**		
3233					5% K-S Critical Value	0.316				Detected data appear Gamma Distributed at 5% Significance Level		
3234					**Detected data appear Gamma Distributed at 5% Significance Level**							
3235												
3236					**Gamma Statistics on Detected Data Only**							
3237					k hat (MLE)	1.649				k star (bias corrected MLE)		1.037
3238					Theta hat (MLE)	1.094				Theta star (bias corrected MLE)		1.739
3239					nu hat (MLE)	23.08				nu star (bias corrected)		14.52
3240					Mean (detects)	1.804						
3241												
3242					**Gamma ROS Statistics using Imputed Non-Detects**							
3243					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
3244					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
3245					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
3246					This is especially true when the sample size is small.							
3247					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
3248					Minimum	0.38				Mean		1.698
3249					Maximum	4.2				Median		1.1
3250					SD	1.466				CV		0.863
3251					k hat (MLE)	1.76				k star (bias corrected MLE)		1.183
3252					Theta hat (MLE)	0.965				Theta star (bias corrected MLE)		1.435
3253					nu hat (MLE)	28.16				nu star (bias corrected)		18.93
3254					Adjusted Level of Significance (β)	0.0195						
3255					Approximate Chi Square Value (18.93, α)	10.07				Adjusted Chi Square Value (18.93, β)		8.482
3256					95% Gamma Approximate UCL (use when n>=50)	3.193				95% Gamma Adjusted UCL (use when n<50)		3.79
3257												
3258					**Estimates of Gamma Parameters using KM Estimates**							
3259					Mean (KM)	1.695				SD (KM)		1.381
3260					Variance (KM)	1.906				SE of Mean (KM)		0.531
3261					k hat (KM)	1.506				k star (KM)		1.025
3262					nu hat (KM)	24.1				nu star (KM)		16.4
3263					theta hat (KM)	1.125				theta star (KM)		1.654
3264					80% gamma percentile (KM)	2.722				90% gamma percentile (KM)		3.878
3265					95% gamma percentile (KM)	5.033				99% gamma percentile (KM)		7.708
3266												
3267					**Gamma Kaplan-Meier (KM) Statistics**							
3268					Approximate Chi Square Value (16.40, α)	8.243				Adjusted Chi Square Value (16.40, β)		6.833
3269					95% Gamma Approximate KM-UCL (use when n>=50)	3.371				95% Gamma Adjusted KM-UCL (use when n<50)		4.066
3270												
3271					**Lognormal GOF Test on Detected Observations Only**							
3272					Shapiro Wilk Test Statistic	0.932				**Shapiro Wilk GOF Test**		
3273					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
3274					Lilliefors Test Statistic	0.17				**Lilliefors GOF Test**		

3275	5% Lilliefors Critical Value					0.304	Detected Data appear Lognormal at 5% Significance Level					
3276	**Detected Data appear Lognormal at 5% Significance Level**											
3277												
3278	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3279	Mean in Original Scale					1.688	Mean in Log Scale					0.208
3280	SD in Original Scale					1.472	SD in Log Scale					0.844
3281	95% t UCL (assumes normality of ROS data)					2.674	95% Percentile Bootstrap UCL					2.572
3282	95% BCA Bootstrap UCL					2.75	95% Bootstrap t UCL					4.821
3283	95% H-UCL (Log ROS)					4.658						
3284												
3285	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3286	KM Mean (logged)					0.201	KM Geo Mean					1.222
3287	KM SD (logged)					0.813	95% Critical H Value (KM-Log)					2.982
3288	KM Standard Error of Mean (logged)					0.319	95% H-UCL (KM -Log)					4.255
3289	KM SD (logged)					0.813	95% Critical H Value (KM-Log)					2.982
3290	KM Standard Error of Mean (logged)					0.319						
3291												
3292	**DL/2 Statistics**											
3293	**DL/2 Normal**						**DL/2 Log-Transformed**					
3294	Mean in Original Scale					1.685	Mean in Log Scale					0.205
3295	SD in Original Scale					1.474	SD in Log Scale					0.846
3296	95% t UCL (Assumes normality)					2.672	95% H-Stat UCL					4.664
3297	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3298												
3299	**Nonparametric Distribution Free UCL Statistics**											
3300	**Detected Data appear Normal Distributed at 5% Significance Level**											
3301												
3302	**Suggested UCL to Use**											
3303	95% KM (t) UCL					2.7						
3304												
3305	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3306	Recommendations are based upon data size, data distribution, and skewness.											
3307	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3308	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3309												
3310	**Cobalt (smw8)**											
3311												
3312	**General Statistics**											
3313	Total Number of Observations					8	Number of Distinct Observations					7
3314	Number of Detects					3	Number of Non-Detects					5
3315	Number of Distinct Detects					3	Number of Distinct Non-Detects					4
3316	Minimum Detect					0.073	Minimum Non-Detect					0.085
3317	Maximum Detect					0.097	Maximum Non-Detect					1.7
3318	Variance Detects					1.5233E-4	Percent Non-Detects					62.5%
3319	Mean Detects					0.0867	SD Detects					0.0123
3320	Median Detects					0.09	CV Detects					0.142
3321	Skewness Detects					-1.127	Kurtosis Detects					N/A
3322	Mean of Logged Detects					-2.453	SD of Logged Detects					0.147
3323												
3324	**Warning: Data set has only 3 Detected Values.**											
3325	**This is not enough to compute meaningful or reliable statistics and estimates.**											
3326												

	A	B	C	D	E	F	G	H	I	J	K	L
3327												
3328	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3329	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3330	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3331	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3332												
3333	**Normal GOF Test on Detects Only**											
3334					Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**					
3335					5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level					
3336					Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**					
3337					5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level					
3338	**Detected Data appear Normal at 5% Significance Level**											
3339												
3340	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3341					KM Mean	0.0812	KM Standard Error of Mean	0.00563				
3342					KM SD	0.0103	95% KM (BCA) UCL	N/A				
3343					95% KM (t) UCL	0.0919	95% KM (Percentile Bootstrap) UCL	N/A				
3344					95% KM (z) UCL	0.0905	95% KM Bootstrap t UCL	N/A				
3345					90% KM Chebyshev UCL	0.0981	95% KM Chebyshev UCL	0.106				
3346					97.5% KM Chebyshev UCL	0.116	99% KM Chebyshev UCL	0.137				
3347												
3348	**Gamma GOF Tests on Detected Observations Only**											
3349	**Not Enough Data to Perform GOF Test**											
3350												
3351	**Gamma Statistics on Detected Data Only**											
3352					k hat (MLE)	70.83	k star (bias corrected MLE)	N/A				
3353					Theta hat (MLE)	0.00122	Theta star (bias corrected MLE)	N/A				
3354					nu hat (MLE)	425	nu star (bias corrected)	N/A				
3355					Mean (detects)	0.0867						
3356												
3357	**Gamma ROS Statistics using Imputed Non-Detects**											
3358	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3359	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3360	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3361	This is especially true when the sample size is small.											
3362	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3363					Minimum	0.0688	Mean	0.0809				
3364					Maximum	0.097	Median	0.0805				
3365					SD	0.00901	CV	0.111				
3366					k hat (MLE)	94.67	k star (bias corrected MLE)	59.25				
3367					Theta hat (MLE)	8.5446E-4	Theta star (bias corrected MLE)	0.00137				
3368					nu hat (MLE)	1515	nu star (bias corrected)	948				
3369					Adjusted Level of Significance (β)	0.0195						
3370					Approximate Chi Square Value (948.04, α)	877.6	Adjusted Chi Square Value (948.04, β)	860.3				
3371					95% Gamma Approximate UCL (use when n>=50)	0.0874	95% Gamma Adjusted UCL (use when n<50)	N/A				
3372												
3373	**Estimates of Gamma Parameters using KM Estimates**											
3374					Mean (KM)	0.0812	SD (KM)	0.0103				
3375					Variance (KM)	1.0576E-4	SE of Mean (KM)	0.00563				
3376					k hat (KM)	62.34	k star (KM)	39.05				
3377					nu hat (KM)	997.5	nu star (KM)	624.8				
3378					theta hat (KM)	0.0013	theta star (KM)	0.00208				

	A	B	C	D	E	F	G	H	I	J	K	L
3379	80% gamma percentile (KM)					0.0919	90% gamma percentile (KM)					0.0982
3380	95% gamma percentile (KM)					0.104	99% gamma percentile (KM)					0.114
3381												
3382	**Gamma Kaplan-Meier (KM) Statistics**											
3383	Approximate Chi Square Value (624.77, α)					567.8	Adjusted Chi Square Value (624.77, β)					554
3384	95% Gamma Approximate KM-UCL (use when n>=50)					0.0893	95% Gamma Adjusted KM-UCL (use when n<50)					0.0916
3385												
3386	**Lognormal GOF Test on Detected Observations Only**											
3387	Shapiro Wilk Test Statistic					0.931	**Shapiro Wilk GOF Test**					
3388	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Lognormal at 5% Significance Level					
3389	Lilliefors Test Statistic					0.286	**Lilliefors GOF Test**					
3390	5% Lilliefors Critical Value					0.425	Detected Data appear Lognormal at 5% Significance Level					
3391	**Detected Data appear Lognormal at 5% Significance Level**											
3392												
3393	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3394	Mean in Original Scale					0.0808	Mean in Log Scale					-2.521
3395	SD in Original Scale					0.00895	SD in Log Scale					0.108
3396	95% t UCL (assumes normality of ROS data)					0.0868	95% Percentile Bootstrap UCL					0.0859
3397	95% BCA Bootstrap UCL					0.0867	95% Bootstrap t UCL					0.0901
3398	95% H-UCL (Log ROS)					0.0872						
3399												
3400	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3401	KM Mean (logged)					-2.519	KM Geo Mean					0.0806
3402	KM SD (logged)					0.123	95% Critical H Value (KM-Log)					1.869
3403	KM Standard Error of Mean (logged)					0.0675	95% H-UCL (KM -Log)					0.0886
3404	KM SD (logged)					0.123	95% Critical H Value (KM-Log)					1.869
3405	KM Standard Error of Mean (logged)					0.0675						
3406												
3407	**DL/2 Statistics**											
3408	**DL/2 Normal**						**DL/2 Log-Transformed**					
3409	Mean in Original Scale					0.19	Mean in Log Scale					-2.227
3410	SD in Original Scale					0.275	SD in Log Scale					1.002
3411	95% t UCL (Assumes normality)					0.374	95% H-Stat UCL					0.654
3412	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3413												
3414	**Nonparametric Distribution Free UCL Statistics**											
3415	**Detected Data appear Normal Distributed at 5% Significance Level**											
3416												
3417	**Suggested UCL to Use**											
3418	95% KM (t) UCL					0.0919						
3419												
3420	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3421	Recommendations are based upon data size, data distribution, and skewness.											
3422	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3423	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3424												
3425	**Cobalt (smw9)**											
3426												
3427	**General Statistics**											
3428	Total Number of Observations					9	Number of Distinct Observations					8
3429	Number of Detects					6	Number of Non-Detects					3
3430	Number of Distinct Detects					5	Number of Distinct Non-Detects					3

3431					Minimum Detect	0.15					Minimum Non-Detect	0.25
3432					Maximum Detect	0.3					Maximum Non-Detect	1.7
3433					Variance Detects	0.00231					Percent Non-Detects	33.33%
3434					Mean Detects	0.223					SD Detects	0.048
3435					Median Detects	0.225					CV Detects	0.215
3436					Skewness Detects	0.147					Kurtosis Detects	2.105
3437					Mean of Logged Detects	-1.519					SD of Logged Detects	0.223
3438												
3439					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
3440					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
3441					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
3442					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
3443												
3444					**Normal GOF Test on Detects Only**							
3445					Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**					
3446					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
3447					Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**					
3448					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
3449					**Detected Data appear Normal at 5% Significance Level**							
3450												
3451					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
3452					KM Mean	0.221	KM Standard Error of Mean	0.0183				
3453					KM SD	0.0425	95% KM (BCA) UCL	0.248				
3454					95% KM (t) UCL	0.255	95% KM (Percentile Bootstrap) UCL	0.248				
3455					95% KM (z) UCL	0.251	95% KM Bootstrap t UCL	0.254				
3456					90% KM Chebyshev UCL	0.276	95% KM Chebyshev UCL	0.301				
3457					97.5% KM Chebyshev UCL	0.336	99% KM Chebyshev UCL	0.403				
3458												
3459					**Gamma GOF Tests on Detected Observations Only**							
3460					A-D Test Statistic	0.429	**Anderson-Darling GOF Test**					
3461					5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level					
3462					K-S Test Statistic	0.248	**Kolmogorov-Smirnov GOF**					
3463					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
3464					**Detected data appear Gamma Distributed at 5% Significance Level**							
3465												
3466					**Gamma Statistics on Detected Data Only**							
3467					k hat (MLE)	25.02	k star (bias corrected MLE)	12.62				
3468					Theta hat (MLE)	0.00892	Theta star (bias corrected MLE)	0.0177				
3469					nu hat (MLE)	300.3	nu star (bias corrected)	151.5				
3470					Mean (detects)	0.223						
3471												
3472					**Gamma ROS Statistics using Imputed Non-Detects**							
3473					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
3474					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
3475					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
3476					This is especially true when the sample size is small.							
3477					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
3478					Minimum	0.15	Mean	0.221				
3479					Maximum	0.3	Median	0.218				
3480					SD	0.0383	CV	0.174				
3481					k hat (MLE)	36.83	k star (bias corrected MLE)	24.63				
3482					Theta hat (MLE)	0.00599	Theta star (bias corrected MLE)	0.00895				

3483					nu hat (MLE)	662.9				nu star (bias corrected)		443.3
3484					Adjusted Level of Significance (β)	0.0231						
3485					Approximate Chi Square Value (443.29, α)	395.5				Adjusted Chi Square Value (443.29, β)		385.9
3486					95% Gamma Approximate UCL (use when n>=50)	0.247				95% Gamma Adjusted UCL (use when n<50)		0.253
3487												
3488					**Estimates of Gamma Parameters using KM Estimates**							
3489					Mean (KM)	0.221				SD (KM)		0.0425
3490					Variance (KM)	0.0018				SE of Mean (KM)		0.0183
3491					k hat (KM)	27.1				k star (KM)		18.14
3492					nu hat (KM)	487.8				nu star (KM)		326.6
3493					theta hat (KM)	0.00816				theta star (KM)		0.0122
3494					80% gamma percentile (KM)	0.263				90% gamma percentile (KM)		0.29
3495					95% gamma percentile (KM)	0.313				99% gamma percentile (KM)		0.359
3496												
3497					**Gamma Kaplan-Meier (KM) Statistics**							
3498					Approximate Chi Square Value (326.56, α)	285.7				Adjusted Chi Square Value (326.56, β)		277.6
3499					95% Gamma Approximate KM-UCL (use when n>=50)	0.253				95% Gamma Adjusted KM-UCL (use when n<50)		0.26
3500												
3501					**Lognormal GOF Test on Detected Observations Only**							
3502					Shapiro Wilk Test Statistic	0.907				**Shapiro Wilk GOF Test**		
3503					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
3504					Lilliefors Test Statistic	0.26				**Lilliefors GOF Test**		
3505					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
3506					**Detected Data appear Lognormal at 5% Significance Level**							
3507												
3508					**Lognormal ROS Statistics Using Imputed Non-Detects**							
3509					Mean in Original Scale	0.22				Mean in Log Scale		-1.529
3510					SD in Original Scale	0.0384				SD in Log Scale		0.177
3511					95% t UCL (assumes normality of ROS data)	0.244				95% Percentile Bootstrap UCL		0.24
3512					95% BCA Bootstrap UCL	0.241				95% Bootstrap t UCL		0.244
3513					95% H-UCL (Log ROS)	0.248						
3514												
3515					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
3516					KM Mean (logged)	-1.528				KM Geo Mean		0.217
3517					KM SD (logged)	0.199				95% Critical H Value (KM-Log)		1.907
3518					KM Standard Error of Mean (logged)	0.087				95% H-UCL (KM -Log)		0.253
3519					KM SD (logged)	0.199				95% Critical H Value (KM-Log)		1.907
3520					KM Standard Error of Mean (logged)	0.087						
3521												
3522					**DL/2 Statistics**							
3523					**DL/2 Normal**					**DL/2 Log-Transformed**		
3524					Mean in Original Scale	0.281				Mean in Log Scale		-1.433
3525					SD in Original Scale	0.219				SD in Log Scale		0.54
3526					95% t UCL (Assumes normality)	0.417				95% H-Stat UCL		0.428
3527					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
3528												
3529					**Nonparametric Distribution Free UCL Statistics**							
3530					**Detected Data appear Normal Distributed at 5% Significance Level**							
3531												
3532					**Suggested UCL to Use**							
3533					95% KM (t) UCL	0.255						
3534												

	A	B	C	D	E	F	G	H	I	J	K	L
3535	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3536	Recommendations are based upon data size, data distribution, and skewness.											
3537	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3538	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3539												
3540	**Cobalt (tw2r)**											
3541												
3542	**General Statistics**											
3543						Total Number of Observations	9				Number of Distinct Observations	9
3544						Number of Detects	7				Number of Non-Detects	2
3545						Number of Distinct Detects	7				Number of Distinct Non-Detects	2
3546						Minimum Detect	0.12				Minimum Non-Detect	0.25
3547						Maximum Detect	0.55				Maximum Non-Detect	0.43
3548						Variance Detects	0.0359				Percent Non-Detects	22.22%
3549						Mean Detects	0.317				SD Detects	0.189
3550						Median Detects	0.21				CV Detects	0.597
3551						Skewness Detects	0.33				Kurtosis Detects	-2.561
3552						Mean of Logged Detects	-1.316				SD of Logged Detects	0.636
3553												
3554	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3555	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3556	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3557	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3558												
3559	**Normal GOF Test on Detects Only**											
3560						Shapiro Wilk Test Statistic	0.81				**Shapiro Wilk GOF Test**	
3561						5% Shapiro Wilk Critical Value	0.803				Detected Data appear Normal at 5% Significance Level	
3562						Lilliefors Test Statistic	0.286				**Lilliefors GOF Test**	
3563						5% Lilliefors Critical Value	0.304				Detected Data appear Normal at 5% Significance Level	
3564	**Detected Data appear Normal at 5% Significance Level**											
3565												
3566	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3567						KM Mean	0.284				KM Standard Error of Mean	0.0606
3568						KM SD	0.167				95% KM (BCA) UCL	0.393
3569						95% KM (t) UCL	0.397				95% KM (Percentile Bootstrap) UCL	0.386
3570						95% KM (z) UCL	0.384				95% KM Bootstrap t UCL	0.409
3571						90% KM Chebyshev UCL	0.466				95% KM Chebyshev UCL	0.548
3572						97.5% KM Chebyshev UCL	0.663				99% KM Chebyshev UCL	0.887
3573												
3574	**Gamma GOF Tests on Detected Observations Only**											
3575						A-D Test Statistic	0.642				**Anderson-Darling GOF Test**	
3576						5% A-D Critical Value	0.712				Detected data appear Gamma Distributed at 5% Significance Level	
3577						K-S Test Statistic	0.273				**Kolmogorov-Smirnov GOF**	
3578						5% K-S Critical Value	0.314				Detected data appear Gamma Distributed at 5% Significance Level	
3579	**Detected data appear Gamma Distributed at 5% Significance Level**											
3580												
3581	**Gamma Statistics on Detected Data Only**											
3582						k hat (MLE)	3.138				k star (bias corrected MLE)	1.888
3583						Theta hat (MLE)	0.101				Theta star (bias corrected MLE)	0.168
3584						nu hat (MLE)	43.93				nu star (bias corrected)	26.44
3585						Mean (detects)	0.317					
3586												

	A	B	C	D	E	F	G	H	I	J	K	L
3587	**Gamma ROS Statistics using Imputed Non-Detects**											
3588	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3589	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3590	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3591	This is especially true when the sample size is small.											
3592	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3593					Minimum	0.12				Mean	0.288	
3594					Maximum	0.55				Median	0.186	
3595					SD	0.174				CV	0.604	
3596					k hat (MLE)	3.432				k star (bias corrected MLE)	2.362	
3597					Theta hat (MLE)	0.0839				Theta star (bias corrected MLE)	0.122	
3598					nu hat (MLE)	61.77				nu star (bias corrected)	42.51	
3599					Adjusted Level of Significance (β)	0.0231						
3600					Approximate Chi Square Value (42.51, α)	28.57				Adjusted Chi Square Value (42.51, β)	26.18	
3601					95% Gamma Approximate UCL (use when n>=50)	0.429				95% Gamma Adjusted UCL (use when n<50)	0.468	
3602												
3603	**Estimates of Gamma Parameters using KM Estimates**											
3604					Mean (KM)	0.284				SD (KM)	0.167	
3605					Variance (KM)	0.028				SE of Mean (KM)	0.0606	
3606					k hat (KM)	2.877				k star (KM)	1.992	
3607					nu hat (KM)	51.79				nu star (KM)	35.86	
3608					theta hat (KM)	0.0987				theta star (KM)	0.143	
3609					80% gamma percentile (KM)	0.425				90% gamma percentile (KM)	0.553	
3610					95% gamma percentile (KM)	0.674				99% gamma percentile (KM)	0.944	
3611												
3612	**Gamma Kaplan-Meier (KM) Statistics**											
3613					Approximate Chi Square Value (35.86, α)	23.15				Adjusted Chi Square Value (35.86, β)	21.03	
3614					95% Gamma Approximate KM-UCL (use when n>=50)	0.44				95% Gamma Adjusted KM-UCL (use when n<50)	0.484	
3615												
3616	**Lognormal GOF Test on Detected Observations Only**											
3617					Shapiro Wilk Test Statistic	0.856				**Shapiro Wilk GOF Test**		
3618					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
3619					Lilliefors Test Statistic	0.257				**Lilliefors GOF Test**		
3620					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
3621	**Detected Data appear Lognormal at 5% Significance Level**											
3622												
3623	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3624					Mean in Original Scale	0.286				Mean in Log Scale	-1.407	
3625					SD in Original Scale	0.175				SD in Log Scale	0.579	
3626					95% t UCL (assumes normality of ROS data)	0.395				95% Percentile Bootstrap UCL	0.372	
3627					95% BCA Bootstrap UCL	0.4				95% Bootstrap t UCL	0.413	
3628					95% H-UCL (Log ROS)	0.472						
3629												
3630	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3631					KM Mean (logged)	-1.425				KM Geo Mean	0.24	
3632					KM SD (logged)	0.566				95% Critical H Value (KM-Log)	2.354	
3633					KM Standard Error of Mean (logged)	0.208				95% H-UCL (KM -Log)	0.452	
3634					KM SD (logged)	0.566				95% Critical H Value (KM-Log)	2.354	
3635					KM Standard Error of Mean (logged)	0.208						
3636												
3637	**DL/2 Statistics**											
3638	**DL/2 Normal**									**DL/2 Log-Transformed**		

3639				Mean in Original Scale		0.284				Mean in Log Scale		-1.425
3640				SD in Original Scale		0.178				SD in Log Scale		0.607
3641				95% t UCL (Assumes normality)		0.395				95% H-Stat UCL		0.489
3642	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3643												
3644	**Nonparametric Distribution Free UCL Statistics**											
3645	**Detected Data appear Normal Distributed at 5% Significance Level**											
3646												
3647	**Suggested UCL to Use**											
3648				95% KM (t) UCL		0.397						
3649												
3650	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3651	Recommendations are based upon data size, data distribution, and skewness.											
3652	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3653	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3654												
3655	**Cobalt (tw5r)**											
3656												
3657	**General Statistics**											
3658				Total Number of Observations		8				Number of Distinct Observations		8
3659				Number of Detects		7				Number of Non-Detects		1
3660				Number of Distinct Detects		7				Number of Distinct Non-Detects		1
3661				Minimum Detect		0.1				Minimum Non-Detect		1.7
3662				Maximum Detect		0.85				Maximum Non-Detect		1.7
3663				Variance Detects		0.0605				Percent Non-Detects		12.5%
3664				Mean Detects		0.424				SD Detects		0.246
3665				Median Detects		0.37				CV Detects		0.58
3666				Skewness Detects		0.628				Kurtosis Detects		0.401
3667				Mean of Logged Detects		-1.033				SD of Logged Detects		0.693
3668												
3669	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3670	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3671	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3672	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3673												
3674	**Normal GOF Test on Detects Only**											
3675				Shapiro Wilk Test Statistic		0.971				**Shapiro Wilk GOF Test**		
3676				5% Shapiro Wilk Critical Value		0.803				Detected Data appear Normal at 5% Significance Level		
3677				Lilliefors Test Statistic		0.159				**Lilliefors GOF Test**		
3678				5% Lilliefors Critical Value		0.304				Detected Data appear Normal at 5% Significance Level		
3679	**Detected Data appear Normal at 5% Significance Level**											
3680												
3681	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3682				KM Mean		0.424				KM Standard Error of Mean		0.093
3683				KM SD		0.228				95% KM (BCA) UCL		0.57
3684				95% KM (t) UCL		0.6				95% KM (Percentile Bootstrap) UCL		0.569
3685				95% KM (z) UCL		0.577				95% KM Bootstrap t UCL		0.627
3686				90% KM Chebyshev UCL		0.703				95% KM Chebyshev UCL		0.83
3687				97.5% KM Chebyshev UCL		1.005				99% KM Chebyshev UCL		1.35
3688												
3689	**Gamma GOF Tests on Detected Observations Only**											
3690				A-D Test Statistic		0.17				**Anderson-Darling GOF Test**		

	A	B	C	D	E	F	G	H	I	J	K	L
3691				5% A-D Critical Value		0.712	Detected data appear Gamma Distributed at 5% Significance Level					
3692				K-S Test Statistic		0.139	**Kolmogorov-Smirnov GOF**					
3693				5% K-S Critical Value		0.314	Detected data appear Gamma Distributed at 5% Significance Level					
3694	**Detected data appear Gamma Distributed at 5% Significance Level**											
3695												
3696	**Gamma Statistics on Detected Data Only**											
3697				k hat (MLE)		2.999	k star (bias corrected MLE)					1.809
3698				Theta hat (MLE)		0.141	Theta star (bias corrected MLE)					0.235
3699				nu hat (MLE)		41.98	nu star (bias corrected)					25.32
3700				Mean (detects)		0.424						
3701												
3702	**Gamma ROS Statistics using Imputed Non-Detects**											
3703	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3704	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3705	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3706	This is especially true when the sample size is small.											
3707	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3708				Minimum		0.1	Mean					0.42
3709				Maximum		0.85	Median					0.381
3710				SD		0.228	CV					0.543
3711				k hat (MLE)		3.398	k star (bias corrected MLE)					2.207
3712				Theta hat (MLE)		0.124	Theta star (bias corrected MLE)					0.19
3713				nu hat (MLE)		54.38	nu star (bias corrected)					35.32
3714				Adjusted Level of Significance (β)		0.0195						
3715				Approximate Chi Square Value (35.32, α)		22.72	Adjusted Chi Square Value (35.32, β)					20.2
3716				95% Gamma Approximate UCL (use when n>=50)		0.653	95% Gamma Adjusted UCL (use when n<50)					0.735
3717												
3718	**Estimates of Gamma Parameters using KM Estimates**											
3719				Mean (KM)		0.424	SD (KM)					0.228
3720				Variance (KM)		0.0519	SE of Mean (KM)					0.093
3721				k hat (KM)		3.47	k star (KM)					2.252
3722				nu hat (KM)		55.52	nu star (KM)					36.03
3723				theta hat (KM)		0.122	theta star (KM)					0.188
3724				80% gamma percentile (KM)		0.626	90% gamma percentile (KM)					0.803
3725				95% gamma percentile (KM)		0.97	99% gamma percentile (KM)					1.338
3726												
3727	**Gamma Kaplan-Meier (KM) Statistics**											
3728				Approximate Chi Square Value (36.03, α)		23.29	Adjusted Chi Square Value (36.03, β)					20.74
3729				95% Gamma Approximate KM-UCL (use when n>=50)		0.656	95% Gamma Adjusted KM-UCL (use when n<50)					0.737
3730												
3731	**Lognormal GOF Test on Detected Observations Only**											
3732				Shapiro Wilk Test Statistic		0.952	**Shapiro Wilk GOF Test**					
3733				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Lognormal at 5% Significance Level					
3734				Lilliefors Test Statistic		0.162	**Lilliefors GOF Test**					
3735				5% Lilliefors Critical Value		0.304	Detected Data appear Lognormal at 5% Significance Level					
3736	**Detected Data appear Lognormal at 5% Significance Level**											
3737												
3738	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3739				Mean in Original Scale		0.416	Mean in Log Scale					-1.033
3740				SD in Original Scale		0.229	SD in Log Scale					0.641
3741				95% t UCL (assumes normality of ROS data)		0.569	95% Percentile Bootstrap UCL					0.549
3742				95% BCA Bootstrap UCL		0.565	95% Bootstrap t UCL					0.61

3743					95% H-UCL (Log ROS)	0.824						
3744												
3745	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3746					KM Mean (logged)	-1.033				KM Geo Mean		0.356
3747					KM SD (logged)	0.641				95% Critical H Value (KM-Log)		2.615
3748					KM Standard Error of Mean (logged)	0.262				95% H-UCL (KM -Log)		0.824
3749					KM SD (logged)	0.641				95% Critical H Value (KM-Log)		2.615
3750					KM Standard Error of Mean (logged)	0.262						
3751												
3752	**DL/2 Statistics**											
3753	**DL/2 Normal**						**DL/2 Log-Transformed**					
3754					Mean in Original Scale	0.478				Mean in Log Scale		-0.924
3755					SD in Original Scale	0.273				SD in Log Scale		0.712
3756					95% t UCL (Assumes normality)	0.66				95% H-Stat UCL		1.073
3757	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3758												
3759	**Nonparametric Distribution Free UCL Statistics**											
3760	**Detected Data appear Normal Distributed at 5% Significance Level**											
3761												
3762	**Suggested UCL to Use**											
3763					95% KM (t) UCL	0.6						
3764												
3765	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3766	Recommendations are based upon data size, data distribution, and skewness.											
3767	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3768	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3769												
3770												
3771	**Cobalt (waste water clarifier well)**											
3772												
3773	**General Statistics**											
3774					Total Number of Observations	1				Number of Distinct Observations		1
3775										Number of Missing Observations		0
3776					Minimum	12.5				Mean		12.5
3777					Maximum	12.5				Median		12.5
3778												
3779	**Warning: This data set only has 1 observations!**											
3780	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
3781	**The data set for variable Cobalt (waste water clarifier well) was not processed!**											
3782												
3783	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
3784	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
3785												
3786												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 10:57:35 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Copper (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1.7	Mean	4.911
Maximum	10.8	Median	4.5
SD	2.654	Std. Error of Mean	0.885
Coefficient of Variation	0.54	Skewness	1.374

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.556	95% Adjusted-CLT UCL (Chen-1995)	6.799
		95% Modified-t UCL (Johnson-1978)	6.624

Gamma GOF Test

A-D Test Statistic	0.244	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.171	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.202	k star (bias corrected MLE)	2.875
Theta hat (MLE)	1.169	Theta star (bias corrected MLE)	1.708
nu hat (MLE)	75.63	nu star (bias corrected)	51.75
MLE Mean (bias corrected)	4.911	MLE Sd (bias corrected)	2.896
		Approximate Chi Square Value (0.05)	36.23
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	33.51

53	**Assuming Gamma Distribution**											
54	95% Approximate Gamma UCL (use when n>=50))					7.015	95% Adjusted Gamma UCL (use when n<50)					7.585
55												
56	**Lognormal GOF Test**											
57	Shapiro Wilk Test Statistic					0.973	**Shapiro Wilk Lognormal GOF Test**					
58	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
59	Lilliefors Test Statistic					0.18	**Lilliefors Lognormal GOF Test**					
60	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64	Minimum of Logged Data					0.531	Mean of logged Data					1.468
65	Maximum of Logged Data					2.38	SD of logged Data					0.534
66												
67	**Assuming Lognormal Distribution**											
68	95% H-UCL					7.711	90% Chebyshev (MVUE) UCL					7.59
69	95% Chebyshev (MVUE) UCL					8.8	97.5% Chebyshev (MVUE) UCL					10.48
70	99% Chebyshev (MVUE) UCL					13.78						
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
74												
75	**Nonparametric Distribution Free UCLs**											
76	95% CLT UCL					6.366	95% Jackknife UCL					6.556
77	95% Standard Bootstrap UCL					6.276	95% Bootstrap-t UCL					7.373
78	95% Hall's Bootstrap UCL					14.45	95% Percentile Bootstrap UCL					6.467
79	95% BCA Bootstrap UCL					6.822						
80	90% Chebyshev(Mean, Sd) UCL					7.565	95% Chebyshev(Mean, Sd) UCL					8.767
81	97.5% Chebyshev(Mean, Sd) UCL					10.44	99% Chebyshev(Mean, Sd) UCL					13.71
82												
83	**Suggested UCL to Use**											
84	95% Student's-t UCL					6.556						
85												
86	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
87	Recommendations are based upon data size, data distribution, and skewness.											
88	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
89	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
90												
91	**Copper (nfmw10)**											
92												
93	**General Statistics**											
94	Total Number of Observations					8	Number of Distinct Observations					7
95	Number of Detects					7	Number of Non-Detects					1
96	Number of Distinct Detects					6	Number of Distinct Non-Detects					1
97	Minimum Detect					0.5	Minimum Non-Detect					4.3
98	Maximum Detect					5.9	Maximum Non-Detect					4.3
99	Variance Detects					3.622	Percent Non-Detects					12.5%
100	Mean Detects					2.159	SD Detects					1.903
101	Median Detects					2.3	CV Detects					0.882
102	Skewness Detects					1.396	Kurtosis Detects					2.214
103	Mean of Logged Detects					0.417	SD of Logged Detects					0.935
104												

105	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
106	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
107	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
108	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
109												
110	**Normal GOF Test on Detects Only**											
111						Shapiro Wilk Test Statistic	0.834	**Shapiro Wilk GOF Test**				
112						5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level				
113						Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**				
114						5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level				
115	**Detected Data appear Normal at 5% Significance Level**											
116												
117	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
118						KM Mean	2.081	KM Standard Error of Mean	0.662			
119						KM SD	1.694	95% KM (BCA) UCL	3.2			
120						95% KM (t) UCL	3.334	95% KM (Percentile Bootstrap) UCL	3.136			
121						95% KM (z) UCL	3.169	95% KM Bootstrap t UCL	3.853			
122						90% KM Chebyshev UCL	4.066	95% KM Chebyshev UCL	4.965			
123						97.5% KM Chebyshev UCL	6.213	99% KM Chebyshev UCL	8.665			
124												
125	**Gamma GOF Tests on Detected Observations Only**											
126						A-D Test Statistic	0.427	**Anderson-Darling GOF Test**				
127						5% A-D Critical Value	0.72	Detected data appear Gamma Distributed at 5% Significance Level				
128						K-S Test Statistic	0.238	**Kolmogorov-Smirnov GOF**				
129						5% K-S Critical Value	0.317	Detected data appear Gamma Distributed at 5% Significance Level				
130	**Detected data appear Gamma Distributed at 5% Significance Level**											
131												
132	**Gamma Statistics on Detected Data Only**											
133						k hat (MLE)	1.566	k star (bias corrected MLE)	0.99			
134						Theta hat (MLE)	1.379	Theta star (bias corrected MLE)	2.181			
135						nu hat (MLE)	21.92	nu star (bias corrected)	13.86			
136						Mean (detects)	2.159					
137												
138	**Gamma ROS Statistics using Imputed Non-Detects**											
139	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
140	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
141	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
142	This is especially true when the sample size is small.											
143	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
144						Minimum	0.5	Mean	2.067			
145						Maximum	5.9	Median	1.863			
146						SD	1.781	CV	0.862			
147						k hat (MLE)	1.727	k star (bias corrected MLE)	1.163			
148						Theta hat (MLE)	1.197	Theta star (bias corrected MLE)	1.778			
149						nu hat (MLE)	27.63	nu star (bias corrected)	18.6			
150						Adjusted Level of Significance (β)	0.0195					
151						Approximate Chi Square Value (18.60, α)	9.829	Adjusted Chi Square Value (18.60, β)	8.265			
152						95% Gamma Approximate UCL (use when n>=50)	3.912	95% Gamma Adjusted UCL (use when n<50)	4.652			
153												
154	**Estimates of Gamma Parameters using KM Estimates**											
155						Mean (KM)	2.081	SD (KM)	1.694			
156						Variance (KM)	2.871	SE of Mean (KM)	0.662			

	A	B	C	D	E	F	G	H	I	J	K	L
157					k hat (KM)	1.508				k star (KM)		1.026
158					nu hat (KM)	24.12				nu star (KM)		16.41
159					theta hat (KM)	1.38				theta star (KM)		2.029
160					80% gamma percentile (KM)	3.342				90% gamma percentile (KM)		4.761
161					95% gamma percentile (KM)	6.178				99% gamma percentile (KM)		9.461
162												
163					**Gamma Kaplan-Meier (KM) Statistics**							
164					Approximate Chi Square Value (16.41, α)	8.252				Adjusted Chi Square Value (16.41, β)		6.841
165					95% Gamma Approximate KM-UCL (use when n>=50)	4.137				95% Gamma Adjusted KM-UCL (use when n<50)		4.991
166												
167					**Lognormal GOF Test on Detected Observations Only**							
168					Shapiro Wilk Test Statistic	0.9				**Shapiro Wilk GOF Test**		
169					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
170					Lilliefors Test Statistic	0.243				**Lilliefors GOF Test**		
171					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
172					**Detected Data appear Lognormal at 5% Significance Level**							
173												
174					**Lognormal ROS Statistics Using Imputed Non-Detects**							
175					Mean in Original Scale	2.042				Mean in Log Scale		0.391
176					SD in Original Scale	1.792				SD in Log Scale		0.869
177					95% t UCL (assumes normality of ROS data)	3.243				95% Percentile Bootstrap UCL		3.121
178					95% BCA Bootstrap UCL	3.416				95% Bootstrap t UCL		4.042
179					95% H-UCL (Log ROS)	5.988						
180												
181					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
182					KM Mean (logged)	0.389				KM Geo Mean		1.476
183					KM SD (logged)	0.852				95% Critical H Value (KM-Log)		3.071
184					KM Standard Error of Mean (logged)	0.342				95% H-UCL (KM -Log)		5.701
185					KM SD (logged)	0.852				95% Critical H Value (KM-Log)		3.071
186					KM Standard Error of Mean (logged)	0.342						
187												
188					**DL/2 Statistics**							
189					**DL/2 Normal**					**DL/2 Log-Transformed**		
190					Mean in Original Scale	2.158				Mean in Log Scale		0.461
191					SD in Original Scale	1.762				SD in Log Scale		0.874
192					95% t UCL (Assumes normality)	3.338				95% H-Stat UCL		6.523
193					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
194												
195					**Nonparametric Distribution Free UCL Statistics**							
196					**Detected Data appear Normal Distributed at 5% Significance Level**							
197												
198					**Suggested UCL to Use**							
199					95% KM (t) UCL	3.334						
200												
201					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
202					Recommendations are based upon data size, data distribution, and skewness.							
203					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
204					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
205												
206	**Copper (nfmw11)**											
207												
208					**General Statistics**							

209				Total Number of Observations		8			Number of Distinct Observations			5
210				Number of Detects		1			Number of Non-Detects			7
211				Number of Distinct Detects		1			Number of Distinct Non-Detects			4
212												
213	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
214	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
215												
216	**The data set for variable Copper (nfmw11) was not processed!**											
217												
218												
219	**Copper (nfmw12)**											
220												
221	**General Statistics**											
222				Total Number of Observations		8			Number of Distinct Observations			5
223				Number of Detects		2			Number of Non-Detects			6
224				Number of Distinct Detects		2			Number of Distinct Non-Detects			3
225				Minimum Detect		0.28			Minimum Non-Detect			0.2
226				Maximum Detect		1.5			Maximum Non-Detect			1.1
227				Variance Detects		0.744			Percent Non-Detects			75%
228				Mean Detects		0.89			SD Detects			0.863
229				Median Detects		0.89			CV Detects			0.969
230				Skewness Detects		N/A			Kurtosis Detects			N/A
231				Mean of Logged Detects		-0.434			SD of Logged Detects			1.187
232												
233	**Warning: Data set has only 2 Detected Values.**											
234	**This is not enough to compute meaningful or reliable statistics and estimates.**											
235												
236												
237	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
238	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
239	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
240	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
241												
242	**Normal GOF Test on Detects Only**											
243	**Not Enough Data to Perform GOF Test**											
244												
245	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
246				KM Mean		0.398			KM Standard Error of Mean			0.211
247				KM SD		0.418			95% KM (BCA) UCL			N/A
248				95% KM (t) UCL		0.798			95% KM (Percentile Bootstrap) UCL			N/A
249				95% KM (z) UCL		0.745			95% KM Bootstrap t UCL			N/A
250				90% KM Chebyshev UCL		1.031			95% KM Chebyshev UCL			1.318
251				97.5% KM Chebyshev UCL		1.717			99% KM Chebyshev UCL			2.5
252												
253	**Gamma GOF Tests on Detected Observations Only**											
254	**Not Enough Data to Perform GOF Test**											
255												
256	**Gamma Statistics on Detected Data Only**											
257				k hat (MLE)		1.724			k star (bias corrected MLE)			N/A
258				Theta hat (MLE)		0.516			Theta star (bias corrected MLE)			N/A
259				nu hat (MLE)		6.896			nu star (bias corrected)			N/A
260				Mean (detects)		0.89						

	A	B	C	D	E	F	G	H	I	J	K	L
261												
262	**Estimates of Gamma Parameters using KM Estimates**											
263					Mean (KM)	0.398				SD (KM)		0.418
264					Variance (KM)	0.175				SE of Mean (KM)		0.211
265					k hat (KM)	0.903				k star (KM)		0.648
266					nu hat (KM)	14.44				nu star (KM)		10.36
267					theta hat (KM)	0.44				theta star (KM)		0.614
268					80% gamma percentile (KM)	0.655				90% gamma percentile (KM)		1.016
269					95% gamma percentile (KM)	1.392				99% gamma percentile (KM)		2.294
270												
271	**Gamma Kaplan-Meier (KM) Statistics**											
272										Adjusted Level of Significance (β)		0.0195
273					Approximate Chi Square Value (10.36, α)	4.168				Adjusted Chi Square Value (10.36, β)		3.234
274					95% Gamma Approximate KM-UCL (use when n>=50)	0.988				95% Gamma Adjusted KM-UCL (use when n<50)		1.273
275												
276	**Lognormal GOF Test on Detected Observations Only**											
277	**Not Enough Data to Perform GOF Test**											
278												
279	**Lognormal ROS Statistics Using Imputed Non-Detects**											
280					Mean in Original Scale	0.323				Mean in Log Scale		-1.819
281					SD in Original Scale	0.487				SD in Log Scale		1.18
282					95% t UCL (assumes normality of ROS data)	0.649				95% Percentile Bootstrap UCL		0.653
283					95% BCA Bootstrap UCL	0.71				95% Bootstrap t UCL		1.521
284					95% H-UCL (Log ROS)	1.84						
285												
286	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
287					KM Mean (logged)	-1.21				KM Geo Mean		0.298
288					KM SD (logged)	0.631				95% Critical H Value (KM-Log)		2.593
289					KM Standard Error of Mean (logged)	0.339				95% H-UCL (KM -Log)		0.675
290					KM SD (logged)	0.631				95% Critical H Value (KM-Log)		2.593
291					KM Standard Error of Mean (logged)	0.339						
292												
293	**DL/2 Statistics**											
294	**DL/2 Normal**						**DL/2 Log-Transformed**					
295					Mean in Original Scale	0.411				Mean in Log Scale		-1.24
296					SD in Original Scale	0.459				SD in Log Scale		0.811
297					95% t UCL (Assumes normality)	0.718				95% H-Stat UCL		1.002
298	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
299												
300	**Nonparametric Distribution Free UCL Statistics**											
301	**Data do not follow a Discernible Distribution at 5% Significance Level**											
302												
303	**Suggested UCL to Use**											
304					95% KM (Chebyshev) UCL	1.318						
305												
306	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
307	Recommendations are based upon data size, data distribution, and skewness.											
308	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
309	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
310												
311	**Copper (nfmw19)**											
312												

313	**General Statistics**											
314					Total Number of Observations	8				Number of Distinct Observations	8	
315					Number of Detects	5				Number of Non-Detects	3	
316					Number of Distinct Detects	5				Number of Distinct Non-Detects	3	
317					Minimum Detect	3.4				Minimum Non-Detect	1	
318					Maximum Detect	42.4				Maximum Non-Detect	4.3	
319					Variance Detects	260.5				Percent Non-Detects	37.5%	
320					Mean Detects	17.84				SD Detects	16.14	
321					Median Detects	14.6				CV Detects	0.905	
322					Skewness Detects	0.958				Kurtosis Detects	0.122	
323					Mean of Logged Detects	2.469				SD of Logged Detects	1.082	
324												
325	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
326	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
327	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
328	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
329												
330	**Normal GOF Test on Detects Only**											
331					Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk GOF Test**					
332					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level					
333					Lilliefors Test Statistic	0.196	**Lilliefors GOF Test**					
334					5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level					
335	**Detected Data appear Normal at 5% Significance Level**											
336												
337	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
338					KM Mean	11.63				KM Standard Error of Mean	5.52	
339					KM SD	13.96				95% KM (BCA) UCL	20.83	
340					95% KM (t) UCL	22.08				95% KM (Percentile Bootstrap) UCL	20.5	
341					95% KM (z) UCL	20.71				95% KM Bootstrap t UCL	27.09	
342					90% KM Chebyshev UCL	28.19				95% KM Chebyshev UCL	35.69	
343					97.5% KM Chebyshev UCL	46.1				99% KM Chebyshev UCL	66.55	
344												
345	**Gamma GOF Tests on Detected Observations Only**											
346					A-D Test Statistic	0.277	**Anderson-Darling GOF Test**					
347					5% A-D Critical Value	0.688	Detected data appear Gamma Distributed at 5% Significance Level					
348					K-S Test Statistic	0.24	**Kolmogorov-Smirnov GOF**					
349					5% K-S Critical Value	0.362	Detected data appear Gamma Distributed at 5% Significance Level					
350	**Detected data appear Gamma Distributed at 5% Significance Level**											
351												
352	**Gamma Statistics on Detected Data Only**											
353					k hat (MLE)	1.356				k star (bias corrected MLE)	0.676	
354					Theta hat (MLE)	13.16				Theta star (bias corrected MLE)	26.41	
355					nu hat (MLE)	13.56				nu star (bias corrected)	6.756	
356					Mean (detects)	17.84						
357												
358	**Gamma ROS Statistics using Imputed Non-Detects**											
359	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
360	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
361	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
362	This is especially true when the sample size is small.											
363	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
364					Minimum	0.01				Mean	11.15	

	A	B	C	D	E	F	G	H	I	J	K	L
365					Maximum	42.4					Median	3.95
366					SD	15.3					CV	1.371
367					k hat (MLE)	0.27					k star (bias corrected MLE)	0.252
368					Theta hat (MLE)	41.27					Theta star (bias corrected MLE)	44.22
369					nu hat (MLE)	4.324					nu star (bias corrected)	4.036
370					Adjusted Level of Significance (β)	0.0195						
371					Approximate Chi Square Value (4.04, α)	0.736					Adjusted Chi Square Value (4.04, β)	0.452
372					95% Gamma Approximate UCL (use when n>=50)	61.17					95% Gamma Adjusted UCL (use when n<50)	99.61
373												
374	**Estimates of Gamma Parameters using KM Estimates**											
375					Mean (KM)	11.63					SD (KM)	13.96
376					Variance (KM)	194.8					SE of Mean (KM)	5.52
377					k hat (KM)	0.694					k star (KM)	0.517
378					nu hat (KM)	11.1					nu star (KM)	8.27
379					theta hat (KM)	16.76					theta star (KM)	22.49
380					80% gamma percentile (KM)	19.12					90% gamma percentile (KM)	31.23
381					95% gamma percentile (KM)	44.13					99% gamma percentile (KM)	75.75
382												
383	**Gamma Kaplan-Meier (KM) Statistics**											
384					Approximate Chi Square Value (8.27, α)	2.892					Adjusted Chi Square Value (8.27, β)	2.151
385					95% Gamma Approximate KM-UCL (use when n>=50)	33.24					95% Gamma Adjusted KM-UCL (use when n<50)	44.7
386												
387	**Lognormal GOF Test on Detected Observations Only**											
388					Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**					
389					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level					
390					Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**					
391					5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level					
392	**Detected Data appear Lognormal at 5% Significance Level**											
393												
394	**Lognormal ROS Statistics Using Imputed Non-Detects**											
395					Mean in Original Scale	11.49					Mean in Log Scale	1.495
396					SD in Original Scale	15.02					SD in Log Scale	1.582
397					95% t UCL (assumes normality of ROS data)	21.55					95% Percentile Bootstrap UCL	19.77
398					95% BCA Bootstrap UCL	21.91					95% Bootstrap t UCL	36.23
399					95% H-UCL (Log ROS)	304						
400												
401	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
402					KM Mean (logged)	1.594					KM Geo Mean	4.925
403					KM SD (logged)	1.384					95% Critical H Value (KM-Log)	4.426
404					KM Standard Error of Mean (logged)	0.555					95% H-UCL (KM -Log)	130.1
405					KM SD (logged)	1.384					95% Critical H Value (KM-Log)	4.426
406					KM Standard Error of Mean (logged)	0.555						
407												
408	**DL/2 Statistics**											
409	**DL/2 Normal**						**DL/2 Log-Transformed**					
410					Mean in Original Scale	11.61					Mean in Log Scale	1.558
411					SD in Original Scale	14.93					SD in Log Scale	1.549
412					95% t UCL (Assumes normality)	21.61					95% H-Stat UCL	274.5
413	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
414												
415	**Nonparametric Distribution Free UCL Statistics**											
416	**Detected Data appear Normal Distributed at 5% Significance Level**											

417												
418	**Suggested UCL to Use**											
419				95% KM (t) UCL	22.08							
420												
421	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
422	Recommendations are based upon data size, data distribution, and skewness.											
423	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
424	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
425												
426	**Copper (nfmw1d)**											
427												
428	**General Statistics**											
429				Total Number of Observations	9			Number of Distinct Observations	7			
430				Number of Detects	5			Number of Non-Detects	4			
431				Number of Distinct Detects	5			Number of Distinct Non-Detects	2			
432				Minimum Detect	0.38			Minimum Non-Detect	0.43			
433				Maximum Detect	37.3			Maximum Non-Detect	4.3			
434				Variance Detects	267.2			Percent Non-Detects	44.44%			
435				Mean Detects	8.068			SD Detects	16.35			
436				Median Detects	0.66			CV Detects	2.026			
437				Skewness Detects	2.233			Kurtosis Detects	4.989			
438				Mean of Logged Detects	0.412			SD of Logged Detects	1.853			
439												
440	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
441	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
442	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
443	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
444												
445	**Normal GOF Test on Detects Only**											
446				Shapiro Wilk Test Statistic	0.572			**Shapiro Wilk GOF Test**				
447				5% Shapiro Wilk Critical Value	0.762			Detected Data Not Normal at 5% Significance Level				
448				Lilliefors Test Statistic	0.458			**Lilliefors GOF Test**				
449				5% Lilliefors Critical Value	0.343			Detected Data Not Normal at 5% Significance Level				
450	**Detected Data Not Normal at 5% Significance Level**											
451												
452	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
453				KM Mean	4.675			KM Standard Error of Mean	4.301			
454				KM SD	11.54			95% KM (BCA) UCL	12.83			
455				95% KM (t) UCL	12.67			95% KM (Percentile Bootstrap) UCL	12.78			
456				95% KM (z) UCL	11.75			95% KM Bootstrap t UCL	384.9			
457				90% KM Chebyshev UCL	17.58			95% KM Chebyshev UCL	23.42			
458				97.5% KM Chebyshev UCL	31.53			99% KM Chebyshev UCL	47.47			
459												
460	**Gamma GOF Tests on Detected Observations Only**											
461				A-D Test Statistic	0.923			**Anderson-Darling GOF Test**				
462				5% A-D Critical Value	0.726			Detected Data Not Gamma Distributed at 5% Significance Level				
463				K-S Test Statistic	0.416			**Kolmogorov-Smirnov GOF**				
464				5% K-S Critical Value	0.376			Detected Data Not Gamma Distributed at 5% Significance Level				
465	**Detected Data Not Gamma Distributed at 5% Significance Level**											
466												
467	**Gamma Statistics on Detected Data Only**											
468				k hat (MLE)	0.394			k star (bias corrected MLE)	0.291			

469					Theta hat (MLE)	20.49				Theta star (bias corrected MLE)		27.74
470					nu hat (MLE)	3.937				nu star (bias corrected)		2.908
471					Mean (detects)	8.068						
472												
473					**Gamma ROS Statistics using Imputed Non-Detects**							
474					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
475					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
476					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
477					This is especially true when the sample size is small.							
478					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
479					Minimum	0.01				Mean		4.487
480					Maximum	37.3				Median		0.38
481					SD	12.31				CV		2.745
482					k hat (MLE)	0.219				k star (bias corrected MLE)		0.22
483					Theta hat (MLE)	20.52				Theta star (bias corrected MLE)		20.41
484					nu hat (MLE)	3.936				nu star (bias corrected)		3.957
485					Adjusted Level of Significance (β)	0.0231						
486					Approximate Chi Square Value (3.96, α)	0.705				Adjusted Chi Square Value (3.96, β)		0.469
487					95% Gamma Approximate UCL (use when n>=50)	25.19				95% Gamma Adjusted UCL (use when n<50)		37.85
488												
489					**Estimates of Gamma Parameters using KM Estimates**							
490					Mean (KM)	4.675				SD (KM)		11.54
491					Variance (KM)	133.2				SE of Mean (KM)		4.301
492					k hat (KM)	0.164				k star (KM)		0.184
493					nu hat (KM)	2.955				nu star (KM)		3.303
494					theta hat (KM)	28.48				theta star (KM)		25.48
495					80% gamma percentile (KM)	5.869				90% gamma percentile (KM)		14.11
496					95% gamma percentile (KM)	24.62				99% gamma percentile (KM)		53.96
497												
498					**Gamma Kaplan-Meier (KM) Statistics**							
499					Approximate Chi Square Value (3.30, α)	0.468				Adjusted Chi Square Value (3.30, β)		0.299
500					95% Gamma Approximate KM-UCL (use when n>=50)	33.02				95% Gamma Adjusted KM-UCL (use when n<50)		51.65
501												
502					**Lognormal GOF Test on Detected Observations Only**							
503					Shapiro Wilk Test Statistic	0.771				**Shapiro Wilk GOF Test**		
504					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
505					Lilliefors Test Statistic	0.316				**Lilliefors GOF Test**		
506					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
507					**Detected Data appear Lognormal at 5% Significance Level**							
508												
509					**Lognormal ROS Statistics Using Imputed Non-Detects**							
510					Mean in Original Scale	4.588				Mean in Log Scale		-0.516
511					SD in Original Scale	12.27				SD in Log Scale		1.792
512					95% t UCL (assumes normality of ROS data)	12.2				95% Percentile Bootstrap UCL		12.7
513					95% BCA Bootstrap UCL	16.96				95% Bootstrap t UCL		262.5
514					95% H-UCL (Log ROS)	78.57						
515												
516					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
517					KM Mean (logged)	-0.164				KM Geo Mean		0.849
518					KM SD (logged)	1.405				95% Critical H Value (KM-Log)		4.201
519					KM Standard Error of Mean (logged)	0.527				95% H-UCL (KM -Log)		18.33
520					KM SD (logged)	1.405				95% Critical H Value (KM-Log)		4.201

521	KM Standard Error of Mean (logged)					0.527						
522												
523	**DL/2 Statistics**											
524	**DL/2 Normal**						**DL/2 Log-Transformed**					
525	Mean in Original Scale					4.793	Mean in Log Scale					-0.198
526	SD in Original Scale					12.21	SD in Log Scale					1.655
527	95% t UCL (Assumes normality)					12.36	95% H-Stat UCL					54.3
528	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
529												
530	**Nonparametric Distribution Free UCL Statistics**											
531	**Detected Data appear Lognormal Distributed at 5% Significance Level**											
532												
533	**Suggested UCL to Use**											
534	97.5% KM (Chebyshev) UCL					31.53	99% KM (Chebyshev) UCL					47.47
535	**Warning: Recommended UCL exceeds the maximum observation**											
536												
537	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
538	Recommendations are based upon data size, data distribution, and skewness.											
539	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
540	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
541												
542	**Copper (nfmw1s)**											
543												
544	**General Statistics**											
545	Total Number of Observations					7	Number of Distinct Observations					7
546	Number of Detects					5	Number of Non-Detects					2
547	Number of Distinct Detects					5	Number of Distinct Non-Detects					2
548	Minimum Detect					1.3	Minimum Non-Detect					0.22
549	Maximum Detect					50.5	Maximum Non-Detect					2.1
550	Variance Detects					448.5	Percent Non-Detects					28.57%
551	Mean Detects					12.74	SD Detects					21.18
552	Median Detects					3.9	CV Detects					1.662
553	Skewness Detects					2.2	Kurtosis Detects					4.867
554	Mean of Logged Detects					1.618	SD of Logged Detects					1.407
555												
556	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
557	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
558	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
559	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
560												
561	**Normal GOF Test on Detects Only**											
562	Shapiro Wilk Test Statistic					0.628	**Shapiro Wilk GOF Test**					
563	5% Shapiro Wilk Critical Value					0.762	Detected Data Not Normal at 5% Significance Level					
564	Lilliefors Test Statistic					0.428	**Lilliefors GOF Test**					
565	5% Lilliefors Critical Value					0.343	Detected Data Not Normal at 5% Significance Level					
566	**Detected Data Not Normal at 5% Significance Level**											
567												
568	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
569	KM Mean					9.24	KM Standard Error of Mean					7.16
570	KM SD					16.94	95% KM (BCA) UCL					22.89
571	95% KM (t) UCL					23.15	95% KM (Percentile Bootstrap) UCL					22.58
572	95% KM (z) UCL					21.02	95% KM Bootstrap t UCL					108.1

573				90% KM Chebyshev UCL		30.72				95% KM Chebyshev UCL		40.45
574				97.5% KM Chebyshev UCL		53.95				99% KM Chebyshev UCL		80.48
575												
576				**Gamma GOF Tests on Detected Observations Only**								
577				A-D Test Statistic		0.623			**Anderson-Darling GOF Test**			
578				5% A-D Critical Value		0.703			Detected data appear Gamma Distributed at 5% Significance Level			
579				K-S Test Statistic		0.353			**Kolmogorov-Smirnov GOF**			
580				5% K-S Critical Value		0.368			Detected data appear Gamma Distributed at 5% Significance Level			
581				**Detected data appear Gamma Distributed at 5% Significance Level**								
582												
583				**Gamma Statistics on Detected Data Only**								
584				k hat (MLE)		0.658			k star (bias corrected MLE)			0.397
585				Theta hat (MLE)		19.36			Theta star (bias corrected MLE)			32.13
586				nu hat (MLE)		6.581			nu star (bias corrected)			3.966
587				Mean (detects)		12.74						
588												
589				**Gamma ROS Statistics using Imputed Non-Detects**								
590				GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs								
591				GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)								
592				For such situations, GROS method may yield incorrect values of UCLs and BTVs								
593				This is especially true when the sample size is small.								
594				For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates								
595				Minimum		0.01			Mean			9.103
596				Maximum		50.5			Median			2.2
597				SD		18.37			CV			2.018
598				k hat (MLE)		0.292			k star (bias corrected MLE)			0.262
599				Theta hat (MLE)		31.13			Theta star (bias corrected MLE)			34.7
600				nu hat (MLE)		4.093			nu star (bias corrected)			3.672
601				Adjusted Level of Significance (β)		0.0158						
602				Approximate Chi Square Value (3.67, α)		0.597			Adjusted Chi Square Value (3.67, β)			0.321
603				95% Gamma Approximate UCL (use when n>=50)		56.02			95% Gamma Adjusted UCL (use when n<50)			104.2
604												
605				**Estimates of Gamma Parameters using KM Estimates**								
606				Mean (KM)		9.24			SD (KM)			16.94
607				Variance (KM)		287			SE of Mean (KM)			7.16
608				k hat (KM)		0.297			k star (KM)			0.265
609				nu hat (KM)		4.165			nu star (KM)			3.713
610				theta hat (KM)		31.06			theta star (KM)			34.84
611				80% gamma percentile (KM)		13.69			90% gamma percentile (KM)			27.6
612				95% gamma percentile (KM)		43.93			99% gamma percentile (KM)			87.05
613												
614				**Gamma Kaplan-Meier (KM) Statistics**								
615				Approximate Chi Square Value (3.71, α)		0.612			Adjusted Chi Square Value (3.71, β)			0.33
616				95% Gamma Approximate KM-UCL (use when n>=50)		56.08			95% Gamma Adjusted KM-UCL (use when n<50)			104
617												
618				**Lognormal GOF Test on Detected Observations Only**								
619				Shapiro Wilk Test Statistic		0.898			**Shapiro Wilk GOF Test**			
620				5% Shapiro Wilk Critical Value		0.762			Detected Data appear Lognormal at 5% Significance Level			
621				Lilliefors Test Statistic		0.261			**Lilliefors GOF Test**			
622				5% Lilliefors Critical Value		0.343			Detected Data appear Lognormal at 5% Significance Level			
623				**Detected Data appear Lognormal at 5% Significance Level**								
624												

625	**Lognormal ROS Statistics Using Imputed Non-Detects**											
626					Mean in Original Scale	9.185				Mean in Log Scale	0.779	
627					SD in Original Scale	18.33				SD in Log Scale	1.857	
628					95% t UCL (assumes normality of ROS data)	22.65				95% Percentile Bootstrap UCL	22.76	
629					95% BCA Bootstrap UCL	23.63				95% Bootstrap t UCL	110.9	
630					95% H-UCL (Log ROS)	1447						
631												
632	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
633					KM Mean (logged)	0.85				KM Geo Mean	2.34	
634					KM SD (logged)	1.666				95% Critical H Value (KM-Log)	5.697	
635					KM Standard Error of Mean (logged)	0.725				95% H-UCL (KM -Log)	451.5	
636					KM SD (logged)	1.666				95% Critical H Value (KM-Log)	5.697	
637					KM Standard Error of Mean (logged)	0.725						
638												
639	**DL/2 Statistics**											
640	**DL/2 Normal**									**DL/2 Log-Transformed**		
641					Mean in Original Scale	9.266				Mean in Log Scale	0.848	
642					SD in Original Scale	18.28				SD in Log Scale	1.865	
643					95% t UCL (Assumes normality)	22.69				95% H-Stat UCL	1630	
644	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
645												
646	**Nonparametric Distribution Free UCL Statistics**											
647	**Detected Data appear Gamma Distributed at 5% Significance Level**											
648												
649	**Suggested UCL to Use**											
650					95% KM Bootstrap t UCL	108.1				Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	104	
651												
652	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
653	Recommendations are based upon data size, data distribution, and skewness.											
654	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
655	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
656												
657	**Copper (nfmw2)**											
658												
659	**General Statistics**											
660					Total Number of Observations	9				Number of Distinct Observations	6	
661					Number of Detects	5				Number of Non-Detects	4	
662					Number of Distinct Detects	4				Number of Distinct Non-Detects	2	
663					Minimum Detect	0.69				Minimum Non-Detect	0.43	
664					Maximum Detect	4				Maximum Non-Detect	4.3	
665					Variance Detects	1.952				Percent Non-Detects	44.44%	
666					Mean Detects	1.514				SD Detects	1.397	
667					Median Detects	0.89				CV Detects	0.923	
668					Skewness Detects	2.176				Kurtosis Detects	4.786	
669					Mean of Logged Detects	0.175				SD of Logged Detects	0.697	
670												
671	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
672	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
673	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
674	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
675												
676	**Normal GOF Test on Detects Only**											

677				Shapiro Wilk Test Statistic		0.649	**Shapiro Wilk GOF Test**					
678				5% Shapiro Wilk Critical Value		0.762	Detected Data Not Normal at 5% Significance Level					
679				Lilliefors Test Statistic		0.416	**Lilliefors GOF Test**					
680				5% Lilliefors Critical Value		0.343	Detected Data Not Normal at 5% Significance Level					
681	**Detected Data Not Normal at 5% Significance Level**											
682												
683	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
684				KM Mean		1.204	KM Standard Error of Mean					0.492
685				KM SD		1.164	95% KM (BCA) UCL					N/A
686				95% KM (t) UCL		2.119	95% KM (Percentile Bootstrap) UCL					N/A
687				95% KM (z) UCL		2.014	95% KM Bootstrap t UCL					N/A
688				90% KM Chebyshev UCL		2.68	95% KM Chebyshev UCL					3.349
689				97.5% KM Chebyshev UCL		4.277	99% KM Chebyshev UCL					6.099
690												
691	**Gamma GOF Tests on Detected Observations Only**											
692				A-D Test Statistic		0.84	**Anderson-Darling GOF Test**					
693				5% A-D Critical Value		0.684	Detected Data Not Gamma Distributed at 5% Significance Level					
694				K-S Test Statistic		0.389	**Kolmogorov-Smirnov GOF**					
695				5% K-S Critical Value		0.36	Detected Data Not Gamma Distributed at 5% Significance Level					
696	**Detected Data Not Gamma Distributed at 5% Significance Level**											
697												
698	**Gamma Statistics on Detected Data Only**											
699				k hat (MLE)		2.242	k star (bias corrected MLE)					1.03
700				Theta hat (MLE)		0.675	Theta star (bias corrected MLE)					1.47
701				nu hat (MLE)		22.42	nu star (bias corrected)					10.3
702				Mean (detects)		1.514						
703												
704	**Gamma ROS Statistics using Imputed Non-Detects**											
705	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
706	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
707	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
708	This is especially true when the sample size is small.											
709	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
710				Minimum		0.01	Mean					1.004
711				Maximum		4	Median					0.89
712				SD		1.238	CV					1.233
713				k hat (MLE)		0.459	k star (bias corrected MLE)					0.38
714				Theta hat (MLE)		2.185	Theta star (bias corrected MLE)					2.64
715				nu hat (MLE)		8.268	nu star (bias corrected)					6.845
716				Adjusted Level of Significance (β)		0.0231						
717				Approximate Chi Square Value (6.85, α)		2.086	Adjusted Chi Square Value (6.85, β)					1.578
718				95% Gamma Approximate UCL (use when n>=50)		3.294	95% Gamma Adjusted UCL (use when n<50)					4.354
719												
720	**Estimates of Gamma Parameters using KM Estimates**											
721				Mean (KM)		1.204	SD (KM)					1.164
722				Variance (KM)		1.355	SE of Mean (KM)					0.492
723				k hat (KM)		1.07	k star (KM)					0.787
724				nu hat (KM)		19.26	nu star (KM)					14.17
725				theta hat (KM)		1.126	theta star (KM)					1.529
726				80% gamma percentile (KM)		1.97	90% gamma percentile (KM)					2.94
727				95% gamma percentile (KM)		3.929	99% gamma percentile (KM)					6.268
728												

	A	B	C	D	E	F	G	H	I	J	K	L
729	**Gamma Kaplan-Meier (KM) Statistics**											
730	Approximate Chi Square Value (14.17, α)					6.69	Adjusted Chi Square Value (14.17, β)					5.642
731	95% Gamma Approximate KM-UCL (use when n>=50)					2.551	95% Gamma Adjusted KM-UCL (use when n<50)					3.025
732												
733	**Lognormal GOF Test on Detected Observations Only**											
734	Shapiro Wilk Test Statistic					0.765	**Shapiro Wilk GOF Test**					
735	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Lognormal at 5% Significance Level					
736	Lilliefors Test Statistic					0.346	**Lilliefors GOF Test**					
737	5% Lilliefors Critical Value					0.343	Detected Data Not Lognormal at 5% Significance Level					
738	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
739												
740	**Lognormal ROS Statistics Using Imputed Non-Detects**											
741	Mean in Original Scale					1.078	Mean in Log Scale					-0.303
742	SD in Original Scale					1.152	SD in Log Scale					0.908
743	95% t UCL (assumes normality of ROS data)					1.792	95% Percentile Bootstrap UCL					1.735
744	95% BCA Bootstrap UCL					1.987	95% Bootstrap t UCL					2.774
745	95% H-UCL (Log ROS)					2.956						
746												
747	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
748	KM Mean (logged)					-0.116	KM Geo Mean					0.891
749	KM SD (logged)					0.7	95% Critical H Value (KM-Log)					2.617
750	KM Standard Error of Mean (logged)					0.296	95% H-UCL (KM -Log)					2.174
751	KM SD (logged)					0.7	95% Critical H Value (KM-Log)					2.617
752	KM Standard Error of Mean (logged)					0.296						
753												
754	**DL/2 Statistics**											
755	**DL/2 Normal**						**DL/2 Log-Transformed**					
756	Mean in Original Scale					1.367	Mean in Log Scale					-0.074
757	SD in Original Scale					1.214	SD in Log Scale					0.996
758	95% t UCL (Assumes normality)					2.119	95% H-Stat UCL					4.763
759	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
760												
761	**Nonparametric Distribution Free UCL Statistics**											
762	**Detected Data appear Approximate Lognormal Distributed at 5% Significance Level**											
763												
764	**Suggested UCL to Use**											
765	KM H-UCL					2.174						
766												
767	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
768	Recommendations are based upon data size, data distribution, and skewness.											
769	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
770	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
771												
772	**Copper (nfmw20)**											
773												
774	**General Statistics**											
775	Total Number of Observations					8	Number of Distinct Observations					7
776	Number of Detects					4	Number of Non-Detects					4
777	Number of Distinct Detects					4	Number of Distinct Non-Detects					3
778	Minimum Detect					0.48	Minimum Non-Detect					0.43
779	Maximum Detect					1.7	Maximum Non-Detect					4.3
780	Variance Detects					0.312	Percent Non-Detects					50%

	A	B	C	D	E	F	G	H	I	J	K	L
781					Mean Detects	1.22					SD Detects	0.559
782					Median Detects	1.35					CV Detects	0.458
783					Skewness Detects	-0.923					Kurtosis Detects	-0.715
784					Mean of Logged Detects	0.0905					SD of Logged Detects	0.582
785												
786	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
787	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
788	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
789	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
790												
791	**Normal GOF Test on Detects Only**											
792					Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk GOF Test**					
793					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level					
794					Lilliefors Test Statistic	0.252	**Lilliefors GOF Test**					
795					5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level					
796	**Detected Data appear Normal at 5% Significance Level**											
797												
798	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
799					KM Mean	1.062					KM Standard Error of Mean	0.277
800					KM SD	0.536					95% KM (BCA) UCL	N/A
801					95% KM (t) UCL	1.586					95% KM (Percentile Bootstrap) UCL	N/A
802					95% KM (z) UCL	1.517					95% KM Bootstrap t UCL	N/A
803					90% KM Chebyshev UCL	1.892					95% KM Chebyshev UCL	2.268
804					97.5% KM Chebyshev UCL	2.79					99% KM Chebyshev UCL	3.816
805												
806	**Gamma GOF Tests on Detected Observations Only**											
807					A-D Test Statistic	0.408	**Anderson-Darling GOF Test**					
808					5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level					
809					K-S Test Statistic	0.279	**Kolmogorov-Smirnov GOF**					
810					5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level					
811	**Detected data appear Gamma Distributed at 5% Significance Level**											
812												
813	**Gamma Statistics on Detected Data Only**											
814					k hat (MLE)	4.775					k star (bias corrected MLE)	1.36
815					Theta hat (MLE)	0.256					Theta star (bias corrected MLE)	0.897
816					nu hat (MLE)	38.2					nu star (bias corrected)	10.88
817					Mean (detects)	1.22						
818												
819	**Gamma ROS Statistics using Imputed Non-Detects**											
820	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
821	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
822	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
823	This is especially true when the sample size is small.											
824	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
825					Minimum	0.116					Mean	0.985
826					Maximum	1.7					Median	1.023
827					SD	0.555					CV	0.563
828					k hat (MLE)	2.229					k star (bias corrected MLE)	1.476
829					Theta hat (MLE)	0.442					Theta star (bias corrected MLE)	0.667
830					nu hat (MLE)	35.66					nu star (bias corrected)	23.62
831					Adjusted Level of Significance (β)	0.0195						
832					Approximate Chi Square Value (23.62, α)	13.56					Adjusted Chi Square Value (23.62, β)	11.68

833	95% Gamma Approximate UCL (use when n>=50)					1.716	95% Gamma Adjusted UCL (use when n<50)					N/A
834												
835	**Estimates of Gamma Parameters using KM Estimates**											
836	Mean (KM)					1.062	SD (KM)					0.536
837	Variance (KM)					0.287	SE of Mean (KM)					0.277
838	k hat (KM)					3.927	k star (KM)					2.538
839	nu hat (KM)					62.83	nu star (KM)					40.6
840	theta hat (KM)					0.27	theta star (KM)					0.419
841	80% gamma percentile (KM)					1.545	90% gamma percentile (KM)					1.955
842	95% gamma percentile (KM)					2.341	99% gamma percentile (KM)					3.185
843												
844	**Gamma Kaplan-Meier (KM) Statistics**											
845	Approximate Chi Square Value (40.60, α)					27	Adjusted Chi Square Value (40.60, β)					24.23
846	95% Gamma Approximate KM-UCL (use when n>=50)					1.597	95% Gamma Adjusted KM-UCL (use when n<50)					1.78
847												
848	**Lognormal GOF Test on Detected Observations Only**											
849	Shapiro Wilk Test Statistic					0.853	**Shapiro Wilk GOF Test**					
850	5% Shapiro Wilk Critical Value					0.748	Detected Data appear Lognormal at 5% Significance Level					
851	Lilliefors Test Statistic					0.253	**Lilliefors GOF Test**					
852	5% Lilliefors Critical Value					0.375	Detected Data appear Lognormal at 5% Significance Level					
853	**Detected Data appear Lognormal at 5% Significance Level**											
854												
855	**Lognormal ROS Statistics Using Imputed Non-Detects**											
856	Mean in Original Scale					0.975	Mean in Log Scale					-0.185
857	SD in Original Scale					0.526	SD in Log Scale					0.648
858	95% t UCL (assumes normality of ROS data)					1.328	95% Percentile Bootstrap UCL					1.26
859	95% BCA Bootstrap UCL					1.27	95% Bootstrap t UCL					1.346
860	95% H-UCL (Log ROS)					1.951						
861												
862	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
863	KM Mean (logged)					-0.0964	KM Geo Mean					0.908
864	KM SD (logged)					0.586	95% Critical H Value (KM-Log)					2.507
865	KM Standard Error of Mean (logged)					0.303	95% H-UCL (KM -Log)					1.878
866	KM SD (logged)					0.586	95% Critical H Value (KM-Log)					2.507
867	KM Standard Error of Mean (logged)					0.303						
868												
869	**DL/2 Statistics**											
870	**DL/2 Normal**						**DL/2 Log-Transformed**					
871	Mean in Original Scale					1.168	Mean in Log Scale					-0.039
872	SD in Original Scale					0.638	SD in Log Scale					0.755
873	95% t UCL (Assumes normality)					1.595	95% H-Stat UCL					2.887
874	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
875												
876	**Nonparametric Distribution Free UCL Statistics**											
877	**Detected Data appear Normal Distributed at 5% Significance Level**											
878												
879	**Suggested UCL to Use**											
880	95% KM (t) UCL					1.586						
881												
882	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
883	Recommendations are based upon data size, data distribution, and skewness.											
884	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

	A	B	C	D	E	F	G	H	I	J	K	L
885	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
886												
887												
888	**Copper (nfmw22)**											
889												
890	**General Statistics**											
891	Total Number of Observations					4	Number of Distinct Observations					4
892							Number of Missing Observations					0
893	Minimum					3.8	Mean					4.375
894	Maximum					5	Median					4.35
895	SD					0.506	Std. Error of Mean					0.253
896	Coefficient of Variation					0.116	Skewness					0.261
897												
898	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
899	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
900	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
901	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
902												
903	**Normal GOF Test**											
904	Shapiro Wilk Test Statistic					0.997	**Shapiro Wilk GOF Test**					
905	5% Shapiro Wilk Critical Value					0.748	Data appear Normal at 5% Significance Level					
906	Lilliefors Test Statistic					0.152	**Lilliefors GOF Test**					
907	5% Lilliefors Critical Value					0.375	Data appear Normal at 5% Significance Level					
908	**Data appear Normal at 5% Significance Level**											
909												
910	**Assuming Normal Distribution**											
911	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
912	95% Student's-t UCL					4.97	95% Adjusted-CLT UCL (Chen-1995)					4.826
913							95% Modified-t UCL (Johnson-1978)					4.976
914												
915	**Gamma GOF Test**											
916	A-D Test Statistic					0.192	**Anderson-Darling Gamma GOF Test**					
917	5% A-D Critical Value					0.657	Detected data appear Gamma Distributed at 5% Significance Level					
918	K-S Test Statistic					0.169	**Kolmogorov-Smirnov Gamma GOF Test**					
919	5% K-S Critical Value					0.394	Detected data appear Gamma Distributed at 5% Significance Level					
920	**Detected data appear Gamma Distributed at 5% Significance Level**											
921												
922	**Gamma Statistics**											
923	k hat (MLE)					100	k star (bias corrected MLE)					25.18
924	Theta hat (MLE)					0.0437	Theta star (bias corrected MLE)					0.174
925	nu hat (MLE)					800.3	nu star (bias corrected)					201.4
926	MLE Mean (bias corrected)					4.375	MLE Sd (bias corrected)					0.872
927							Approximate Chi Square Value (0.05)					169.6
928	Adjusted Level of Significance					N/A	Adjusted Chi Square Value					N/A
929												
930	**Assuming Gamma Distribution**											
931	95% Approximate Gamma UCL (use when n>=50))					5.196	95% Adjusted Gamma UCL (use when n<50)					N/A
932												
933	**Lognormal GOF Test**											
934	Shapiro Wilk Test Statistic					N/A	**Shapiro Wilk Lognormal GOF Test**					
935	5% Shapiro Wilk Critical Value					0.748	Data Not Lognormal at 5% Significance Level					
936	Lilliefors Test Statistic					0.137	**Lilliefors Lognormal GOF Test**					

937				5% Lilliefors Critical Value		0.375		Data appear Lognormal at 5% Significance Level				
938	**Data appear Approximate Lognormal at 5% Significance Level**											
939												
940	**Lognormal Statistics**											
941				Minimum of Logged Data		1.335				Mean of logged Data		1.471
942				Maximum of Logged Data		1.609				SD of logged Data		0.116
943												
944	**Assuming Lognormal Distribution**											
945				95% H-UCL		5.094				90% Chebyshev (MVUE) UCL		5.132
946				95% Chebyshev (MVUE) UCL		5.475				97.5% Chebyshev (MVUE) UCL		5.952
947				99% Chebyshev (MVUE) UCL		6.887						
948												
949	**Nonparametric Distribution Free UCL Statistics**											
950	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
951												
952	**Nonparametric Distribution Free UCLs**											
953				95% CLT UCL		4.791				95% Jackknife UCL		4.97
954				95% Standard Bootstrap UCL		N/A				95% Bootstrap-t UCL		N/A
955				95% Hall's Bootstrap UCL		N/A				95% Percentile Bootstrap UCL		N/A
956				95% BCA Bootstrap UCL		N/A						
957				90% Chebyshev(Mean, Sd) UCL		5.134				95% Chebyshev(Mean, Sd) UCL		5.477
958				97.5% Chebyshev(Mean, Sd) UCL		5.954				99% Chebyshev(Mean, Sd) UCL		6.891
959												
960	**Suggested UCL to Use**											
961				95% Student's-t UCL		4.97						
962												
963	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
964	Recommendations are based upon data size, data distribution, and skewness.											
965	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
966	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
967												
968												
969	**Copper (nfmw23)**											
970												
971	**General Statistics**											
972				Total Number of Observations		4				Number of Distinct Observations		4
973										Number of Missing Observations		0
974				Minimum		8.2				Mean		11.83
975				Maximum		16				Median		11.55
976				SD		3.774				Std. Error of Mean		1.887
977				Coefficient of Variation		0.319				Skewness		0.188
978												
979	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
980	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
981	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
982	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
983												
984	**Normal GOF Test**											
985				Shapiro Wilk Test Statistic		0.894				**Shapiro Wilk GOF Test**		
986				5% Shapiro Wilk Critical Value		0.748				Data appear Normal at 5% Significance Level		
987				Lilliefors Test Statistic		0.265				**Lilliefors GOF Test**		
988				5% Lilliefors Critical Value		0.375				Data appear Normal at 5% Significance Level		

989	**Data appear Normal at 5% Significance Level**											
990												
991	**Assuming Normal Distribution**											
992	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
993	95% Student's-t UCL				16.27		95% Adjusted-CLT UCL (Chen-1995)				15.12	
994							95% Modified-t UCL (Johnson-1978)				16.3	
995												
996	**Gamma GOF Test**											
997	A-D Test Statistic				0.393		**Anderson-Darling Gamma GOF Test**					
998	5% A-D Critical Value				0.657		Detected data appear Gamma Distributed at 5% Significance Level					
999	K-S Test Statistic				0.29		**Kolmogorov-Smirnov Gamma GOF Test**					
1000	5% K-S Critical Value				0.395		Detected data appear Gamma Distributed at 5% Significance Level					
1001	**Detected data appear Gamma Distributed at 5% Significance Level**											
1002												
1003	**Gamma Statistics**											
1004	k hat (MLE)				12.92		k star (bias corrected MLE)				3.396	
1005	Theta hat (MLE)				0.915		Theta star (bias corrected MLE)				3.482	
1006	nu hat (MLE)				103.4		nu star (bias corrected)				27.17	
1007	MLE Mean (bias corrected)				11.83		MLE Sd (bias corrected)				6.416	
1008							Approximate Chi Square Value (0.05)				16.28	
1009	Adjusted Level of Significance				N/A		Adjusted Chi Square Value				N/A	
1010												
1011	**Assuming Gamma Distribution**											
1012	95% Approximate Gamma UCL (use when n>=50))				19.73		95% Adjusted Gamma UCL (use when n<50)				N/A	
1013												
1014	**Lognormal GOF Test**											
1015	Shapiro Wilk Test Statistic				0.893		**Shapiro Wilk Lognormal GOF Test**					
1016	5% Shapiro Wilk Critical Value				0.748		Data appear Lognormal at 5% Significance Level					
1017	Lilliefors Test Statistic				0.254		**Lilliefors Lognormal GOF Test**					
1018	5% Lilliefors Critical Value				0.375		Data appear Lognormal at 5% Significance Level					
1019	**Data appear Lognormal at 5% Significance Level**											
1020												
1021	**Lognormal Statistics**											
1022	Minimum of Logged Data				2.104		Mean of logged Data				2.431	
1023	Maximum of Logged Data				2.773		SD of logged Data				0.325	
1024												
1025	**Assuming Lognormal Distribution**											
1026	95% H-UCL				20.52		90% Chebyshev (MVUE) UCL				17.54	
1027	95% Chebyshev (MVUE) UCL				20.13		97.5% Chebyshev (MVUE) UCL				23.72	
1028	99% Chebyshev (MVUE) UCL				30.78							
1029												
1030	**Nonparametric Distribution Free UCL Statistics**											
1031	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1032												
1033	**Nonparametric Distribution Free UCLs**											
1034	95% CLT UCL				14.93		95% Jackknife UCL				16.27	
1035	95% Standard Bootstrap UCL				N/A		95% Bootstrap-t UCL				N/A	
1036	95% Hall's Bootstrap UCL				N/A		95% Percentile Bootstrap UCL				N/A	
1037	95% BCA Bootstrap UCL				N/A							
1038	90% Chebyshev(Mean, Sd) UCL				17.49		95% Chebyshev(Mean, Sd) UCL				20.05	
1039	97.5% Chebyshev(Mean, Sd) UCL				23.61		99% Chebyshev(Mean, Sd) UCL				30.6	
1040												

	A	B	C	D	E	F	G	H	I	J	K	L
1041	**Suggested UCL to Use**											
1042					95% Student's-t UCL	16.27						
1043												
1044	**Recommended UCL exceeds the maximum observation**											
1045												
1046	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1047	Recommendations are based upon data size, data distribution, and skewness.											
1048	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1049	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1050												
1051	**Copper (nfmw3)**											
1052												
1053	**General Statistics**											
1054					Total Number of Observations	9				Number of Distinct Observations	8	
1055					Number of Detects	2				Number of Non-Detects	7	
1056					Number of Distinct Detects	2				Number of Distinct Non-Detects	6	
1057					Minimum Detect	0.48				Minimum Non-Detect	0.22	
1058					Maximum Detect	0.68				Maximum Non-Detect	4.3	
1059					Variance Detects	0.02				Percent Non-Detects	77.78%	
1060					Mean Detects	0.58				SD Detects	0.141	
1061					Median Detects	0.58				CV Detects	0.244	
1062					Skewness Detects	N/A				Kurtosis Detects	N/A	
1063					Mean of Logged Detects	-0.56				SD of Logged Detects	0.246	
1064												
1065	**Warning: Data set has only 2 Detected Values.**											
1066	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1067												
1068												
1069	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1070	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1071	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1072	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1073												
1074	**Normal GOF Test on Detects Only**											
1075	**Not Enough Data to Perform GOF Test**											
1076												
1077	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1078					KM Mean	0.351				KM Standard Error of Mean	0.108	
1079					KM SD	0.18				95% KM (BCA) UCL	N/A	
1080					95% KM (t) UCL	0.551				95% KM (Percentile Bootstrap) UCL	N/A	
1081					95% KM (z) UCL	0.528				95% KM Bootstrap t UCL	N/A	
1082					90% KM Chebyshev UCL	0.674				95% KM Chebyshev UCL	0.821	
1083					97.5% KM Chebyshev UCL	1.024				99% KM Chebyshev UCL	1.424	
1084												
1085	**Gamma GOF Tests on Detected Observations Only**											
1086	**Not Enough Data to Perform GOF Test**											
1087												
1088	**Gamma Statistics on Detected Data Only**											
1089					k hat (MLE)	33.3				k star (bias corrected MLE)	N/A	
1090					Theta hat (MLE)	0.0174				Theta star (bias corrected MLE)	N/A	
1091					nu hat (MLE)	133.2				nu star (bias corrected)	N/A	
1092					Mean (detects)	0.58						

1093												
1094	**Estimates of Gamma Parameters using KM Estimates**											
1095					Mean (KM)	0.351				SD (KM)	0.18	
1096					Variance (KM)	0.0322				SE of Mean (KM)	0.108	
1097					k hat (KM)	3.819				k star (KM)	2.62	
1098					nu hat (KM)	68.74				nu star (KM)	47.16	
1099					theta hat (KM)	0.0919				theta star (KM)	0.134	
1100					80% gamma percentile (KM)	0.509				90% gamma percentile (KM)	0.641	
1101					95% gamma percentile (KM)	0.766				99% gamma percentile (KM)	1.038	
1102												
1103	**Gamma Kaplan-Meier (KM) Statistics**											
1104										Adjusted Level of Significance (β)	0.0231	
1105					Approximate Chi Square Value (47.16, α)	32.4				Adjusted Chi Square Value (47.16, β)	29.84	
1106					95% Gamma Approximate KM-UCL (use when n>=50)	0.511				95% Gamma Adjusted KM-UCL (use when n<50)	0.554	
1107												
1108	**Lognormal GOF Test on Detected Observations Only**											
1109	**Not Enough Data to Perform GOF Test**											
1110												
1111	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1112					Mean in Original Scale	0.385				Mean in Log Scale	-0.995	
1113					SD in Original Scale	0.127				SD in Log Scale	0.288	
1114					95% t UCL (assumes normality of ROS data)	0.463				95% Percentile Bootstrap UCL	0.455	
1115					95% BCA Bootstrap UCL	0.479				95% Bootstrap t UCL	0.566	
1116					95% H-UCL (Log ROS)	0.472						
1117												
1118	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1119					KM Mean (logged)	-1.164				KM Geo Mean	0.312	
1120					KM SD (logged)	0.465				95% Critical H Value (KM-Log)	2.198	
1121					KM Standard Error of Mean (logged)	0.283				95% H-UCL (KM -Log)	0.499	
1122					KM SD (logged)	0.465				95% Critical H Value (KM-Log)	2.198	
1123					KM Standard Error of Mean (logged)	0.283						
1124												
1125	**DL/2 Statistics**											
1126	**DL/2 Normal**									**DL/2 Log-Transformed**		
1127					Mean in Original Scale	0.58				Mean in Log Scale	-0.896	
1128					SD in Original Scale	0.617				SD in Log Scale	0.85	
1129					95% t UCL (Assumes normality)	0.963				95% H-Stat UCL	1.406	
1130	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1131												
1132	**Nonparametric Distribution Free UCL Statistics**											
1133	**Data do not follow a Discernible Distribution at 5% Significance Level**											
1134												
1135	**Suggested UCL to Use**											
1136					95% KM (t) UCL	0.551				KM H-UCL	0.499	
1137					95% KM (BCA) UCL	N/A						
1138	**Warning: One or more Recommended UCL(s) not available!**											
1139												
1140	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1141	Recommendations are based upon data size, data distribution, and skewness.											
1142	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1143	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1144												

	A	B	C	D	E	F	G	H	I	J	K	L
1145	**Copper (nfmw4)**											
1146												
1147	**General Statistics**											
1148					Total Number of Observations	9			Number of Distinct Observations	9		
1149					Number of Detects	7			Number of Non-Detects	2		
1150					Number of Distinct Detects	7			Number of Distinct Non-Detects	2		
1151					Minimum Detect	0.34			Minimum Non-Detect	0.43		
1152					Maximum Detect	3			Maximum Non-Detect	4.3		
1153					Variance Detects	1.026			Percent Non-Detects	22.22%		
1154					Mean Detects	1.219			SD Detects	1.013		
1155					Median Detects	0.66			CV Detects	0.831		
1156					Skewness Detects	1.004			Kurtosis Detects	-0.157		
1157					Mean of Logged Detects	-0.11			SD of Logged Detects	0.853		
1158												
1159	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1160	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1161	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1162	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1163												
1164	**Normal GOF Test on Detects Only**											
1165					Shapiro Wilk Test Statistic	0.852			**Shapiro Wilk GOF Test**			
1166					5% Shapiro Wilk Critical Value	0.803			Detected Data appear Normal at 5% Significance Level			
1167					Lilliefors Test Statistic	0.281			**Lilliefors GOF Test**			
1168					5% Lilliefors Critical Value	0.304			Detected Data appear Normal at 5% Significance Level			
1169	**Detected Data appear Normal at 5% Significance Level**											
1170												
1171	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1172					KM Mean	1.114			KM Standard Error of Mean	0.351		
1173					KM SD	0.92			95% KM (BCA) UCL	1.69		
1174					95% KM (t) UCL	1.767			95% KM (Percentile Bootstrap) UCL	1.646		
1175					95% KM (z) UCL	1.692			95% KM Bootstrap t UCL	2.25		
1176					90% KM Chebyshev UCL	2.168			95% KM Chebyshev UCL	2.645		
1177					97.5% KM Chebyshev UCL	3.308			99% KM Chebyshev UCL	4.61		
1178												
1179	**Gamma GOF Tests on Detected Observations Only**											
1180					A-D Test Statistic	0.439			**Anderson-Darling GOF Test**			
1181					5% A-D Critical Value	0.718			Detected data appear Gamma Distributed at 5% Significance Level			
1182					K-S Test Statistic	0.255			**Kolmogorov-Smirnov GOF**			
1183					5% K-S Critical Value	0.316			Detected data appear Gamma Distributed at 5% Significance Level			
1184	**Detected data appear Gamma Distributed at 5% Significance Level**											
1185												
1186	**Gamma Statistics on Detected Data Only**											
1187					k hat (MLE)	1.771			k star (bias corrected MLE)	1.107		
1188					Theta hat (MLE)	0.688			Theta star (bias corrected MLE)	1.101		
1189					nu hat (MLE)	24.79			nu star (bias corrected)	15.5		
1190					Mean (detects)	1.219						
1191												
1192	**Gamma ROS Statistics using Imputed Non-Detects**											
1193	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1194	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1195	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1196	This is especially true when the sample size is small.											

	A	B	C	D	E	F	G	H	I	J	K	L
1197	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1198					Minimum	0.145				Mean		1.063
1199					Maximum	3				Median		0.66
1200					SD	0.948				CV		0.892
1201					k hat (MLE)	1.481				k star (bias corrected MLE)		1.061
1202					Theta hat (MLE)	0.718				Theta star (bias corrected MLE)		1.002
1203					nu hat (MLE)	26.65				nu star (bias corrected)		19.1
1204					Adjusted Level of Significance (β)	0.0231						
1205					Approximate Chi Square Value (19.10, α)	10.19				Adjusted Chi Square Value (19.10, β)		8.852
1206					95% Gamma Approximate UCL (use when n>=50)	1.992				95% Gamma Adjusted UCL (use when n<50)		2.294
1207												
1208	**Estimates of Gamma Parameters using KM Estimates**											
1209					Mean (KM)	1.114				SD (KM)		0.92
1210					Variance (KM)	0.846				SE of Mean (KM)		0.351
1211					k hat (KM)	1.466				k star (KM)		1.051
1212					nu hat (KM)	26.38				nu star (KM)		18.92
1213					theta hat (KM)	0.76				theta star (KM)		1.059
1214					80% gamma percentile (KM)	1.785				90% gamma percentile (KM)		2.533
1215					95% gamma percentile (KM)	3.278				99% gamma percentile (KM)		5.002
1216												
1217	**Gamma Kaplan-Meier (KM) Statistics**											
1218					Approximate Chi Square Value (18.92, α)	10.06				Adjusted Chi Square Value (18.92, β)		8.731
1219					95% Gamma Approximate KM-UCL (use when n>=50)	2.095				95% Gamma Adjusted KM-UCL (use when n<50)		2.414
1220												
1221	**Lognormal GOF Test on Detected Observations Only**											
1222					Shapiro Wilk Test Statistic	0.908				**Shapiro Wilk GOF Test**		
1223					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
1224					Lilliefors Test Statistic	0.211				**Lilliefors GOF Test**		
1225					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
1226	**Detected Data appear Lognormal at 5% Significance Level**											
1227												
1228	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1229					Mean in Original Scale	1.073				Mean in Log Scale		-0.233
1230					SD in Original Scale	0.93				SD in Log Scale		0.807
1231					95% t UCL (assumes normality of ROS data)	1.65				95% Percentile Bootstrap UCL		1.58
1232					95% BCA Bootstrap UCL	1.684				95% Bootstrap t UCL		2.063
1233					95% H-UCL (Log ROS)	2.455						
1234												
1235	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1236					KM Mean (logged)	-0.218				KM Geo Mean		0.804
1237					KM SD (logged)	0.793				95% Critical H Value (KM-Log)		2.798
1238					KM Standard Error of Mean (logged)	0.303				95% H-UCL (KM -Log)		2.411
1239					KM SD (logged)	0.793				95% Critical H Value (KM-Log)		2.798
1240					KM Standard Error of Mean (logged)	0.303						
1241												
1242	**DL/2 Statistics**											
1243	**DL/2 Normal**						**DL/2 Log-Transformed**					
1244					Mean in Original Scale	1.211				Mean in Log Scale		-0.172
1245					SD in Original Scale	1.002				SD in Log Scale		0.944
1246					95% t UCL (Assumes normality)	1.831				95% H-Stat UCL		3.724
1247	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1248												

	A	B	C	D	E	F	G	H	I	J	K	L
1249	**Nonparametric Distribution Free UCL Statistics**											
1250	**Detected Data appear Normal Distributed at 5% Significance Level**											
1251												
1252	**Suggested UCL to Use**											
1253	95% KM (t) UCL					1.767						
1254												
1255	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1256	Recommendations are based upon data size, data distribution, and skewness.											
1257	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1258	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1259												
1260												
1261	**Copper (nfmw7)**											
1262												
1263	**General Statistics**											
1264	Total Number of Observations					9				Number of Distinct Observations		8
1265										Number of Missing Observations		0
1266	Minimum					5.6				Mean		7.833
1267	Maximum					10.4				Median		7.4
1268	SD					1.613				Std. Error of Mean		0.538
1269	Coefficient of Variation					0.206				Skewness		0.778
1270												
1271	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1272	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1273	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1274	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1275												
1276	**Normal GOF Test**											
1277	Shapiro Wilk Test Statistic					0.884				**Shapiro Wilk GOF Test**		
1278	5% Shapiro Wilk Critical Value					0.829				Data appear Normal at 5% Significance Level		
1279	Lilliefors Test Statistic					0.212				**Lilliefors GOF Test**		
1280	5% Lilliefors Critical Value					0.274				Data appear Normal at 5% Significance Level		
1281	**Data appear Normal at 5% Significance Level**											
1282												
1283	**Assuming Normal Distribution**											
1284	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
1285	95% Student's-t UCL					8.833				95% Adjusted-CLT UCL (Chen-1995)		8.867
1286										95% Modified-t UCL (Johnson-1978)		8.857
1287												
1288	**Gamma GOF Test**											
1289	A-D Test Statistic					0.457				**Anderson-Darling Gamma GOF Test**		
1290	5% A-D Critical Value					0.721				Detected data appear Gamma Distributed at 5% Significance Level		
1291	K-S Test Statistic					0.183				**Kolmogorov-Smirnov Gamma GOF Test**		
1292	5% K-S Critical Value					0.279				Detected data appear Gamma Distributed at 5% Significance Level		
1293	**Detected data appear Gamma Distributed at 5% Significance Level**											
1294												
1295	**Gamma Statistics**											
1296	k hat (MLE)					27.87				k star (bias corrected MLE)		18.65
1297	Theta hat (MLE)					0.281				Theta star (bias corrected MLE)		0.42
1298	nu hat (MLE)					501.6				nu star (bias corrected)		335.7
1299	MLE Mean (bias corrected)					7.833				MLE Sd (bias corrected)		1.814
1300										Approximate Chi Square Value (0.05)		294.3

1301					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		286.1
1302												
1303					**Assuming Gamma Distribution**							
1304					95% Approximate Gamma UCL (use when n>=50))	8.937				95% Adjusted Gamma UCL (use when n<50)		9.193
1305												
1306					**Lognormal GOF Test**							
1307					Shapiro Wilk Test Statistic	0.921				**Shapiro Wilk Lognormal GOF Test**		
1308					5% Shapiro Wilk Critical Value	0.829				Data appear Lognormal at 5% Significance Level		
1309					Lilliefors Test Statistic	0.176				**Lilliefors Lognormal GOF Test**		
1310					5% Lilliefors Critical Value	0.274				Data appear Lognormal at 5% Significance Level		
1311					**Data appear Lognormal at 5% Significance Level**							
1312												
1313					**Lognormal Statistics**							
1314					Minimum of Logged Data	1.723				Mean of logged Data		2.04
1315					Maximum of Logged Data	2.342				SD of logged Data		0.2
1316												
1317					**Assuming Lognormal Distribution**							
1318					95% H-UCL	8.98				90% Chebyshev (MVUE) UCL		9.399
1319					95% Chebyshev (MVUE) UCL	10.11				97.5% Chebyshev (MVUE) UCL		11.1
1320					99% Chebyshev (MVUE) UCL	13.03						
1321												
1322					**Nonparametric Distribution Free UCL Statistics**							
1323					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
1324												
1325					**Nonparametric Distribution Free UCLs**							
1326					95% CLT UCL	8.718				95% Jackknife UCL		8.833
1327					95% Standard Bootstrap UCL	8.665				95% Bootstrap-t UCL		9.429
1328					95% Hall's Bootstrap UCL	11				95% Percentile Bootstrap UCL		8.689
1329					95% BCA Bootstrap UCL	8.811						
1330					90% Chebyshev(Mean, Sd) UCL	9.447				95% Chebyshev(Mean, Sd) UCL		10.18
1331					97.5% Chebyshev(Mean, Sd) UCL	11.19				99% Chebyshev(Mean, Sd) UCL		13.18
1332												
1333					**Suggested UCL to Use**							
1334					95% Student's-t UCL	8.833						
1335												
1336					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1337					Recommendations are based upon data size, data distribution, and skewness.							
1338					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1339					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1340												
1341	**Copper (nfmw8)**											
1342												
1343					**General Statistics**							
1344					Total Number of Observations	8				Number of Distinct Observations		6
1345					Number of Detects	3				Number of Non-Detects		5
1346					Number of Distinct Detects	3				Number of Distinct Non-Detects		3
1347					Minimum Detect	0.84				Minimum Non-Detect		0.4
1348					Maximum Detect	5.6				Maximum Non-Detect		4.3
1349					Variance Detects	7.163				Percent Non-Detects		62.5%
1350					Mean Detects	2.513				SD Detects		2.676
1351					Median Detects	1.1				CV Detects		1.065
1352					Skewness Detects	1.714				Kurtosis Detects		N/A

1353				Mean of Logged Detects		0.548				SD of Logged Detects		1.026
1354												
1355						**Warning: Data set has only 3 Detected Values.**							
1356						**This is not enough to compute meaningful or reliable statistics and estimates.**						
1357												
1358												
1359						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1360						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
1361						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
1362						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
1363												
1364						**Normal GOF Test on Detects Only**						
1365				Shapiro Wilk Test Statistic		0.791			**Shapiro Wilk GOF Test**			
1366				5% Shapiro Wilk Critical Value		0.767			Detected Data appear Normal at 5% Significance Level			
1367				Lilliefors Test Statistic		0.368			**Lilliefors GOF Test**			
1368				5% Lilliefors Critical Value		0.425			Detected Data appear Normal at 5% Significance Level			
1369						**Detected Data appear Normal at 5% Significance Level**						
1370												
1371						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
1372				KM Mean		1.216			KM Standard Error of Mean			0.728
1373				KM SD		1.677			95% KM (BCA) UCL			N/A
1374				95% KM (t) UCL		2.595			95% KM (Percentile Bootstrap) UCL			N/A
1375				95% KM (z) UCL		2.413			95% KM Bootstrap t UCL			N/A
1376				90% KM Chebyshev UCL		3.4			95% KM Chebyshev UCL			4.389
1377				97.5% KM Chebyshev UCL		5.761			99% KM Chebyshev UCL			8.457
1378												
1379						**Gamma GOF Tests on Detected Observations Only**						
1380						**Not Enough Data to Perform GOF Test**						
1381												
1382						**Gamma Statistics on Detected Data Only**						
1383				k hat (MLE)		1.483			k star (bias corrected MLE)			N/A
1384				Theta hat (MLE)		1.695			Theta star (bias corrected MLE)			N/A
1385				nu hat (MLE)		8.896			nu star (bias corrected)			N/A
1386				Mean (detects)		2.513						
1387												
1388						**Gamma ROS Statistics using Imputed Non-Detects**						
1389						GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs						
1390						GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)						
1391						For such situations, GROS method may yield incorrect values of UCLs and BTVs						
1392						This is especially true when the sample size is small.						
1393						For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates						
1394				Minimum		0.01			Mean			0.949
1395				Maximum		5.6			Median			0.01
1396				SD		1.93			CV			2.034
1397				k hat (MLE)		0.268			k star (bias corrected MLE)			0.251
1398				Theta hat (MLE)		3.539			Theta star (bias corrected MLE)			3.782
1399				nu hat (MLE)		4.289			nu star (bias corrected)			4.014
1400				Adjusted Level of Significance (β)		0.0195						
1401				Approximate Chi Square Value (4.01, α)		0.727			Adjusted Chi Square Value (4.01, β)			0.446
1402				95% Gamma Approximate UCL (use when n>=50)		5.237			95% Gamma Adjusted UCL (use when n<50)			N/A
1403												
1404						**Estimates of Gamma Parameters using KM Estimates**						

1405					Mean (KM)	1.216					SD (KM)	1.677
1406					Variance (KM)	2.813					SE of Mean (KM)	0.728
1407					k hat (KM)	0.526					k star (KM)	0.412
1408					nu hat (KM)	8.413					nu star (KM)	6.591
1409					theta hat (KM)	2.313					theta star (KM)	2.952
1410					80% gamma percentile (KM)	1.969					90% gamma percentile (KM)	3.417
1411					95% gamma percentile (KM)	5.002					99% gamma percentile (KM)	8.975
1412												
1413					**Gamma Kaplan-Meier (KM) Statistics**							
1414					Approximate Chi Square Value (6.59, α)	1.949					Adjusted Chi Square Value (6.59, β)	1.377
1415					95% Gamma Approximate KM-UCL (use when n>=50)	4.113					95% Gamma Adjusted KM-UCL (use when n<50)	5.822
1416												
1417					**Lognormal GOF Test on Detected Observations Only**							
1418					Shapiro Wilk Test Statistic	0.854					**Shapiro Wilk GOF Test**	
1419					5% Shapiro Wilk Critical Value	0.767					Detected Data appear Lognormal at 5% Significance Level	
1420					Lilliefors Test Statistic	0.337					**Lilliefors GOF Test**	
1421					5% Lilliefors Critical Value	0.425					Detected Data appear Lognormal at 5% Significance Level	
1422					**Detected Data appear Lognormal at 5% Significance Level**							
1423												
1424					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1425					Mean in Original Scale	1.035					Mean in Log Scale	-1.088
1426					SD in Original Scale	1.884					SD in Log Scale	1.55
1427					95% t UCL (assumes normality of ROS data)	2.297					95% Percentile Bootstrap UCL	2.307
1428					95% BCA Bootstrap UCL	2.482					95% Bootstrap t UCL	6.917
1429					95% H-UCL (Log ROS)	19.53						
1430												
1431					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1432					KM Mean (logged)	-0.331					KM Geo Mean	0.718
1433					KM SD (logged)	0.87					95% Critical H Value (KM-Log)	3.113
1434					KM Standard Error of Mean (logged)	0.383					95% H-UCL (KM -Log)	2.921
1435					KM SD (logged)	0.87					95% Critical H Value (KM-Log)	3.113
1436					KM Standard Error of Mean (logged)	0.383						
1437												
1438					**DL/2 Statistics**							
1439					**DL/2 Normal**						**DL/2 Log-Transformed**	
1440					Mean in Original Scale	1.317					Mean in Log Scale	-0.476
1441					SD in Original Scale	1.859					SD in Log Scale	1.279
1442					95% t UCL (Assumes normality)	2.562					95% H-Stat UCL	10.44
1443					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1444												
1445					**Nonparametric Distribution Free UCL Statistics**							
1446					**Detected Data appear Normal Distributed at 5% Significance Level**							
1447												
1448					**Suggested UCL to Use**							
1449					95% KM (t) UCL	2.595						
1450												
1451					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1452					Recommendations are based upon data size, data distribution, and skewness.							
1453					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1454					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1455												
1456	**Copper (nfmw9)**											

1457												
1458	**General Statistics**											
1459					Total Number of Observations	8			Number of Distinct Observations	8		
1460					Number of Detects	6			Number of Non-Detects	2		
1461					Number of Distinct Detects	6			Number of Distinct Non-Detects	2		
1462					Minimum Detect	4.5			Minimum Non-Detect	1		
1463					Maximum Detect	60.6			Maximum Non-Detect	4.3		
1464					Variance Detects	536.3			Percent Non-Detects	25%		
1465					Mean Detects	22.33			SD Detects	23.16		
1466					Median Detects	10.9			CV Detects	1.037		
1467					Skewness Detects	1.177			Kurtosis Detects	-0.188		
1468					Mean of Logged Detects	2.632			SD of Logged Detects	1.068		
1469												
1470	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1471	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1472	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1473	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1474												
1475	**Normal GOF Test on Detects Only**											
1476					Shapiro Wilk Test Statistic	0.806			**Shapiro Wilk GOF Test**			
1477					5% Shapiro Wilk Critical Value	0.788			Detected Data appear Normal at 5% Significance Level			
1478					Lilliefors Test Statistic	0.299			**Lilliefors GOF Test**			
1479					5% Lilliefors Critical Value	0.325			Detected Data appear Normal at 5% Significance Level			
1480	**Detected Data appear Normal at 5% Significance Level**											
1481												
1482	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1483					KM Mean	17			KM Standard Error of Mean	7.942		
1484					KM SD	20.51			95% KM (BCA) UCL	29.65		
1485					95% KM (t) UCL	32.05			95% KM (Percentile Bootstrap) UCL	29.69		
1486					95% KM (z) UCL	30.06			95% KM Bootstrap t UCL	66.13		
1487					90% KM Chebyshev UCL	40.83			95% KM Chebyshev UCL	51.62		
1488					97.5% KM Chebyshev UCL	66.6			99% KM Chebyshev UCL	96.03		
1489												
1490	**Gamma GOF Tests on Detected Observations Only**											
1491					A-D Test Statistic	0.462			**Anderson-Darling GOF Test**			
1492					5% A-D Critical Value	0.712			Detected data appear Gamma Distributed at 5% Significance Level			
1493					K-S Test Statistic	0.259			**Kolmogorov-Smirnov GOF**			
1494					5% K-S Critical Value	0.34			Detected data appear Gamma Distributed at 5% Significance Level			
1495	**Detected data appear Gamma Distributed at 5% Significance Level**											
1496												
1497	**Gamma Statistics on Detected Data Only**											
1498					k hat (MLE)	1.194			k star (bias corrected MLE)	0.708		
1499					Theta hat (MLE)	18.71			Theta star (bias corrected MLE)	31.54		
1500					nu hat (MLE)	14.33			nu star (bias corrected)	8.497		
1501					Mean (detects)	22.33						
1502												
1503	**Gamma ROS Statistics using Imputed Non-Detects**											
1504	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1505	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1506	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1507	This is especially true when the sample size is small.											
1508	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											

	A	B	C	D	E	F	G	H	I	J	K	L
1509					Minimum	0.01					Mean	16.75
1510					Maximum	60.6					Median	6.7
1511					SD	22.13					CV	1.321
1512					k hat (MLE)	0.339					k star (bias corrected MLE)	0.295
1513					Theta hat (MLE)	49.46					Theta star (bias corrected MLE)	56.78
1514					nu hat (MLE)	5.42					nu star (bias corrected)	4.721
1515					Adjusted Level of Significance (β)	0.0195						
1516					Approximate Chi Square Value (4.72, α)	1.025					Adjusted Chi Square Value (4.72, β)	0.66
1517					95% Gamma Approximate UCL (use when n>=50)	77.13					95% Gamma Adjusted UCL (use when n<50)	119.8
1518												
1519					**Estimates of Gamma Parameters using KM Estimates**							
1520					Mean (KM)	17					SD (KM)	20.51
1521					Variance (KM)	420.5					SE of Mean (KM)	7.942
1522					k hat (KM)	0.687					k star (KM)	0.513
1523					nu hat (KM)	11					nu star (KM)	8.205
1524					theta hat (KM)	24.74					theta star (KM)	33.15
1525					80% gamma percentile (KM)	27.95					90% gamma percentile (KM)	45.75
1526					95% gamma percentile (KM)	64.72					99% gamma percentile (KM)	111.2
1527												
1528					**Gamma Kaplan-Meier (KM) Statistics**							
1529					Approximate Chi Square Value (8.21, α)	2.855					Adjusted Chi Square Value (8.21, β)	2.119
1530					95% Gamma Approximate KM-UCL (use when n>=50)	48.87					95% Gamma Adjusted KM-UCL (use when n<50)	65.82
1531												
1532					**Lognormal GOF Test on Detected Observations Only**							
1533					Shapiro Wilk Test Statistic	0.901					**Shapiro Wilk GOF Test**	
1534					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Lognormal at 5% Significance Level	
1535					Lilliefors Test Statistic	0.227					**Lilliefors GOF Test**	
1536					5% Lilliefors Critical Value	0.325					Detected Data appear Lognormal at 5% Significance Level	
1537					**Detected Data appear Lognormal at 5% Significance Level**							
1538												
1539					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1540					Mean in Original Scale	16.99					Mean in Log Scale	1.959
1541					SD in Original Scale	21.94					SD in Log Scale	1.539
1542					95% t UCL (assumes normality of ROS data)	31.68					95% Percentile Bootstrap UCL	29.61
1543					95% BCA Bootstrap UCL	33.1					95% Bootstrap t UCL	73.3
1544					95% H-UCL (Log ROS)	389.3						
1545												
1546					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1547					KM Mean (logged)	1.974					KM Geo Mean	7.2
1548					KM SD (logged)	1.418					95% Critical H Value (KM-Log)	4.518
1549					KM Standard Error of Mean (logged)	0.549					95% H-UCL (KM -Log)	221.9
1550					KM SD (logged)	1.418					95% Critical H Value (KM-Log)	4.518
1551					KM Standard Error of Mean (logged)	0.549						
1552												
1553					**DL/2 Statistics**							
1554					**DL/2 Normal**						**DL/2 Log-Transformed**	
1555					Mean in Original Scale	17.08					Mean in Log Scale	1.983
1556					SD in Original Scale	21.86					SD in Log Scale	1.553
1557					95% t UCL (Assumes normality)	31.72					95% H-Stat UCL	426.5
1558					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1559												
1560					**Nonparametric Distribution Free UCL Statistics**							

	A	B	C	D	E	F	G	H	I	J	K	L
1561	**Detected Data appear Normal Distributed at 5% Significance Level**											
1562												
1563	**Suggested UCL to Use**											
1564	95% KM (t) UCL					32.05						
1565												
1566	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1567	Recommendations are based upon data size, data distribution, and skewness.											
1568	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1569	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1570												
1571												
1572	**Copper (smw10)**											
1573												
1574	**General Statistics**											
1575	Total Number of Observations					8	Number of Distinct Observations					8
1576							Number of Missing Observations					0
1577	Minimum					1.7	Mean					2.6
1578	Maximum					4.8	Median					2.15
1579	SD					1.061	Std. Error of Mean					0.375
1580	Coefficient of Variation					0.408	Skewness					1.552
1581												
1582	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1583	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1584	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1585	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1586												
1587	**Normal GOF Test**											
1588	Shapiro Wilk Test Statistic					0.82	**Shapiro Wilk GOF Test**					
1589	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					
1590	Lilliefors Test Statistic					0.272	**Lilliefors GOF Test**					
1591	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
1592	**Data appear Normal at 5% Significance Level**											
1593												
1594	**Assuming Normal Distribution**											
1595	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1596	95% Student's-t UCL					3.311	95% Adjusted-CLT UCL (Chen-1995)					3.437
1597							95% Modified-t UCL (Johnson-1978)					3.345
1598												
1599	**Gamma GOF Test**											
1600	A-D Test Statistic					0.522	**Anderson-Darling Gamma GOF Test**					
1601	5% A-D Critical Value					0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1602	K-S Test Statistic					0.263	**Kolmogorov-Smirnov Gamma GOF Test**					
1603	5% K-S Critical Value					0.295	Detected data appear Gamma Distributed at 5% Significance Level					
1604	**Detected data appear Gamma Distributed at 5% Significance Level**											
1605												
1606	**Gamma Statistics**											
1607	k hat (MLE)					8.368	k star (bias corrected MLE)					5.313
1608	Theta hat (MLE)					0.311	Theta star (bias corrected MLE)					0.489
1609	nu hat (MLE)					133.9	nu star (bias corrected)					85.02
1610	MLE Mean (bias corrected)					2.6	MLE Sd (bias corrected)					1.128
1611							Approximate Chi Square Value (0.05)					64.76
1612	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					60.31

1613												
1614	**Assuming Gamma Distribution**											
1615	95% Approximate Gamma UCL (use when n>=50))					3.413	95% Adjusted Gamma UCL (use when n<50)					3.665
1616												
1617	**Lognormal GOF Test**											
1618	Shapiro Wilk Test Statistic					0.893	**Shapiro Wilk Lognormal GOF Test**					
1619	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1620	Lilliefors Test Statistic					0.242	**Lilliefors Lognormal GOF Test**					
1621	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
1622	**Data appear Lognormal at 5% Significance Level**											
1623												
1624	**Lognormal Statistics**											
1625	Minimum of Logged Data					0.531	Mean of logged Data					0.895
1626	Maximum of Logged Data					1.569	SD of logged Data					0.357
1627												
1628	**Assuming Lognormal Distribution**											
1629	95% H-UCL					3.479	90% Chebyshev (MVUE) UCL					3.572
1630	95% Chebyshev (MVUE) UCL					4.018	97.5% Chebyshev (MVUE) UCL					4.638
1631	99% Chebyshev (MVUE) UCL					5.855						
1632												
1633	**Nonparametric Distribution Free UCL Statistics**											
1634	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1635												
1636	**Nonparametric Distribution Free UCLs**											
1637	95% CLT UCL					3.217	95% Jackknife UCL					3.311
1638	95% Standard Bootstrap UCL					3.177	95% Bootstrap-t UCL					4.368
1639	95% Hall's Bootstrap UCL					6.125	95% Percentile Bootstrap UCL					3.213
1640	95% BCA Bootstrap UCL					3.375						
1641	90% Chebyshev(Mean, Sd) UCL					3.725	95% Chebyshev(Mean, Sd) UCL					4.235
1642	97.5% Chebyshev(Mean, Sd) UCL					4.943	99% Chebyshev(Mean, Sd) UCL					6.332
1643												
1644	**Suggested UCL to Use**											
1645	95% Student's-t UCL					3.311						
1646												
1647	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1648	Recommendations are based upon data size, data distribution, and skewness.											
1649	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1650	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1651												
1652	**Copper (smw11)**											
1653												
1654	**General Statistics**											
1655	Total Number of Observations					9	Number of Distinct Observations					9
1656	Number of Detects					7	Number of Non-Detects					2
1657	Number of Distinct Detects					7	Number of Distinct Non-Detects					2
1658	Minimum Detect					0.58	Minimum Non-Detect					1
1659	Maximum Detect					12.4	Maximum Non-Detect					2.1
1660	Variance Detects					17.46	Percent Non-Detects					22.22%
1661	Mean Detects					3.299	SD Detects					4.178
1662	Median Detects					1.5	CV Detects					1.267
1663	Skewness Detects					2.246	Kurtosis Detects					5.303
1664	Mean of Logged Detects					0.667	SD of Logged Detects					1.053

	A	B	C	D	E	F	G	H	I	J	K	L
1665												
1666	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1667	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1668	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1669	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1670												
1671	**Normal GOF Test on Detects Only**											
1672					Shapiro Wilk Test Statistic	0.691	**Shapiro Wilk GOF Test**					
1673					5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level					
1674					Lilliefors Test Statistic	0.319	**Lilliefors GOF Test**					
1675					5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level					
1676	**Detected Data Not Normal at 5% Significance Level**											
1677												
1678	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1679					KM Mean	2.747			KM Standard Error of Mean		1.285	
1680					KM SD	3.567			95% KM (BCA) UCL		4.993	
1681					95% KM (t) UCL	5.136			95% KM (Percentile Bootstrap) UCL		5.122	
1682					95% KM (z) UCL	4.861			95% KM Bootstrap t UCL		10.44	
1683					90% KM Chebyshev UCL	6.602			95% KM Chebyshev UCL		8.348	
1684					97.5% KM Chebyshev UCL	10.77			99% KM Chebyshev UCL		15.53	
1685												
1686	**Gamma GOF Tests on Detected Observations Only**											
1687					A-D Test Statistic	0.446	**Anderson-Darling GOF Test**					
1688					5% A-D Critical Value	0.726	Detected data appear Gamma Distributed at 5% Significance Level					
1689					K-S Test Statistic	0.222	**Kolmogorov-Smirnov GOF**					
1690					5% K-S Critical Value	0.319	Detected data appear Gamma Distributed at 5% Significance Level					
1691	**Detected data appear Gamma Distributed at 5% Significance Level**											
1692												
1693	**Gamma Statistics on Detected Data Only**											
1694					k hat (MLE)	1.086			k star (bias corrected MLE)		0.716	
1695					Theta hat (MLE)	3.037			Theta star (bias corrected MLE)		4.607	
1696					nu hat (MLE)	15.21			nu star (bias corrected)		10.02	
1697					Mean (detects)	3.299						
1698												
1699	**Gamma ROS Statistics using Imputed Non-Detects**											
1700	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1701	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1702	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1703	This is especially true when the sample size is small.											
1704	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1705					Minimum	0.01			Mean		2.599	
1706					Maximum	12.4			Median		1.1	
1707					SD	3.876			CV		1.491	
1708					k hat (MLE)	0.574			k star (bias corrected MLE)		0.457	
1709					Theta hat (MLE)	4.531			Theta star (bias corrected MLE)		5.693	
1710					nu hat (MLE)	10.33			nu star (bias corrected)		8.218	
1711					Adjusted Level of Significance (β)	0.0231						
1712					Approximate Chi Square Value (8.22, α)	2.862			Adjusted Chi Square Value (8.22, β)		2.239	
1713					95% Gamma Approximate UCL (use when n>=50)	7.464			95% Gamma Adjusted UCL (use when n<50)		9.541	
1714												
1715	**Estimates of Gamma Parameters using KM Estimates**											
1716					Mean (KM)	2.747			SD (KM)		3.567	

1717					Variance (KM)	12.72					SE of Mean (KM)	1.285
1718					k hat (KM)	0.593					k star (KM)	0.47
1719					nu hat (KM)	10.68					nu star (KM)	8.452
1720					theta hat (KM)	4.631					theta star (KM)	5.85
1721					80% gamma percentile (KM)	4.497					90% gamma percentile (KM)	7.528
1722					95% gamma percentile (KM)	10.79					99% gamma percentile (KM)	18.86
1723												
1724					**Gamma Kaplan-Meier (KM) Statistics**							
1725					Approximate Chi Square Value (8.45, α)	2.999					Adjusted Chi Square Value (8.45, β)	2.357
1726					95% Gamma Approximate KM-UCL (use when n>=50)	7.74					95% Gamma Adjusted KM-UCL (use when n<50)	9.848
1727												
1728					**Lognormal GOF Test on Detected Observations Only**							
1729					Shapiro Wilk Test Statistic	0.946					**Shapiro Wilk GOF Test**	
1730					5% Shapiro Wilk Critical Value	0.803					Detected Data appear Lognormal at 5% Significance Level	
1731					Lilliefors Test Statistic	0.17					**Lilliefors GOF Test**	
1732					5% Lilliefors Critical Value	0.304					Detected Data appear Lognormal at 5% Significance Level	
1733					**Detected Data appear Lognormal at 5% Significance Level**							
1734												
1735					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1736					Mean in Original Scale	2.735					Mean in Log Scale	0.453
1737					SD in Original Scale	3.788					SD in Log Scale	1.014
1738					95% t UCL (assumes normality of ROS data)	5.083					95% Percentile Bootstrap UCL	5.072
1739					95% BCA Bootstrap UCL	5.854					95% Bootstrap t UCL	10.65
1740					95% H-UCL (Log ROS)	8.479						
1741												
1742					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1743					KM Mean (logged)	0.463					KM Geo Mean	1.589
1744					KM SD (logged)	0.952					95% Critical H Value (KM-Log)	3.132
1745					KM Standard Error of Mean (logged)	0.347					95% H-UCL (KM -Log)	7.169
1746					KM SD (logged)	0.952					95% Critical H Value (KM-Log)	3.132
1747					KM Standard Error of Mean (logged)	0.347						
1748												
1749					**DL/2 Statistics**							
1750					**DL/2 Normal**						**DL/2 Log-Transformed**	
1751					Mean in Original Scale	2.738					Mean in Log Scale	0.447
1752					SD in Original Scale	3.788					SD in Log Scale	1.028
1753					95% t UCL (Assumes normality)	5.086					95% H-Stat UCL	8.808
1754					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1755												
1756					**Nonparametric Distribution Free UCL Statistics**							
1757					**Detected Data appear Gamma Distributed at 5% Significance Level**							
1758												
1759					**Suggested UCL to Use**							
1760					95% KM Bootstrap t UCL	10.44					Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	9.848
1761												
1762					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1763					Recommendations are based upon data size, data distribution, and skewness.							
1764					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1765					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1766												
1767	**Copper (smw12)**											
1768												

1769	**General Statistics**											
1770					Total Number of Observations	8				Number of Distinct Observations	8	
1771					Number of Detects	7				Number of Non-Detects	1	
1772					Number of Distinct Detects	7				Number of Distinct Non-Detects	1	
1773					Minimum Detect	0.88				Minimum Non-Detect	0.58	
1774					Maximum Detect	6				Maximum Non-Detect	0.58	
1775					Variance Detects	3.823				Percent Non-Detects	12.5%	
1776					Mean Detects	2.926				SD Detects	1.955	
1777					Median Detects	2.5				CV Detects	0.668	
1778					Skewness Detects	0.693				Kurtosis Detects	-1.04	
1779					Mean of Logged Detects	0.864				SD of Logged Detects	0.717	
1780												
1781	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1782	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1783	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1784	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1785												
1786	**Normal GOF Test on Detects Only**											
1787					Shapiro Wilk Test Statistic	0.909				**Shapiro Wilk GOF Test**		
1788					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Normal at 5% Significance Level		
1789					Lilliefors Test Statistic	0.196				**Lilliefors GOF Test**		
1790					5% Lilliefors Critical Value	0.304				Detected Data appear Normal at 5% Significance Level		
1791	**Detected Data appear Normal at 5% Significance Level**											
1792												
1793	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1794					KM Mean	2.633				KM Standard Error of Mean	0.711	
1795					KM SD	1.862				95% KM (BCA) UCL	3.7	
1796					95% KM (t) UCL	3.98				95% KM (Percentile Bootstrap) UCL	3.71	
1797					95% KM (z) UCL	3.802				95% KM Bootstrap t UCL	4.552	
1798					90% KM Chebyshev UCL	4.766				95% KM Chebyshev UCL	5.733	
1799					97.5% KM Chebyshev UCL	7.074				99% KM Chebyshev UCL	9.709	
1800												
1801	**Gamma GOF Tests on Detected Observations Only**											
1802					A-D Test Statistic	0.254				**Anderson-Darling GOF Test**		
1803					5% A-D Critical Value	0.713				Detected data appear Gamma Distributed at 5% Significance Level		
1804					K-S Test Statistic	0.199				**Kolmogorov-Smirnov GOF**		
1805					5% K-S Critical Value	0.314				Detected data appear Gamma Distributed at 5% Significance Level		
1806	**Detected data appear Gamma Distributed at 5% Significance Level**											
1807												
1808	**Gamma Statistics on Detected Data Only**											
1809					k hat (MLE)	2.546				k star (bias corrected MLE)	1.55	
1810					Theta hat (MLE)	1.149				Theta star (bias corrected MLE)	1.887	
1811					nu hat (MLE)	35.64				nu star (bias corrected)	21.7	
1812					Mean (detects)	2.926						
1813												
1814	**Gamma ROS Statistics using Imputed Non-Detects**											
1815	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1816	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1817	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1818	This is especially true when the sample size is small.											
1819	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1820					Minimum	0.01				Mean	2.561	

1821					Maximum	6				Median		2
1822					SD	2.083				CV		0.813
1823					k hat (MLE)	0.783				k star (bias corrected MLE)		0.573
1824					Theta hat (MLE)	3.269				Theta star (bias corrected MLE)		4.47
1825					nu hat (MLE)	12.53				nu star (bias corrected)		9.167
1826					Adjusted Level of Significance (β)	0.0195						
1827					Approximate Chi Square Value (9.17, α)	3.428				Adjusted Chi Square Value (9.17, β)		2.602
1828					95% Gamma Approximate UCL (use when n>=50)	6.849				95% Gamma Adjusted UCL (use when n<50)		9.023
1829												
1830					**Estimates of Gamma Parameters using KM Estimates**							
1831					Mean (KM)	2.633				SD (KM)		1.862
1832					Variance (KM)	3.469				SE of Mean (KM)		0.711
1833					k hat (KM)	1.998				k star (KM)		1.332
1834					nu hat (KM)	31.97				nu star (KM)		21.31
1835					theta hat (KM)	1.318				theta star (KM)		1.976
1836					80% gamma percentile (KM)	4.125				90% gamma percentile (KM)		5.648
1837					95% gamma percentile (KM)	7.138				99% gamma percentile (KM)		10.53
1838												
1839					**Gamma Kaplan-Meier (KM) Statistics**							
1840					Approximate Chi Square Value (21.31, α)	11.82				Adjusted Chi Square Value (21.31, β)		10.08
1841					95% Gamma Approximate KM-UCL (use when n>=50)	4.745				95% Gamma Adjusted KM-UCL (use when n<50)		5.564
1842												
1843					**Lognormal GOF Test on Detected Observations Only**							
1844					Shapiro Wilk Test Statistic	0.954				**Shapiro Wilk GOF Test**		
1845					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
1846					Lilliefors Test Statistic	0.168				**Lilliefors GOF Test**		
1847					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
1848					**Detected Data appear Lognormal at 5% Significance Level**							
1849												
1850					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1851					Mean in Original Scale	2.609				Mean in Log Scale		0.639
1852					SD in Original Scale	2.02				SD in Log Scale		0.92
1853					95% t UCL (assumes normality of ROS data)	3.962				95% Percentile Bootstrap UCL		3.773
1854					95% BCA Bootstrap UCL	3.873				95% Bootstrap t UCL		4.325
1855					95% H-UCL (Log ROS)	8.898						
1856												
1857					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1858					KM Mean (logged)	0.688				KM Geo Mean		1.99
1859					KM SD (logged)	0.776				95% Critical H Value (KM-Log)		2.899
1860					KM Standard Error of Mean (logged)	0.296				95% H-UCL (KM -Log)		6.299
1861					KM SD (logged)	0.776				95% Critical H Value (KM-Log)		2.899
1862					KM Standard Error of Mean (logged)	0.296						
1863												
1864					**DL/2 Statistics**							
1865					**DL/2 Normal**					**DL/2 Log-Transformed**		
1866					Mean in Original Scale	2.596				Mean in Log Scale		0.602
1867					SD in Original Scale	2.036				SD in Log Scale		0.997
1868					95% t UCL (Assumes normality)	3.96				95% H-Stat UCL		10.86
1869					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
1870												
1871					**Nonparametric Distribution Free UCL Statistics**							
1872					**Detected Data appear Normal Distributed at 5% Significance Level**							

1873												
1874	**Suggested UCL to Use**											
1875					95% KM (t) UCL	3.98						
1876												
1877	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1878	Recommendations are based upon data size, data distribution, and skewness.											
1879	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1880	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1881												
1882	**Copper (smw13)**											
1883												
1884	**General Statistics**											
1885					Total Number of Observations	8			Number of Distinct Observations	8		
1886					Number of Detects	6			Number of Non-Detects	2		
1887					Number of Distinct Detects	6			Number of Distinct Non-Detects	2		
1888					Minimum Detect	1.4			Minimum Non-Detect	2.1		
1889					Maximum Detect	4.5			Maximum Non-Detect	4.3		
1890					Variance Detects	1.382			Percent Non-Detects	25%		
1891					Mean Detects	3.117			SD Detects	1.175		
1892					Median Detects	3.2			CV Detects	0.377		
1893					Skewness Detects	-0.352			Kurtosis Detects	-0.958		
1894					Mean of Logged Detects	1.065			SD of Logged Detects	0.438		
1895												
1896	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1897	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1898	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1899	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1900												
1901	**Normal GOF Test on Detects Only**											
1902					Shapiro Wilk Test Statistic	0.958			**Shapiro Wilk GOF Test**			
1903					5% Shapiro Wilk Critical Value	0.788			Detected Data appear Normal at 5% Significance Level			
1904					Lilliefors Test Statistic	0.161			**Lilliefors GOF Test**			
1905					5% Lilliefors Critical Value	0.325			Detected Data appear Normal at 5% Significance Level			
1906	**Detected Data appear Normal at 5% Significance Level**											
1907												
1908	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1909					KM Mean	2.838			KM Standard Error of Mean	0.47		
1910					KM SD	1.149			95% KM (BCA) UCL	3.672		
1911					95% KM (t) UCL	3.728			95% KM (Percentile Bootstrap) UCL	3.625		
1912					95% KM (z) UCL	3.611			95% KM Bootstrap t UCL	3.704		
1913					90% KM Chebyshev UCL	4.248			95% KM Chebyshev UCL	4.887		
1914					97.5% KM Chebyshev UCL	5.774			99% KM Chebyshev UCL	7.515		
1915												
1916	**Gamma GOF Tests on Detected Observations Only**											
1917					A-D Test Statistic	0.281			**Anderson-Darling GOF Test**			
1918					5% A-D Critical Value	0.698			Detected data appear Gamma Distributed at 5% Significance Level			
1919					K-S Test Statistic	0.211			**Kolmogorov-Smirnov GOF**			
1920					5% K-S Critical Value	0.333			Detected data appear Gamma Distributed at 5% Significance Level			
1921	**Detected data appear Gamma Distributed at 5% Significance Level**											
1922												
1923	**Gamma Statistics on Detected Data Only**											
1924					k hat (MLE)	7.12			k star (bias corrected MLE)	3.671		

1925					Theta hat (MLE)	0.438				Theta star (bias corrected MLE)		0.849
1926					nu hat (MLE)	85.44				nu star (bias corrected)		44.06
1927					Mean (detects)	3.117						
1928												
1929					**Gamma ROS Statistics using Imputed Non-Detects**							
1930					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1931					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1932					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1933					This is especially true when the sample size is small.							
1934					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1935					Minimum	1.4				Mean		2.864
1936					Maximum	4.5				Median		2.829
1937					SD	1.124				CV		0.392
1938					k hat (MLE)	6.996				k star (bias corrected MLE)		4.456
1939					Theta hat (MLE)	0.409				Theta star (bias corrected MLE)		0.643
1940					nu hat (MLE)	111.9				nu star (bias corrected)		71.29
1941					Adjusted Level of Significance (β)	0.0195						
1942					Approximate Chi Square Value (71.29, α)	52.85				Adjusted Chi Square Value (71.29, β)		48.86
1943					95% Gamma Approximate UCL (use when n>=50)	3.864				95% Gamma Adjusted UCL (use when n<50)		4.179
1944												
1945					**Estimates of Gamma Parameters using KM Estimates**							
1946					Mean (KM)	2.838				SD (KM)		1.149
1947					Variance (KM)	1.319				SE of Mean (KM)		0.47
1948					k hat (KM)	6.102				k star (KM)		3.897
1949					nu hat (KM)	97.64				nu star (KM)		62.36
1950					theta hat (KM)	0.465				theta star (KM)		0.728
1951					80% gamma percentile (KM)	3.924				90% gamma percentile (KM)		4.764
1952					95% gamma percentile (KM)	5.538				99% gamma percentile (KM)		7.194
1953												
1954					**Gamma Kaplan-Meier (KM) Statistics**							
1955					Approximate Chi Square Value (62.36, α)	45.19				Adjusted Chi Square Value (62.36, β)		41.52
1956					95% Gamma Approximate KM-UCL (use when n>=50)	3.915				95% Gamma Adjusted KM-UCL (use when n<50)		4.261
1957												
1958					**Lognormal GOF Test on Detected Observations Only**							
1959					Shapiro Wilk Test Statistic	0.918				**Shapiro Wilk GOF Test**		
1960					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
1961					Lilliefors Test Statistic	0.227				**Lilliefors GOF Test**		
1962					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
1963					**Detected Data appear Lognormal at 5% Significance Level**							
1964												
1965					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1966					Mean in Original Scale	2.837				Mean in Log Scale		0.966
1967					SD in Original Scale	1.143				SD in Log Scale		0.428
1968					95% t UCL (assumes normality of ROS data)	3.602				95% Percentile Bootstrap UCL		3.454
1969					95% BCA Bootstrap UCL	3.485				95% Bootstrap t UCL		3.678
1970					95% H-UCL (Log ROS)	4.136						
1971												
1972					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1973					KM Mean (logged)	0.95				KM Geo Mean		2.584
1974					KM SD (logged)	0.447				95% Critical H Value (KM-Log)		2.267
1975					KM Standard Error of Mean (logged)	0.184				95% H-UCL (KM -Log)		4.189
1976					KM SD (logged)	0.447				95% Critical H Value (KM-Log)		2.267

1977	KM Standard Error of Mean (logged)					0.184						
1978												
1979	**DL/2 Statistics**											
1980	**DL/2 Normal**						**DL/2 Log-Transformed**					
1981	Mean in Original Scale					2.738	Mean in Log Scale					0.9
1982	SD in Original Scale					1.251	SD in Log Scale					0.516
1983	95% t UCL (Assumes normality)					3.576	95% H-Stat UCL					4.473
1984	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1985												
1986	**Nonparametric Distribution Free UCL Statistics**											
1987	**Detected Data appear Normal Distributed at 5% Significance Level**											
1988												
1989	**Suggested UCL to Use**											
1990	95% KM (t) UCL					3.728						
1991												
1992	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1993	Recommendations are based upon data size, data distribution, and skewness.											
1994	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1995	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1996												
1997	**Copper (smw14)**											
1998												
1999	**General Statistics**											
2000	Total Number of Observations					8	Number of Distinct Observations					6
2001	Number of Detects					7	Number of Non-Detects					1
2002	Number of Distinct Detects					6	Number of Distinct Non-Detects					1
2003	Minimum Detect					4	Minimum Non-Detect					4.3
2004	Maximum Detect					9.6	Maximum Non-Detect					4.3
2005	Variance Detects					3.538	Percent Non-Detects					12.5%
2006	Mean Detects					5.886	SD Detects					1.881
2007	Median Detects					5.3	CV Detects					0.32
2008	Skewness Detects					1.427	Kurtosis Detects					2.428
2009	Mean of Logged Detects					1.734	SD of Logged Detects					0.293
2010												
2011	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2012	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2013	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2014	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2015												
2016	**Normal GOF Test on Detects Only**											
2017	Shapiro Wilk Test Statistic					0.877	**Shapiro Wilk GOF Test**					
2018	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Normal at 5% Significance Level					
2019	Lilliefors Test Statistic					0.194	**Lilliefors GOF Test**					
2020	5% Lilliefors Critical Value					0.304	Detected Data appear Normal at 5% Significance Level					
2021	**Detected Data appear Normal at 5% Significance Level**											
2022												
2023	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2024	KM Mean					5.65	KM Standard Error of Mean					0.666
2025	KM SD					1.744	95% KM (BCA) UCL					6.75
2026	95% KM (t) UCL					6.912	95% KM (Percentile Bootstrap) UCL					6.763
2027	95% KM (z) UCL					6.746	95% KM Bootstrap t UCL					7.705
2028	90% KM Chebyshev UCL					7.648	95% KM Chebyshev UCL					8.553

2029				97.5% KM Chebyshev UCL		9.81				99% KM Chebyshev UCL		12.28
2030												
2031						**Gamma GOF Tests on Detected Observations Only**							
2032				A-D Test Statistic		0.314				**Anderson-Darling GOF Test**		
2033				5% A-D Critical Value		0.708				Detected data appear Gamma Distributed at 5% Significance Level		
2034				K-S Test Statistic		0.181				**Kolmogorov-Smirnov GOF**		
2035				5% K-S Critical Value		0.312				Detected data appear Gamma Distributed at 5% Significance Level		
2036						**Detected data appear Gamma Distributed at 5% Significance Level**						
2037												
2038						**Gamma Statistics on Detected Data Only**							
2039				k hat (MLE)		13.04				k star (bias corrected MLE)		7.549
2040				Theta hat (MLE)		0.451				Theta star (bias corrected MLE)		0.78
2041				nu hat (MLE)		182.6				nu star (bias corrected)		105.7
2042				Mean (detects)		5.886						
2043												
2044						**Gamma ROS Statistics using Imputed Non-Detects**							
2045						GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs						
2046						GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)						
2047						For such situations, GROS method may yield incorrect values of UCLs and BTVs						
2048						This is especially true when the sample size is small.						
2049						For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates						
2050				Minimum		3.186				Mean		5.548
2051				Maximum		9.6				Median		5.3
2052				SD		1.986				CV		0.358
2053				k hat (MLE)		9.845				k star (bias corrected MLE)		6.236
2054				Theta hat (MLE)		0.564				Theta star (bias corrected MLE)		0.89
2055				nu hat (MLE)		157.5				nu star (bias corrected)		99.78
2056				Adjusted Level of Significance (β)		0.0195						
2057				Approximate Chi Square Value (99.78, α)		77.73				Adjusted Chi Square Value (99.78, β)		72.82
2058				95% Gamma Approximate UCL (use when n>=50)		7.122				95% Gamma Adjusted UCL (use when n<50)		7.602
2059												
2060						**Estimates of Gamma Parameters using KM Estimates**							
2061				Mean (KM)		5.65				SD (KM)		1.744
2062				Variance (KM)		3.043				SE of Mean (KM)		0.666
2063				k hat (KM)		10.49				k star (KM)		6.641
2064				nu hat (KM)		167.9				nu star (KM)		106.3
2065				theta hat (KM)		0.538				theta star (KM)		0.851
2066				80% gamma percentile (KM)		7.365				90% gamma percentile (KM)		8.578
2067				95% gamma percentile (KM)		9.672				99% gamma percentile (KM)		11.95
2068												
2069						**Gamma Kaplan-Meier (KM) Statistics**							
2070				Approximate Chi Square Value (106.26, α)		83.47				Adjusted Chi Square Value (106.26, β)		78.37
2071				95% Gamma Approximate KM-UCL (use when n>=50)		7.193				95% Gamma Adjusted KM-UCL (use when n<50)		7.661
2072												
2073						**Lognormal GOF Test on Detected Observations Only**							
2074				Shapiro Wilk Test Statistic		0.943				**Shapiro Wilk GOF Test**		
2075				5% Shapiro Wilk Critical Value		0.803				Detected Data appear Lognormal at 5% Significance Level		
2076				Lilliefors Test Statistic		0.16				**Lilliefors GOF Test**		
2077				5% Lilliefors Critical Value		0.304				Detected Data appear Lognormal at 5% Significance Level		
2078						**Detected Data appear Lognormal at 5% Significance Level**						
2079												
2080						**Lognormal ROS Statistics Using Imputed Non-Detects**						

2081				Mean in Original Scale		5.597				Mean in Log Scale		1.676
2082				SD in Original Scale		1.923				SD in Log Scale		0.316
2083			95% t UCL (assumes normality of ROS data)			6.885				95% Percentile Bootstrap UCL		6.685
2084				95% BCA Bootstrap UCL		6.9				95% Bootstrap t UCL		7.612
2085				95% H-UCL (Log ROS)		7.205						
2086												
2087	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2088				KM Mean (logged)		1.69				KM Geo Mean		5.421
2089				KM SD (logged)		0.279				95% Critical H Value (KM-Log)		2.032
2090			KM Standard Error of Mean (logged)			0.106				95% H-UCL (KM -Log)		6.98
2091				KM SD (logged)		0.279				95% Critical H Value (KM-Log)		2.032
2092			KM Standard Error of Mean (logged)			0.106						
2093												
2094	**DL/2 Statistics**											
2095	**DL/2 Normal**						**DL/2 Log-Transformed**					
2096				Mean in Original Scale		5.419				Mean in Log Scale		1.613
2097				SD in Original Scale		2.186				SD in Log Scale		0.437
2098			95% t UCL (Assumes normality)			6.883				95% H-Stat UCL		8.003
2099	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2100												
2101	**Nonparametric Distribution Free UCL Statistics**											
2102	**Detected Data appear Normal Distributed at 5% Significance Level**											
2103												
2104	**Suggested UCL to Use**											
2105				95% KM (t) UCL		6.912						
2106												
2107	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2108	Recommendations are based upon data size, data distribution, and skewness.											
2109	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2110	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2111												
2112												
2113	**Copper (smw15)**											
2114												
2115	**General Statistics**											
2116				Total Number of Observations		9				Number of Distinct Observations		9
2117										Number of Missing Observations		0
2118				Minimum		3.5				Mean		34.96
2119				Maximum		97.2				Median		26.6
2120				SD		28.59				Std. Error of Mean		9.531
2121				Coefficient of Variation		0.818				Skewness		1.347
2122												
2123	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2124	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2125	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2126	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2127												
2128	**Normal GOF Test**											
2129				Shapiro Wilk Test Statistic		0.884	**Shapiro Wilk GOF Test**					
2130				5% Shapiro Wilk Critical Value		0.829	Data appear Normal at 5% Significance Level					
2131				Lilliefors Test Statistic		0.242	**Lilliefors GOF Test**					
2132				5% Lilliefors Critical Value		0.274	Data appear Normal at 5% Significance Level					

2133	**Data appear Normal at 5% Significance Level**											
2134												
2135	**Assuming Normal Distribution**											
2136	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2137				95% Student's-t UCL		52.68			95% Adjusted-CLT UCL (Chen-1995)			55.21
2138									95% Modified-t UCL (Johnson-1978)			53.39
2139												
2140	**Gamma GOF Test**											
2141				A-D Test Statistic		0.229	**Anderson-Darling Gamma GOF Test**					
2142				5% A-D Critical Value		0.734	Detected data appear Gamma Distributed at 5% Significance Level					
2143				K-S Test Statistic		0.148	**Kolmogorov-Smirnov Gamma GOF Test**					
2144				5% K-S Critical Value		0.284	Detected data appear Gamma Distributed at 5% Significance Level					
2145	**Detected data appear Gamma Distributed at 5% Significance Level**											
2146												
2147	**Gamma Statistics**											
2148				k hat (MLE)		1.538			k star (bias corrected MLE)			1.099
2149				Theta hat (MLE)		22.73			Theta star (bias corrected MLE)			31.8
2150				nu hat (MLE)		27.68			nu star (bias corrected)			19.79
2151				MLE Mean (bias corrected)		34.96			MLE Sd (bias corrected)			33.34
2152									Approximate Chi Square Value (0.05)			10.69
2153				Adjusted Level of Significance		0.0231			Adjusted Chi Square Value			9.317
2154												
2155	**Assuming Gamma Distribution**											
2156				95% Approximate Gamma UCL (use when n>=50))		64.68			95% Adjusted Gamma UCL (use when n<50)			74.24
2157												
2158	**Lognormal GOF Test**											
2159				Shapiro Wilk Test Statistic		0.939	**Shapiro Wilk Lognormal GOF Test**					
2160				5% Shapiro Wilk Critical Value		0.829	Data appear Lognormal at 5% Significance Level					
2161				Lilliefors Test Statistic		0.207	**Lilliefors Lognormal GOF Test**					
2162				5% Lilliefors Critical Value		0.274	Data appear Lognormal at 5% Significance Level					
2163	**Data appear Lognormal at 5% Significance Level**											
2164												
2165	**Lognormal Statistics**											
2166				Minimum of Logged Data		1.253			Mean of logged Data			3.195
2167				Maximum of Logged Data		4.577			SD of logged Data			1.005
2168												
2169	**Assuming Lognormal Distribution**											
2170				95% H-UCL		128.3			90% Chebyshev (MVUE) UCL			76.61
2171				95% Chebyshev (MVUE) UCL		94.31			97.5% Chebyshev (MVUE) UCL			118.9
2172				99% Chebyshev (MVUE) UCL		167.1						
2173												
2174	**Nonparametric Distribution Free UCL Statistics**											
2175	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2176												
2177	**Nonparametric Distribution Free UCLs**											
2178				95% CLT UCL		50.63			95% Jackknife UCL			52.68
2179				95% Standard Bootstrap UCL		49.35			95% Bootstrap-t UCL			61.59
2180				95% Hall's Bootstrap UCL		91.72			95% Percentile Bootstrap UCL			50.38
2181				95% BCA Bootstrap UCL		52.97						
2182				90% Chebyshev(Mean, Sd) UCL		63.55			95% Chebyshev(Mean, Sd) UCL			76.5
2183				97.5% Chebyshev(Mean, Sd) UCL		94.48			99% Chebyshev(Mean, Sd) UCL			129.8
2184												

	A	B	C	D	E	F	G	H	I	J	K	L
2185	**Suggested UCL to Use**											
2186					95% Student's-t UCL	52.68						
2187												
2188	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2189	Recommendations are based upon data size, data distribution, and skewness.											
2190	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2191	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2192												
2193	**Copper (smw16)**											
2194												
2195	**General Statistics**											
2196					Total Number of Observations	9			Number of Distinct Observations	8		
2197					Number of Detects	5			Number of Non-Detects	4		
2198					Number of Distinct Detects	5			Number of Distinct Non-Detects	4		
2199					Minimum Detect	0.37			Minimum Non-Detect	1		
2200					Maximum Detect	1.5			Maximum Non-Detect	4.3		
2201					Variance Detects	0.203			Percent Non-Detects	44.44%		
2202					Mean Detects	0.852			SD Detects	0.451		
2203					Median Detects	0.73			CV Detects	0.529		
2204					Skewness Detects	0.675			Kurtosis Detects	-0.706		
2205					Mean of Logged Detects	-0.278			SD of Logged Detects	0.55		
2206												
2207	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2208	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2209	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2210	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2211												
2212	**Normal GOF Test on Detects Only**											
2213					Shapiro Wilk Test Statistic	0.954			**Shapiro Wilk GOF Test**			
2214					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
2215					Lilliefors Test Statistic	0.207			**Lilliefors GOF Test**			
2216					5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			
2217	**Detected Data appear Normal at 5% Significance Level**											
2218												
2219	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2220					KM Mean	0.767			KM Standard Error of Mean	0.164		
2221					KM SD	0.375			95% KM (BCA) UCL	1.036		
2222					95% KM (t) UCL	1.072			95% KM (Percentile Bootstrap) UCL	1.044		
2223					95% KM (z) UCL	1.037			95% KM Bootstrap t UCL	1.204		
2224					90% KM Chebyshev UCL	1.259			95% KM Chebyshev UCL	1.482		
2225					97.5% KM Chebyshev UCL	1.792			99% KM Chebyshev UCL	2.4		
2226												
2227	**Gamma GOF Tests on Detected Observations Only**											
2228					A-D Test Statistic	0.19			**Anderson-Darling GOF Test**			
2229					5% A-D Critical Value	0.681			Detected data appear Gamma Distributed at 5% Significance Level			
2230					K-S Test Statistic	0.163			**Kolmogorov-Smirnov GOF**			
2231					5% K-S Critical Value	0.358			Detected data appear Gamma Distributed at 5% Significance Level			
2232	**Detected data appear Gamma Distributed at 5% Significance Level**											
2233												
2234	**Gamma Statistics on Detected Data Only**											
2235					k hat (MLE)	4.418			k star (bias corrected MLE)	1.9		
2236					Theta hat (MLE)	0.193			Theta star (bias corrected MLE)	0.448		

	A	B	C	D	E	F	G	H	I	J	K	L
2237					nu hat (MLE)	44.18				nu star (bias corrected)		19
2238					Mean (detects)	0.852						
2239												
2240					**Gamma ROS Statistics using Imputed Non-Detects**							
2241					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2242					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2243					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2244					This is especially true when the sample size is small.							
2245					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2246					Minimum	0.37				Mean		0.753
2247					Maximum	1.5				Median		0.708
2248					SD	0.344				CV		0.457
2249					k hat (MLE)	6.418				k star (bias corrected MLE)		4.353
2250					Theta hat (MLE)	0.117				Theta star (bias corrected MLE)		0.173
2251					nu hat (MLE)	115.5				nu star (bias corrected)		78.35
2252					Adjusted Level of Significance (β)	0.0231						
2253					Approximate Chi Square Value (78.35, α)	58.96				Adjusted Chi Square Value (78.35, β)		55.43
2254					95% Gamma Approximate UCL (use when n>=50)	1.001				95% Gamma Adjusted UCL (use when n<50)		1.064
2255												
2256					**Estimates of Gamma Parameters using KM Estimates**							
2257					Mean (KM)	0.767				SD (KM)		0.375
2258					Variance (KM)	0.141				SE of Mean (KM)		0.164
2259					k hat (KM)	4.179				k star (KM)		2.86
2260					nu hat (KM)	75.22				nu star (KM)		51.48
2261					theta hat (KM)	0.183				theta star (KM)		0.268
2262					80% gamma percentile (KM)	1.1				90% gamma percentile (KM)		1.374
2263					95% gamma percentile (KM)	1.631				99% gamma percentile (KM)		2.19
2264												
2265					**Gamma Kaplan-Meier (KM) Statistics**							
2266					Approximate Chi Square Value (51.48, α)	36				Adjusted Chi Square Value (51.48, β)		33.29
2267					95% Gamma Approximate KM-UCL (use when n>=50)	1.096				95% Gamma Adjusted KM-UCL (use when n<50)		1.186
2268												
2269					**Lognormal GOF Test on Detected Observations Only**							
2270					Shapiro Wilk Test Statistic	0.986				**Shapiro Wilk GOF Test**		
2271					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
2272					Lilliefors Test Statistic	0.151				**Lilliefors GOF Test**		
2273					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
2274					**Detected Data appear Lognormal at 5% Significance Level**							
2275												
2276					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2277					Mean in Original Scale	0.742				Mean in Log Scale		-0.38
2278					SD in Original Scale	0.348				SD in Log Scale		0.415
2279					95% t UCL (assumes normality of ROS data)	0.958				95% Percentile Bootstrap UCL		0.934
2280					95% BCA Bootstrap UCL	1.008				95% Bootstrap t UCL		1.262
2281					95% H-UCL (Log ROS)	1.022						
2282												
2283					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2284					KM Mean (logged)	-0.378				KM Geo Mean		0.685
2285					KM SD (logged)	0.47				95% Critical H Value (KM-Log)		2.202
2286					KM Standard Error of Mean (logged)	0.215				95% H-UCL (KM -Log)		1.103
2287					KM SD (logged)	0.47				95% Critical H Value (KM-Log)		2.202
2288					KM Standard Error of Mean (logged)	0.215						

2289												
2290	**DL/2 Statistics**											
2291	**DL/2 Normal**						**DL/2 Log-Transformed**					
2292					Mean in Original Scale	0.946				Mean in Log Scale	-0.207	
2293					SD in Original Scale	0.578				SD in Log Scale	0.574	
2294					95% t UCL (Assumes normality)	1.304				95% H-Stat UCL	1.552	
2295	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2296												
2297	**Nonparametric Distribution Free UCL Statistics**											
2298	**Detected Data appear Normal Distributed at 5% Significance Level**											
2299												
2300	**Suggested UCL to Use**											
2301					95% KM (t) UCL	1.072						
2302												
2303	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2304	Recommendations are based upon data size, data distribution, and skewness.											
2305	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2306	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2307												
2308	**Copper (smw16d)**											
2309												
2310	**General Statistics**											
2311					Total Number of Observations	8				Number of Distinct Observations	5	
2312					Number of Detects	7				Number of Non-Detects	1	
2313					Number of Distinct Detects	4				Number of Distinct Non-Detects	1	
2314					Minimum Detect	1.3				Minimum Non-Detect	4.3	
2315					Maximum Detect	3.2				Maximum Non-Detect	4.3	
2316					Variance Detects	0.48				Percent Non-Detects	12.5%	
2317					Mean Detects	1.757				SD Detects	0.692	
2318					Median Detects	1.4				CV Detects	0.394	
2319					Skewness Detects	1.881				Kurtosis Detects	3.696	
2320					Mean of Logged Detects	0.51				SD of Logged Detects	0.336	
2321												
2322	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2323	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2324	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2325	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2326												
2327	**Normal GOF Test on Detects Only**											
2328					Shapiro Wilk Test Statistic	0.731	**Shapiro Wilk GOF Test**					
2329					5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level					
2330					Lilliefors Test Statistic	0.275	**Lilliefors GOF Test**					
2331					5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level					
2332	**Detected Data appear Approximate Normal at 5% Significance Level**											
2333												
2334	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2335					KM Mean	1.757				KM Standard Error of Mean	0.262	
2336					KM SD	0.641				95% KM (BCA) UCL	N/A	
2337					95% KM (t) UCL	2.253				95% KM (Percentile Bootstrap) UCL	N/A	
2338					95% KM (z) UCL	2.188				95% KM Bootstrap t UCL	N/A	
2339					90% KM Chebyshev UCL	2.542				95% KM Chebyshev UCL	2.898	
2340					97.5% KM Chebyshev UCL	3.392				99% KM Chebyshev UCL	4.361	

	A	B	C	D	E	F	G	H	I	J	K	L
2341												
2342	**Gamma GOF Tests on Detected Observations Only**											
2343					A-D Test Statistic	0.775	**Anderson-Darling GOF Test**					
2344					5% A-D Critical Value	0.709	Detected Data Not Gamma Distributed at 5% Significance Level					
2345					K-S Test Statistic	0.285	**Kolmogorov-Smirnov GOF**					
2346					5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level					
2347	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
2348												
2349	**Gamma Statistics on Detected Data Only**											
2350					k hat (MLE)	9.487	k star (bias corrected MLE)	5.516				
2351					Theta hat (MLE)	0.185	Theta star (bias corrected MLE)	0.319				
2352					nu hat (MLE)	132.8	nu star (bias corrected)	77.23				
2353					Mean (detects)	1.757						
2354												
2355	**Gamma ROS Statistics using Imputed Non-Detects**											
2356	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2357	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2358	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2359	This is especially true when the sample size is small.											
2360	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2361					Minimum	1.3	Mean	1.751				
2362					Maximum	3.2	Median	1.556				
2363					SD	0.641	CV	0.366				
2364					k hat (MLE)	10.81	k star (bias corrected MLE)	6.84				
2365					Theta hat (MLE)	0.162	Theta star (bias corrected MLE)	0.256				
2366					nu hat (MLE)	173	nu star (bias corrected)	109.4				
2367					Adjusted Level of Significance (β)	0.0195						
2368					Approximate Chi Square Value (109.44, α)	86.3	Adjusted Chi Square Value (109.44, β)	81.11				
2369					95% Gamma Approximate UCL (use when n>=50)	2.221	95% Gamma Adjusted UCL (use when n<50)	2.363				
2370												
2371	**Estimates of Gamma Parameters using KM Estimates**											
2372					Mean (KM)	1.757	SD (KM)	0.641				
2373					Variance (KM)	0.411	SE of Mean (KM)	0.262				
2374					k hat (KM)	7.512	k star (KM)	4.778				
2375					nu hat (KM)	120.2	nu star (KM)	76.45				
2376					theta hat (KM)	0.234	theta star (KM)	0.368				
2377					80% gamma percentile (KM)	2.374	90% gamma percentile (KM)	2.834				
2378					95% gamma percentile (KM)	3.253	99% gamma percentile (KM)	4.142				
2379												
2380	**Gamma Kaplan-Meier (KM) Statistics**											
2381					Approximate Chi Square Value (76.45, α)	57.31	Adjusted Chi Square Value (76.45, β)	53.14				
2382					95% Gamma Approximate KM-UCL (use when n>=50)	2.344	95% Gamma Adjusted KM-UCL (use when n<50)	2.528				
2383												
2384	**Lognormal GOF Test on Detected Observations Only**											
2385					Shapiro Wilk Test Statistic	0.788	**Shapiro Wilk GOF Test**					
2386					5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level					
2387					Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**					
2388					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
2389	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
2390												
2391	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2392					Mean in Original Scale	1.746	Mean in Log Scale	0.51				

2393				SD in Original Scale		0.642				SD in Log Scale		0.311
2394			95% t UCL (assumes normality of ROS data)			2.176				95% Percentile Bootstrap UCL		2.146
2395				95% BCA Bootstrap UCL		2.179				95% Bootstrap t UCL		2.628
2396				95% H-UCL (Log ROS)		2.229						
2397												
2398				**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**								
2399				KM Mean (logged)		0.51				KM Geo Mean		1.665
2400				KM SD (logged)		0.311				95% Critical H Value (KM-Log)		2.072
2401			KM Standard Error of Mean (logged)			0.127				95% H-UCL (KM -Log)		2.229
2402				KM SD (logged)		0.311				95% Critical H Value (KM-Log)		2.072
2403			KM Standard Error of Mean (logged)			0.127						
2404												
2405				**DL/2 Statistics**								
2406				**DL/2 Normal**						**DL/2 Log-Transformed**		
2407				Mean in Original Scale		1.806				Mean in Log Scale		0.542
2408				SD in Original Scale		0.656				SD in Log Scale		0.323
2409				95% t UCL (Assumes normality)		2.246				95% H-Stat UCL		2.339
2410				**DL/2 is not a recommended method, provided for comparisons and historical reasons**								
2411												
2412				**Nonparametric Distribution Free UCL Statistics**								
2413				**Detected Data appear Approximate Normal Distributed at 5% Significance Level**								
2414												
2415				**Suggested UCL to Use**								
2416				95% KM (t) UCL		2.253						
2417												
2418				When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test								
2419				When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL								
2420												
2421				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
2422				Recommendations are based upon data size, data distribution, and skewness.								
2423				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
2424				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
2425												
2426	**Copper (smw17)**											
2427												
2428				**General Statistics**								
2429				Total Number of Observations		8				Number of Distinct Observations		6
2430				Number of Detects		3				Number of Non-Detects		5
2431				Number of Distinct Detects		3				Number of Distinct Non-Detects		3
2432				Minimum Detect		0.45				Minimum Non-Detect		1
2433				Maximum Detect		1.2				Maximum Non-Detect		4.3
2434				Variance Detects		0.166				Percent Non-Detects		62.5%
2435				Mean Detects		0.917				SD Detects		0.407
2436				Median Detects		1.1				CV Detects		0.444
2437				Skewness Detects		-1.615				Kurtosis Detects		N/A
2438				Mean of Logged Detects		-0.174				SD of Logged Detects		0.543
2439												
2440				**Warning: Data set has only 3 Detected Values.**								
2441				**This is not enough to compute meaningful or reliable statistics and estimates.**								
2442												
2443												
2444				**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**								

	A	B	C	D	E	F	G	H	I	J	K	L
2445	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
2446	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
2447	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
2448												
2449	Normal GOF Test on Detects Only											
2450					Shapiro Wilk Test Statistic	0.848	Shapiro Wilk GOF Test					
2451					5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level					
2452					Lilliefors Test Statistic	0.34	Lilliefors GOF Test					
2453					5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level					
2454	Detected Data appear Normal at 5% Significance Level											
2455												
2456	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
2457					KM Mean	0.8	KM Standard Error of Mean	0.215				
2458					KM SD	0.352	95% KM (BCA) UCL	N/A				
2459					95% KM (t) UCL	1.208	95% KM (Percentile Bootstrap) UCL	N/A				
2460					95% KM (z) UCL	1.154	95% KM Bootstrap t UCL	N/A				
2461					90% KM Chebyshev UCL	1.446	95% KM Chebyshev UCL	1.739				
2462					97.5% KM Chebyshev UCL	2.145	99% KM Chebyshev UCL	2.943				
2463												
2464	Gamma GOF Tests on Detected Observations Only											
2465	Not Enough Data to Perform GOF Test											
2466												
2467	Gamma Statistics on Detected Data Only											
2468					k hat (MLE)	5.934	k star (bias corrected MLE)	N/A				
2469					Theta hat (MLE)	0.154	Theta star (bias corrected MLE)	N/A				
2470					nu hat (MLE)	35.61	nu star (bias corrected)	N/A				
2471					Mean (detects)	0.917						
2472												
2473	Gamma ROS Statistics using Imputed Non-Detects											
2474	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2475	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2476	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2477	This is especially true when the sample size is small.											
2478	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2479					Minimum	0.45	Mean	0.798				
2480					Maximum	1.2	Median	0.785				
2481					SD	0.298	CV	0.373				
2482					k hat (MLE)	7.898	k star (bias corrected MLE)	5.02				
2483					Theta hat (MLE)	0.101	Theta star (bias corrected MLE)	0.159				
2484					nu hat (MLE)	126.4	nu star (bias corrected)	80.32				
2485					Adjusted Level of Significance (β)	0.0195						
2486					Approximate Chi Square Value (80.32, α)	60.67	Adjusted Chi Square Value (80.32, β)	56.37				
2487					95% Gamma Approximate UCL (use when n>=50)	1.057	95% Gamma Adjusted UCL (use when n<50)	N/A				
2488												
2489	Estimates of Gamma Parameters using KM Estimates											
2490					Mean (KM)	0.8	SD (KM)	0.352				
2491					Variance (KM)	0.124	SE of Mean (KM)	0.215				
2492					k hat (KM)	5.172	k star (KM)	3.316				
2493					nu hat (KM)	82.75	nu star (KM)	53.05				
2494					theta hat (KM)	0.155	theta star (KM)	0.241				
2495					80% gamma percentile (KM)	1.128	90% gamma percentile (KM)	1.389				
2496					95% gamma percentile (KM)	1.632	99% gamma percentile (KM)	2.156				

	A	B	C	D	E	F	G	H	I	J	K	L
2497												
2498	**Gamma Kaplan-Meier (KM) Statistics**											
2499	Approximate Chi Square Value (53.05, α)					37.32	Adjusted Chi Square Value (53.05, β)					34.01
2500	95% Gamma Approximate KM-UCL (use when n>=50)					1.137	95% Gamma Adjusted KM-UCL (use when n<50)					1.248
2501												
2502	**Lognormal GOF Test on Detected Observations Only**											
2503	Shapiro Wilk Test Statistic					0.816	**Shapiro Wilk GOF Test**					
2504	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Lognormal at 5% Significance Level					
2505	Lilliefors Test Statistic					0.356	**Lilliefors GOF Test**					
2506	5% Lilliefors Critical Value					0.425	Detected Data appear Lognormal at 5% Significance Level					
2507	**Detected Data appear Lognormal at 5% Significance Level**											
2508												
2509	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2510	Mean in Original Scale					0.777	Mean in Log Scale					-0.321
2511	SD in Original Scale					0.303	SD in Log Scale					0.402
2512	95% t UCL (assumes normality of ROS data)					0.98	95% Percentile Bootstrap UCL					0.948
2513	95% BCA Bootstrap UCL					0.956	95% Bootstrap t UCL					1.006
2514	95% H-UCL (Log ROS)					1.098						
2515												
2516	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2517	KM Mean (logged)					-0.33	KM Geo Mean					0.719
2518	KM SD (logged)					0.47	95% Critical H Value (KM-Log)					2.303
2519	KM Standard Error of Mean (logged)					0.288	95% H-UCL (KM -Log)					1.208
2520	KM SD (logged)					0.47	95% Critical H Value (KM-Log)					2.303
2521	KM Standard Error of Mean (logged)					0.288						
2522												
2523	**DL/2 Statistics**											
2524	**DL/2 Normal**						**DL/2 Log-Transformed**					
2525	Mean in Original Scale					1.206	Mean in Log Scale					0.0518
2526	SD in Original Scale					0.645	SD in Log Scale					0.575
2527	95% t UCL (Assumes normality)					1.638	95% H-Stat UCL					2.134
2528	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2529												
2530	**Nonparametric Distribution Free UCL Statistics**											
2531	**Detected Data appear Normal Distributed at 5% Significance Level**											
2532												
2533	**Suggested UCL to Use**											
2534	95% KM (t) UCL					1.208						
2535	**Warning: Recommended UCL exceeds the maximum observation**											
2536												
2537	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2538	Recommendations are based upon data size, data distribution, and skewness.											
2539	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2540	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2541												
2542	**Copper (smw17d)**											
2543												
2544	**General Statistics**											
2545	Total Number of Observations					8	Number of Distinct Observations					7
2546	Number of Detects					7	Number of Non-Detects					1
2547	Number of Distinct Detects					6	Number of Distinct Non-Detects					1
2548	Minimum Detect					0.72	Minimum Non-Detect					0.98

2549					Maximum Detect	4.5					Maximum Non-Detect	0.98
2550					Variance Detects	1.622					Percent Non-Detects	12.5%
2551					Mean Detects	1.689					SD Detects	1.273
2552					Median Detects	1.3					CV Detects	0.754
2553					Skewness Detects	2.355					Kurtosis Detects	5.891
2554					Mean of Logged Detects	0.358					SD of Logged Detects	0.57
2555												
2556					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2557					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2558					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2559					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2560												
2561					**Normal GOF Test on Detects Only**							
2562					Shapiro Wilk Test Statistic	0.676	**Shapiro Wilk GOF Test**					
2563					5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level					
2564					Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**					
2565					5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level					
2566					**Detected Data Not Normal at 5% Significance Level**							
2567												
2568					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
2569					KM Mean	1.568					KM Standard Error of Mean	0.439
2570					KM SD	1.148					95% KM (BCA) UCL	2.455
2571					95% KM (t) UCL	2.398					95% KM (Percentile Bootstrap) UCL	2.38
2572					95% KM (z) UCL	2.289					95% KM Bootstrap t UCL	3.804
2573					90% KM Chebyshev UCL	2.883					95% KM Chebyshev UCL	3.479
2574					97.5% KM Chebyshev UCL	4.306					99% KM Chebyshev UCL	5.931
2575												
2576					**Gamma GOF Tests on Detected Observations Only**							
2577					A-D Test Statistic	0.725	**Anderson-Darling GOF Test**					
2578					5% A-D Critical Value	0.712	Detected Data Not Gamma Distributed at 5% Significance Level					
2579					K-S Test Statistic	0.32	**Kolmogorov-Smirnov GOF**					
2580					5% K-S Critical Value	0.314	Detected Data Not Gamma Distributed at 5% Significance Level					
2581					**Detected Data Not Gamma Distributed at 5% Significance Level**							
2582												
2583					**Gamma Statistics on Detected Data Only**							
2584					k hat (MLE)	3.166					k star (bias corrected MLE)	1.904
2585					Theta hat (MLE)	0.533					Theta star (bias corrected MLE)	0.887
2586					nu hat (MLE)	44.32					nu star (bias corrected)	26.66
2587					Mean (detects)	1.689						
2588												
2589					**Gamma ROS Statistics using Imputed Non-Detects**							
2590					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2591					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2592					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2593					This is especially true when the sample size is small.							
2594					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2595					Minimum	0.163					Mean	1.498
2596					Maximum	4.5					Median	1.2
2597					SD	1.296					CV	0.866
2598					k hat (MLE)	1.721					k star (bias corrected MLE)	1.159
2599					Theta hat (MLE)	0.87					Theta star (bias corrected MLE)	1.293
2600					nu hat (MLE)	27.53					nu star (bias corrected)	18.54

	A	B	C	D	E	F	G	H	I	J	K	L
2601					Adjusted Level of Significance (β)	0.0195						
2602					Approximate Chi Square Value (18.54, α)	9.783					Adjusted Chi Square Value (18.54, β)	8.224
2603					95% Gamma Approximate UCL (use when n>=50)	2.839					95% Gamma Adjusted UCL (use when n<50)	3.377
2604												
2605					**Estimates of Gamma Parameters using KM Estimates**							
2606					Mean (KM)	1.568					SD (KM)	1.148
2607					Variance (KM)	1.319					SE of Mean (KM)	0.439
2608					k hat (KM)	1.863					k star (KM)	1.248
2609					nu hat (KM)	29.81					nu star (KM)	19.96
2610					theta hat (KM)	0.841					theta star (KM)	1.256
2611					80% gamma percentile (KM)	2.472					90% gamma percentile (KM)	3.417
2612					95% gamma percentile (KM)	4.347					99% gamma percentile (KM)	6.471
2613												
2614					**Gamma Kaplan-Meier (KM) Statistics**							
2615					Approximate Chi Square Value (19.96, α)	10.82					Adjusted Chi Square Value (19.96, β)	9.172
2616					95% Gamma Approximate KM-UCL (use when n>=50)	2.891					95% Gamma Adjusted KM-UCL (use when n<50)	3.412
2617												
2618					**Lognormal GOF Test on Detected Observations Only**							
2619					Shapiro Wilk Test Statistic	0.867					**Shapiro Wilk GOF Test**	
2620					5% Shapiro Wilk Critical Value	0.803					Detected Data appear Lognormal at 5% Significance Level	
2621					Lilliefors Test Statistic	0.279					**Lilliefors GOF Test**	
2622					5% Lilliefors Critical Value	0.304					Detected Data appear Lognormal at 5% Significance Level	
2623					**Detected Data appear Lognormal at 5% Significance Level**							
2624												
2625					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2626					Mean in Original Scale	1.554					Mean in Log Scale	0.251
2627					SD in Original Scale	1.239					SD in Log Scale	0.607
2628					95% t UCL (assumes normality of ROS data)	2.384					95% Percentile Bootstrap UCL	2.368
2629					95% BCA Bootstrap UCL	2.575					95% Bootstrap t UCL	3.676
2630					95% H-UCL (Log ROS)	2.774						
2631												
2632					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2633					KM Mean (logged)	0.272					KM Geo Mean	1.313
2634					KM SD (logged)	0.543					95% Critical H Value (KM-Log)	2.429
2635					KM Standard Error of Mean (logged)	0.207					95% H-UCL (KM -Log)	2.504
2636					KM SD (logged)	0.543					95% Critical H Value (KM-Log)	2.429
2637					KM Standard Error of Mean (logged)	0.207						
2638												
2639					**DL/2 Statistics**							
2640					**DL/2 Normal**						**DL/2 Log-Transformed**	
2641					Mean in Original Scale	1.539					Mean in Log Scale	0.224
2642					SD in Original Scale	1.253					SD in Log Scale	0.649
2643					95% t UCL (Assumes normality)	2.378					95% H-Stat UCL	2.945
2644					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2645												
2646					**Nonparametric Distribution Free UCL Statistics**							
2647					**Detected Data appear Lognormal Distributed at 5% Significance Level**							
2648												
2649					**Suggested UCL to Use**							
2650					KM H-UCL	2.504						
2651												
2652					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							

	A	B	C	D	E	F	G	H	I	J	K	L
2653	Recommendations are based upon data size, data distribution, and skewness.											
2654	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2655	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2656												
2657	**Copper (smw18)**											
2658												
2659	**General Statistics**											
2660						Total Number of Observations	8			Number of Distinct Observations	7	
2661						Number of Detects	6			Number of Non-Detects	2	
2662						Number of Distinct Detects	6			Number of Distinct Non-Detects	1	
2663						Minimum Detect	1.5			Minimum Non-Detect	4.3	
2664						Maximum Detect	6.4			Maximum Non-Detect	4.3	
2665						Variance Detects	4.267			Percent Non-Detects	25%	
2666						Mean Detects	4.067			SD Detects	2.066	
2667						Median Detects	4.2			CV Detects	0.508	
2668						Skewness Detects	-0.122			Kurtosis Detects	-2.418	
2669						Mean of Logged Detects	1.271			SD of Logged Detects	0.593	
2670												
2671	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2672	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2673	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2674	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2675												
2676	**Normal GOF Test on Detects Only**											
2677						Shapiro Wilk Test Statistic	0.9			**Shapiro Wilk GOF Test**		
2678						5% Shapiro Wilk Critical Value	0.788			Detected Data appear Normal at 5% Significance Level		
2679						Lilliefors Test Statistic	0.225			**Lilliefors GOF Test**		
2680						5% Lilliefors Critical Value	0.325			Detected Data appear Normal at 5% Significance Level		
2681	**Detected Data appear Normal at 5% Significance Level**											
2682												
2683	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2684						KM Mean	3.617			KM Standard Error of Mean	0.731	
2685						KM SD	1.839			95% KM (BCA) UCL	4.825	
2686						95% KM (t) UCL	5.001			95% KM (Percentile Bootstrap) UCL	4.8	
2687						95% KM (z) UCL	4.819			95% KM Bootstrap t UCL	5.059	
2688						90% KM Chebyshev UCL	5.809			95% KM Chebyshev UCL	6.802	
2689						97.5% KM Chebyshev UCL	8.18			99% KM Chebyshev UCL	10.89	
2690												
2691	**Gamma GOF Tests on Detected Observations Only**											
2692						A-D Test Statistic	0.381			**Anderson-Darling GOF Test**		
2693						5% A-D Critical Value	0.7			Detected data appear Gamma Distributed at 5% Significance Level		
2694						K-S Test Statistic	0.263			**Kolmogorov-Smirnov GOF**		
2695						5% K-S Critical Value	0.334			Detected data appear Gamma Distributed at 5% Significance Level		
2696	**Detected data appear Gamma Distributed at 5% Significance Level**											
2697												
2698	**Gamma Statistics on Detected Data Only**											
2699						k hat (MLE)	3.944			k star (bias corrected MLE)	2.083	
2700						Theta hat (MLE)	1.031			Theta star (bias corrected MLE)	1.952	
2701						nu hat (MLE)	47.32			nu star (bias corrected)	25	
2702						Mean (detects)	4.067					
2703												
2704	**Gamma ROS Statistics using Imputed Non-Detects**											

	A	B	C	D	E	F	G	H	I	J	K	L
2705	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2706	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2707	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2708	This is especially true when the sample size is small.											
2709	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2710					Minimum	1.5				Mean	3.649	
2711					Maximum	6.4				Median	3.016	
2712					SD	1.931				CV	0.529	
2713					k hat (MLE)	4.021				k star (bias corrected MLE)	2.596	
2714					Theta hat (MLE)	0.907				Theta star (bias corrected MLE)	1.405	
2715					nu hat (MLE)	64.33				nu star (bias corrected)	41.54	
2716					Adjusted Level of Significance (β)	0.0195						
2717					Approximate Chi Square Value (41.54, α)	27.77				Adjusted Chi Square Value (41.54, β)	24.95	
2718					95% Gamma Approximate UCL (use when n>=50)	5.458				95% Gamma Adjusted UCL (use when n<50)	6.074	
2719												
2720	**Estimates of Gamma Parameters using KM Estimates**											
2721					Mean (KM)	3.617				SD (KM)	1.839	
2722					Variance (KM)	3.381				SE of Mean (KM)	0.731	
2723					k hat (KM)	3.868				k star (KM)	2.501	
2724					nu hat (KM)	61.89				nu star (KM)	40.02	
2725					theta hat (KM)	0.935				theta star (KM)	1.446	
2726					80% gamma percentile (KM)	5.272				90% gamma percentile (KM)	6.68	
2727					95% gamma percentile (KM)	8.007				99% gamma percentile (KM)	10.91	
2728												
2729	**Gamma Kaplan-Meier (KM) Statistics**											
2730					Approximate Chi Square Value (40.02, α)	26.52				Adjusted Chi Square Value (40.02, β)	23.78	
2731					95% Gamma Approximate KM-UCL (use when n>=50)	5.457				95% Gamma Adjusted KM-UCL (use when n<50)	6.086	
2732												
2733	**Lognormal GOF Test on Detected Observations Only**											
2734					Shapiro Wilk Test Statistic	0.9				**Shapiro Wilk GOF Test**		
2735					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
2736					Lilliefors Test Statistic	0.249				**Lilliefors GOF Test**		
2737					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
2738	**Detected Data appear Lognormal at 5% Significance Level**											
2739												
2740	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2741					Mean in Original Scale	3.617				Mean in Log Scale	1.153	
2742					SD in Original Scale	1.949				SD in Log Scale	0.557	
2743					95% t UCL (assumes normality of ROS data)	4.922				95% Percentile Bootstrap UCL	4.679	
2744					95% BCA Bootstrap UCL	4.739				95% Bootstrap t UCL	5.065	
2745					95% H-UCL (Log ROS)	6.195						
2746												
2747	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2748					KM Mean (logged)	1.147				KM Geo Mean	3.148	
2749					KM SD (logged)	0.536				95% Critical H Value (KM-Log)	2.417	
2750					KM Standard Error of Mean (logged)	0.22				95% H-UCL (KM -Log)	5.931	
2751					KM SD (logged)	0.536				95% Critical H Value (KM-Log)	2.417	
2752					KM Standard Error of Mean (logged)	0.22						
2753												
2754	**DL/2 Statistics**											
2755	**DL/2 Normal**						**DL/2 Log-Transformed**					
2756					Mean in Original Scale	3.588				Mean in Log Scale	1.144	

2757				SD in Original Scale		1.958				SD in Log Scale		0.553
2758				95% t UCL (Assumes normality)		4.899				95% H-Stat UCL		6.099
2759	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2760												
2761	**Nonparametric Distribution Free UCL Statistics**											
2762	**Detected Data appear Normal Distributed at 5% Significance Level**											
2763												
2764	**Suggested UCL to Use**											
2765				95% KM (t) UCL		5.001						
2766												
2767	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2768	Recommendations are based upon data size, data distribution, and skewness.											
2769	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2770	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2771												
2772												
2773	**Copper (smw18d)**											
2774												
2775	**General Statistics**											
2776				Total Number of Observations		8				Number of Distinct Observations		8
2777										Number of Missing Observations		0
2778				Minimum		10.7				Mean		16.65
2779				Maximum		21				Median		17.35
2780				SD		3.506				Std. Error of Mean		1.239
2781				Coefficient of Variation		0.211				Skewness		-0.704
2782												
2783	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2784	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2785	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2786	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2787												
2788	**Normal GOF Test**											
2789				Shapiro Wilk Test Statistic		0.943				**Shapiro Wilk GOF Test**		
2790				5% Shapiro Wilk Critical Value		0.818				Data appear Normal at 5% Significance Level		
2791				Lilliefors Test Statistic		0.154				**Lilliefors GOF Test**		
2792				5% Lilliefors Critical Value		0.283				Data appear Normal at 5% Significance Level		
2793	**Data appear Normal at 5% Significance Level**											
2794												
2795	**Assuming Normal Distribution**											
2796				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
2797				95% Student's-t UCL		19				95% Adjusted-CLT UCL (Chen-1995)		18.36
2798										95% Modified-t UCL (Johnson-1978)		18.95
2799												
2800	**Gamma GOF Test**											
2801				A-D Test Statistic		0.369				**Anderson-Darling Gamma GOF Test**		
2802				5% A-D Critical Value		0.716				Detected data appear Gamma Distributed at 5% Significance Level		
2803				K-S Test Statistic		0.181				**Kolmogorov-Smirnov Gamma GOF Test**		
2804				5% K-S Critical Value		0.294				Detected data appear Gamma Distributed at 5% Significance Level		
2805	**Detected data appear Gamma Distributed at 5% Significance Level**											
2806												
2807	**Gamma Statistics**											
2808				k hat (MLE)		23.06				k star (bias corrected MLE)		14.5

2809					Theta hat (MLE)	0.722					Theta star (bias corrected MLE)	1.149
2810					nu hat (MLE)	368.9					nu star (bias corrected)	231.9
2811					MLE Mean (bias corrected)	16.65					MLE Sd (bias corrected)	4.373
2812											Approximate Chi Square Value (0.05)	197.7
2813					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	189.7
2814												
2815					**Assuming Gamma Distribution**							
2816				95% Approximate Gamma UCL (use when n>=50))		19.54					95% Adjusted Gamma UCL (use when n<50)	20.36
2817												
2818					**Lognormal GOF Test**							
2819					Shapiro Wilk Test Statistic	0.906					**Shapiro Wilk Lognormal GOF Test**	
2820					5% Shapiro Wilk Critical Value	0.818					Data appear Lognormal at 5% Significance Level	
2821					Lilliefors Test Statistic	0.197					**Lilliefors Lognormal GOF Test**	
2822					5% Lilliefors Critical Value	0.283					Data appear Lognormal at 5% Significance Level	
2823					**Data appear Lognormal at 5% Significance Level**							
2824												
2825					**Lognormal Statistics**							
2826					Minimum of Logged Data	2.37					Mean of logged Data	2.791
2827					Maximum of Logged Data	3.045					SD of logged Data	0.23
2828												
2829					**Assuming Lognormal Distribution**							
2830					95% H-UCL	19.87					90% Chebyshev (MVUE) UCL	20.76
2831					95% Chebyshev (MVUE) UCL	22.61					97.5% Chebyshev (MVUE) UCL	25.18
2832					99% Chebyshev (MVUE) UCL	30.22						
2833												
2834					**Nonparametric Distribution Free UCL Statistics**							
2835					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
2836												
2837					**Nonparametric Distribution Free UCLs**							
2838					95% CLT UCL	18.69					95% Jackknife UCL	19
2839					95% Standard Bootstrap UCL	18.56					95% Bootstrap-t UCL	18.6
2840					95% Hall's Bootstrap UCL	18.28					95% Percentile Bootstrap UCL	18.49
2841					95% BCA Bootstrap UCL	18.33						
2842					90% Chebyshev(Mean, Sd) UCL	20.37					95% Chebyshev(Mean, Sd) UCL	22.05
2843					97.5% Chebyshev(Mean, Sd) UCL	24.39					99% Chebyshev(Mean, Sd) UCL	28.98
2844												
2845					**Suggested UCL to Use**							
2846					95% Student's-t UCL	19						
2847												
2848					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2849					Recommendations are based upon data size, data distribution, and skewness.							
2850					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2851					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2852												
2853					**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**							
2854					**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**							
2855												
2856	**Copper (smw19)**											
2857												
2858					**General Statistics**							
2859					Total Number of Observations	8					Number of Distinct Observations	7
2860					Number of Detects	3					Number of Non-Detects	5

2861				Number of Distinct Detects		3				Number of Distinct Non-Detects		4
2862				Minimum Detect		0.48				Minimum Non-Detect		0.98
2863				Maximum Detect		5				Maximum Non-Detect		4.3
2864				Variance Detects		5.706				Percent Non-Detects		62.5%
2865				Mean Detects		2.293				SD Detects		2.389
2866				Median Detects		1.4				CV Detects		1.042
2867				Skewness Detects		1.448				Kurtosis Detects		N/A
2868				Mean of Logged Detects		0.404				SD of Logged Detects		1.173
2869												
2870						**Warning: Data set has only 3 Detected Values.**							
2871						**This is not enough to compute meaningful or reliable statistics and estimates.**						
2872												
2873												
2874						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
2875						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
2876						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
2877						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
2878												
2879						**Normal GOF Test on Detects Only**						
2880				Shapiro Wilk Test Statistic		0.895				**Shapiro Wilk GOF Test**		
2881				5% Shapiro Wilk Critical Value		0.767				Detected Data appear Normal at 5% Significance Level		
2882				Lilliefors Test Statistic		0.312				**Lilliefors GOF Test**		
2883				5% Lilliefors Critical Value		0.425				Detected Data appear Normal at 5% Significance Level		
2884						**Detected Data appear Normal at 5% Significance Level**						
2885												
2886						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
2887				KM Mean		1.246				KM Standard Error of Mean		0.65
2888				KM SD		1.467				95% KM (BCA) UCL		N/A
2889				95% KM (t) UCL		2.478				95% KM (Percentile Bootstrap) UCL		N/A
2890				95% KM (z) UCL		2.316				95% KM Bootstrap t UCL		N/A
2891				90% KM Chebyshev UCL		3.197				95% KM Chebyshev UCL		4.081
2892				97.5% KM Chebyshev UCL		5.308				99% KM Chebyshev UCL		7.717
2893												
2894						**Gamma GOF Tests on Detected Observations Only**						
2895						**Not Enough Data to Perform GOF Test**						
2896												
2897						**Gamma Statistics on Detected Data Only**						
2898				k hat (MLE)		1.315				k star (bias corrected MLE)		N/A
2899				Theta hat (MLE)		1.744				Theta star (bias corrected MLE)		N/A
2900				nu hat (MLE)		7.892				nu star (bias corrected)		N/A
2901				Mean (detects)		2.293						
2902												
2903						**Gamma ROS Statistics using Imputed Non-Detects**						
2904						GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs						
2905						GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)						
2906						For such situations, GROS method may yield incorrect values of UCLs and BTVs						
2907						This is especially true when the sample size is small.						
2908						For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates						
2909				Minimum		0.01				Mean		1.064
2910				Maximum		5				Median		0.461
2911				SD		1.667				CV		1.567
2912				k hat (MLE)		0.497				k star (bias corrected MLE)		0.394

	A	B	C	D	E	F	G	H	I	J	K	L
2913					Theta hat (MLE)	2.142				Theta star (bias corrected MLE)		2.702
2914					nu hat (MLE)	7.947				nu star (bias corrected)		6.3
2915					Adjusted Level of Significance (β)	0.0195						
2916					Approximate Chi Square Value (6.30, α)	1.795				Adjusted Chi Square Value (6.30, β)		1.254
2917					95% Gamma Approximate UCL (use when n>=50)	3.734				95% Gamma Adjusted UCL (use when n<50)		N/A
2918												
2919					**Estimates of Gamma Parameters using KM Estimates**							
2920					Mean (KM)	1.246				SD (KM)		1.467
2921					Variance (KM)	2.152				SE of Mean (KM)		0.65
2922					k hat (KM)	0.722				k star (KM)		0.534
2923					nu hat (KM)	11.55				nu star (KM)		8.551
2924					theta hat (KM)	1.727				theta star (KM)		2.332
2925					80% gamma percentile (KM)	2.052				90% gamma percentile (KM)		3.325
2926					95% gamma percentile (KM)	4.675				99% gamma percentile (KM)		7.974
2927												
2928					**Gamma Kaplan-Meier (KM) Statistics**							
2929					Approximate Chi Square Value (8.55, α)	3.058				Adjusted Chi Square Value (8.55, β)		2.29
2930					95% Gamma Approximate KM-UCL (use when n>=50)	3.485				95% Gamma Adjusted KM-UCL (use when n<50)		4.654
2931												
2932					**Lognormal GOF Test on Detected Observations Only**							
2933					Shapiro Wilk Test Statistic	0.997				**Shapiro Wilk GOF Test**		
2934					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
2935					Lilliefors Test Statistic	0.19				**Lilliefors GOF Test**		
2936					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
2937					**Detected Data appear Lognormal at 5% Significance Level**							
2938												
2939					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2940					Mean in Original Scale	1.214				Mean in Log Scale		-0.238
2941					SD in Original Scale	1.568				SD in Log Scale		0.866
2942					95% t UCL (assumes normality of ROS data)	2.265				95% Percentile Bootstrap UCL		2.228
2943					95% BCA Bootstrap UCL	2.789				95% Bootstrap t UCL		6.983
2944					95% H-UCL (Log ROS)	3.167						
2945												
2946					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2947					KM Mean (logged)	-0.207				KM Geo Mean		0.813
2948					KM SD (logged)	0.812				95% Critical H Value (KM-Log)		2.979
2949					KM Standard Error of Mean (logged)	0.387				95% H-UCL (KM -Log)		2.821
2950					KM SD (logged)	0.812				95% Critical H Value (KM-Log)		2.979
2951					KM Standard Error of Mean (logged)	0.387						
2952												
2953					**DL/2 Statistics**							
2954					**DL/2 Normal**					**DL/2 Log-Transformed**		
2955					Mean in Original Scale	1.521				Mean in Log Scale		0.0955
2956					SD in Original Scale	1.514				SD in Log Scale		0.813
2957					95% t UCL (Assumes normality)	2.535				95% H-Stat UCL		3.827
2958					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2959												
2960					**Nonparametric Distribution Free UCL Statistics**							
2961					**Detected Data appear Normal Distributed at 5% Significance Level**							
2962												
2963					**Suggested UCL to Use**							
2964					95% KM (t) UCL	2.478						

	A	B	C	D	E	F	G	H	I	J	K	L
2965												
2966	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2967	Recommendations are based upon data size, data distribution, and skewness.											
2968	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2969	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2970												
2971	**Copper (smw7)**											
2972												
2973	**General Statistics**											
2974	Total Number of Observations					8	Number of Distinct Observations					8
2975	Number of Detects					7	Number of Non-Detects					1
2976	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
2977	Minimum Detect					3.4	Minimum Non-Detect					4.3
2978	Maximum Detect					6.7	Maximum Non-Detect					4.3
2979	Variance Detects					1.279	Percent Non-Detects					12.5%
2980	Mean Detects					4.629	SD Detects					1.131
2981	Median Detects					4.6	CV Detects					0.244
2982	Skewness Detects					0.993	Kurtosis Detects					0.852
2983	Mean of Logged Detects					1.508	SD of Logged Detects					0.233
2984												
2985	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2986	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2987	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2988	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2989												
2990	**Normal GOF Test on Detects Only**											
2991	Shapiro Wilk Test Statistic					0.928	**Shapiro Wilk GOF Test**					
2992	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Normal at 5% Significance Level					
2993	Lilliefors Test Statistic					0.169	**Lilliefors GOF Test**					
2994	5% Lilliefors Critical Value					0.304	Detected Data appear Normal at 5% Significance Level					
2995	**Detected Data appear Normal at 5% Significance Level**											
2996												
2997	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2998	KM Mean					4.508	KM Standard Error of Mean					0.396
2999	KM SD					1.032	95% KM (BCA) UCL					5.175
3000	95% KM (t) UCL					5.258	95% KM (Percentile Bootstrap) UCL					5.175
3001	95% KM (z) UCL					5.159	95% KM Bootstrap t UCL					5.612
3002	90% KM Chebyshev UCL					5.695	95% KM Chebyshev UCL					6.232
3003	97.5% KM Chebyshev UCL					6.978	99% KM Chebyshev UCL					8.444
3004												
3005	**Gamma GOF Tests on Detected Observations Only**											
3006	A-D Test Statistic					0.238	**Anderson-Darling GOF Test**					
3007	5% A-D Critical Value					0.707	Detected data appear Gamma Distributed at 5% Significance Level					
3008	K-S Test Statistic					0.183	**Kolmogorov-Smirnov GOF**					
3009	5% K-S Critical Value					0.311	Detected data appear Gamma Distributed at 5% Significance Level					
3010	**Detected data appear Gamma Distributed at 5% Significance Level**											
3011												
3012	**Gamma Statistics on Detected Data Only**											
3013	k hat (MLE)					20.98	k star (bias corrected MLE)					12.08
3014	Theta hat (MLE)					0.221	Theta star (bias corrected MLE)					0.383
3015	nu hat (MLE)					293.7	nu star (bias corrected)					169.2
3016	Mean (detects)					4.629						

	A	B	C	D	E	F	G	H	I	J	K	L
3017												
3018	**Gamma ROS Statistics using Imputed Non-Detects**											
3019	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3020	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3021	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3022	This is especially true when the sample size is small.											
3023	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3024					Minimum	3.4				Mean	4.504	
3025					Maximum	6.7				Median	4.25	
3026					SD	1.104				CV	0.245	
3027					k hat (MLE)	20.97				k star (bias corrected MLE)	13.19	
3028					Theta hat (MLE)	0.215				Theta star (bias corrected MLE)	0.341	
3029					nu hat (MLE)	335.6				nu star (bias corrected)	211.1	
3030					Adjusted Level of Significance (β)	0.0195						
3031					Approximate Chi Square Value (211.07, α)	178.5				Adjusted Chi Square Value (211.07, β)	170.8	
3032					95% Gamma Approximate UCL (use when n>=50)	5.328				95% Gamma Adjusted UCL (use when n<50)	5.565	
3033												
3034	**Estimates of Gamma Parameters using KM Estimates**											
3035					Mean (KM)	4.508				SD (KM)	1.032	
3036					Variance (KM)	1.066				SE of Mean (KM)	0.396	
3037					k hat (KM)	19.07				k star (KM)	12	
3038					nu hat (KM)	305.1				nu star (KM)	192	
3039					theta hat (KM)	0.236				theta star (KM)	0.376	
3040					80% gamma percentile (KM)	5.551				90% gamma percentile (KM)	6.236	
3041					95% gamma percentile (KM)	6.84				99% gamma percentile (KM)	8.073	
3042												
3043	**Gamma Kaplan-Meier (KM) Statistics**											
3044					Approximate Chi Square Value (192.04, α)	161				Adjusted Chi Square Value (192.04, β)	153.8	
3045					95% Gamma Approximate KM-UCL (use when n>=50)	5.378				95% Gamma Adjusted KM-UCL (use when n<50)	5.63	
3046												
3047	**Lognormal GOF Test on Detected Observations Only**											
3048					Shapiro Wilk Test Statistic	0.962				**Shapiro Wilk GOF Test**		
3049					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
3050					Lilliefors Test Statistic	0.164				**Lilliefors GOF Test**		
3051					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
3052	**Detected Data appear Lognormal at 5% Significance Level**											
3053												
3054	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3055					Mean in Original Scale	4.509				Mean in Log Scale	1.482	
3056					SD in Original Scale	1.1				SD in Log Scale	0.228	
3057					95% t UCL (assumes normality of ROS data)	5.246				95% Percentile Bootstrap UCL	5.147	
3058					95% BCA Bootstrap UCL	5.263				95% Bootstrap t UCL	5.641	
3059					95% H-UCL (Log ROS)	5.358						
3060												
3061	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3062					KM Mean (logged)	1.482				KM Geo Mean	4.401	
3063					KM SD (logged)	0.215				95% Critical H Value (KM-Log)	1.959	
3064					KM Standard Error of Mean (logged)	0.0825				95% H-UCL (KM -Log)	5.28	
3065					KM SD (logged)	0.215				95% Critical H Value (KM-Log)	1.959	
3066					KM Standard Error of Mean (logged)	0.0825						
3067												
3068	**DL/2 Statistics**											

3069	**DL/2 Normal**						**DL/2 Log-Transformed**					
3070					Mean in Original Scale	4.319				Mean in Log Scale	1.415	
3071					SD in Original Scale	1.365				SD in Log Scale	0.34	
3072					95% t UCL (Assumes normality)	5.233				95% H-Stat UCL	5.723	
3073	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3074												
3075	**Nonparametric Distribution Free UCL Statistics**											
3076	**Detected Data appear Normal Distributed at 5% Significance Level**											
3077												
3078	**Suggested UCL to Use**											
3079					95% KM (t) UCL	5.258						
3080												
3081	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3082	Recommendations are based upon data size, data distribution, and skewness.											
3083	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3084	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3085												
3086	**Copper (smw8)**											
3087												
3088	**General Statistics**											
3089					Total Number of Observations	8				Number of Distinct Observations	8	
3090					Number of Detects	6				Number of Non-Detects	2	
3091					Number of Distinct Detects	6				Number of Distinct Non-Detects	2	
3092					Minimum Detect	0.43				Minimum Non-Detect	0.67	
3093					Maximum Detect	18.3				Maximum Non-Detect	1	
3094					Variance Detects	52.37				Percent Non-Detects	25%	
3095					Mean Detects	3.532				SD Detects	7.237	
3096					Median Detects	0.565				CV Detects	2.049	
3097					Skewness Detects	2.447				Kurtosis Detects	5.991	
3098					Mean of Logged Detects	0.00252				SD of Logged Detects	1.443	
3099												
3100	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3101	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3102	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3103	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3104												
3105	**Normal GOF Test on Detects Only**											
3106					Shapiro Wilk Test Statistic	0.514	**Shapiro Wilk GOF Test**					
3107					5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level					
3108					Lilliefors Test Statistic	0.477	**Lilliefors GOF Test**					
3109					5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level					
3110	**Detected Data Not Normal at 5% Significance Level**											
3111												
3112	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3113					KM Mean	2.783				KM Standard Error of Mean	2.272	
3114					KM SD	5.866				95% KM (BCA) UCL	7.225	
3115					95% KM (t) UCL	7.088				95% KM (Percentile Bootstrap) UCL	7.188	
3116					95% KM (z) UCL	6.52				95% KM Bootstrap t UCL	204.8	
3117					90% KM Chebyshev UCL	9.599				95% KM Chebyshev UCL	12.69	
3118					97.5% KM Chebyshev UCL	16.97				99% KM Chebyshev UCL	25.39	
3119												
3120	**Gamma GOF Tests on Detected Observations Only**											

3121					A-D Test Statistic	1.389	**Anderson-Darling GOF Test**					
3122					5% A-D Critical Value	0.736	Detected Data Not Gamma Distributed at 5% Significance Level					
3123					K-S Test Statistic	0.457	**Kolmogorov-Smirnov GOF**					
3124					5% K-S Critical Value	0.349	Detected Data Not Gamma Distributed at 5% Significance Level					
3125	**Detected Data Not Gamma Distributed at 5% Significance Level**											
3126												
3127	**Gamma Statistics on Detected Data Only**											
3128					k hat (MLE)	0.504	k star (bias corrected MLE)	0.363				
3129					Theta hat (MLE)	7.01	Theta star (bias corrected MLE)	9.729				
3130					nu hat (MLE)	6.046	nu star (bias corrected)	4.356				
3131					Mean (detects)	3.532						
3132												
3133	**Gamma ROS Statistics using Imputed Non-Detects**											
3134	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3135	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3136	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3137	This is especially true when the sample size is small.											
3138	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3139					Minimum	0.01	Mean	2.651				
3140					Maximum	18.3	Median	0.515				
3141					SD	6.33	CV	2.387				
3142					k hat (MLE)	0.321	k star (bias corrected MLE)	0.284				
3143					Theta hat (MLE)	8.259	Theta star (bias corrected MLE)	9.336				
3144					nu hat (MLE)	5.136	nu star (bias corrected)	4.544				
3145					Adjusted Level of Significance (β)	0.0195						
3146					Approximate Chi Square Value (4.54, α)	0.947	Adjusted Chi Square Value (4.54, β)	0.603				
3147					95% Gamma Approximate UCL (use when n>=50)	12.71	95% Gamma Adjusted UCL (use when n<50)	19.97				
3148												
3149	**Estimates of Gamma Parameters using KM Estimates**											
3150					Mean (KM)	2.783	SD (KM)	5.866				
3151					Variance (KM)	34.41	SE of Mean (KM)	2.272				
3152					k hat (KM)	0.225	k star (KM)	0.224				
3153					nu hat (KM)	3.601	nu star (KM)	3.584				
3154					theta hat (KM)	12.37	theta star (KM)	12.42				
3155					80% gamma percentile (KM)	3.871	90% gamma percentile (KM)	8.403				
3156					95% gamma percentile (KM)	13.91	99% gamma percentile (KM)	28.79				
3157												
3158	**Gamma Kaplan-Meier (KM) Statistics**											
3159					Approximate Chi Square Value (3.58, α)	0.565	Adjusted Chi Square Value (3.58, β)	0.335				
3160					95% Gamma Approximate KM-UCL (use when n>=50)	17.67	95% Gamma Adjusted KM-UCL (use when n<50)	29.75				
3161												
3162	**Lognormal GOF Test on Detected Observations Only**											
3163					Shapiro Wilk Test Statistic	0.641	**Shapiro Wilk GOF Test**					
3164					5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level					
3165					Lilliefors Test Statistic	0.376	**Lilliefors GOF Test**					
3166					5% Lilliefors Critical Value	0.325	Detected Data Not Lognormal at 5% Significance Level					
3167	**Detected Data Not Lognormal at 5% Significance Level**											
3168												
3169	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3170					Mean in Original Scale	2.803	Mean in Log Scale	-0.121				
3171					SD in Original Scale	6.263	SD in Log Scale	1.242				
3172					95% t UCL (assumes normality of ROS data)	6.998	95% Percentile Bootstrap UCL	7.224				

3173				95% BCA Bootstrap UCL		9.467				95% Bootstrap t UCL		182
3174				95% H-UCL (Log ROS)		12.82						
3175												
3176	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3177				KM Mean (logged)		-0.158				KM Geo Mean		0.854
3178				KM SD (logged)		1.178				95% Critical H Value (KM-Log)		3.877
3179				KM Standard Error of Mean (logged)		0.458				95% H-UCL (KM -Log)		9.595
3180				KM SD (logged)		1.178				95% Critical H Value (KM-Log)		3.877
3181				KM Standard Error of Mean (logged)		0.458						
3182												
3183	**DL/2 Statistics**											
3184	**DL/2 Normal**						**DL/2 Log-Transformed**					
3185				Mean in Original Scale		2.753				Mean in Log Scale		-0.221
3186				SD in Original Scale		6.284				SD in Log Scale		1.292
3187				95% t UCL (Assumes normality)		6.962				95% H-Stat UCL		14.23
3188	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3189												
3190	**Nonparametric Distribution Free UCL Statistics**											
3191	**Data do not follow a Discernible Distribution at 5% Significance Level**											
3192												
3193	**Suggested UCL to Use**											
3194				95% KM (Chebyshev) UCL		12.69						
3195												
3196	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3197	Recommendations are based upon data size, data distribution, and skewness.											
3198	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3199	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3200												
3201												
3202	**Copper (smw9)**											
3203												
3204	**General Statistics**											
3205				Total Number of Observations		9				Number of Distinct Observations		9
3206										Number of Missing Observations		0
3207				Minimum		4.5				Mean		7.078
3208				Maximum		15.8				Median		5.9
3209				SD		3.443				Std. Error of Mean		1.148
3210				Coefficient of Variation		0.487				Skewness		2.462
3211												
3212	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3213	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3214	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3215	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3216												
3217	**Normal GOF Test**											
3218				Shapiro Wilk Test Statistic		0.687	**Shapiro Wilk GOF Test**					
3219				5% Shapiro Wilk Critical Value		0.829	Data Not Normal at 5% Significance Level					
3220				Lilliefors Test Statistic		0.317	**Lilliefors GOF Test**					
3221				5% Lilliefors Critical Value		0.274	Data Not Normal at 5% Significance Level					
3222	**Data Not Normal at 5% Significance Level**											
3223												
3224	**Assuming Normal Distribution**											

3225	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
3226				95% Student's-t UCL		9.212				95% Adjusted-CLT UCL (Chen-1995)		9.972
3227										95% Modified-t UCL (Johnson-1978)		9.369
3228												
3229	**Gamma GOF Test**											
3230				A-D Test Statistic		0.786	**Anderson-Darling Gamma GOF Test**					
3231				5% A-D Critical Value		0.722	Data Not Gamma Distributed at 5% Significance Level					
3232				K-S Test Statistic		0.252	**Kolmogorov-Smirnov Gamma GOF Test**					
3233				5% K-S Critical Value		0.28	Detected data appear Gamma Distributed at 5% Significance Level					
3234	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
3235												
3236	**Gamma Statistics**											
3237				k hat (MLE)		6.939				k star (bias corrected MLE)		4.7
3238				Theta hat (MLE)		1.02				Theta star (bias corrected MLE)		1.506
3239				nu hat (MLE)		124.9				nu star (bias corrected)		84.6
3240				MLE Mean (bias corrected)		7.078				MLE Sd (bias corrected)		3.265
3241										Approximate Chi Square Value (0.05)		64.4
3242				Adjusted Level of Significance		0.0231				Adjusted Chi Square Value		60.7
3243												
3244	**Assuming Gamma Distribution**											
3245				95% Approximate Gamma UCL (use when n>=50)		9.298				95% Adjusted Gamma UCL (use when n<50)		9.865
3246												
3247	**Lognormal GOF Test**											
3248				Shapiro Wilk Test Statistic		0.836	**Shapiro Wilk Lognormal GOF Test**					
3249				5% Shapiro Wilk Critical Value		0.829	Data appear Lognormal at 5% Significance Level					
3250				Lilliefors Test Statistic		0.225	**Lilliefors Lognormal GOF Test**					
3251				5% Lilliefors Critical Value		0.274	Data appear Lognormal at 5% Significance Level					
3252	**Data appear Lognormal at 5% Significance Level**											
3253												
3254	**Lognormal Statistics**											
3255				Minimum of Logged Data		1.504				Mean of logged Data		1.883
3256				Maximum of Logged Data		2.76				SD of logged Data		0.375
3257												
3258	**Assuming Lognormal Distribution**											
3259				95% H-UCL		9.314				90% Chebyshev (MVUE) UCL		9.637
3260				95% Chebyshev (MVUE) UCL		10.83				97.5% Chebyshev (MVUE) UCL		12.5
3261				99% Chebyshev (MVUE) UCL		15.76						
3262												
3263	**Nonparametric Distribution Free UCL Statistics**											
3264	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
3265												
3266	**Nonparametric Distribution Free UCLs**											
3267				95% CLT UCL		8.966				95% Jackknife UCL		9.212
3268				95% Standard Bootstrap UCL		8.85				95% Bootstrap-t UCL		12.57
3269				95% Hall's Bootstrap UCL		16.25				95% Percentile Bootstrap UCL		9.156
3270				95% BCA Bootstrap UCL		9.822						
3271				90% Chebyshev(Mean, Sd) UCL		10.52				95% Chebyshev(Mean, Sd) UCL		12.08
3272				97.5% Chebyshev(Mean, Sd) UCL		14.25				99% Chebyshev(Mean, Sd) UCL		18.5
3273												
3274	**Suggested UCL to Use**											
3275				95% Adjusted Gamma UCL		9.865						
3276												

3277	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
3278	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
3279												
3280	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3281	Recommendations are based upon data size, data distribution, and skewness.											
3282	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3283	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3284												
3285	**Copper (tw2r)**											
3286												
3287	**General Statistics**											
3288						Total Number of Observations	9			Number of Distinct Observations	9	
3289						Number of Detects	3			Number of Non-Detects	6	
3290						Number of Distinct Detects	3			Number of Distinct Non-Detects	6	
3291						Minimum Detect	0.59			Minimum Non-Detect	0.22	
3292						Maximum Detect	4.6			Maximum Non-Detect	2.1	
3293						Variance Detects	4.496			Percent Non-Detects	66.67%	
3294						Mean Detects	2.197			SD Detects	2.12	
3295						Median Detects	1.4			CV Detects	0.965	
3296						Skewness Detects	1.452			Kurtosis Detects	N/A	
3297						Mean of Logged Detects	0.445			SD of Logged Detects	1.031	
3298												
3299	**Warning: Data set has only 3 Detected Values.**											
3300	**This is not enough to compute meaningful or reliable statistics and estimates.**											
3301												
3302												
3303	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3304	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3305	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3306	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3307												
3308	**Normal GOF Test on Detects Only**											
3309						Shapiro Wilk Test Statistic	0.894			**Shapiro Wilk GOF Test**		
3310						5% Shapiro Wilk Critical Value	0.767			Detected Data appear Normal at 5% Significance Level		
3311						Lilliefors Test Statistic	0.313			**Lilliefors GOF Test**		
3312						5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level		
3313	**Detected Data appear Normal at 5% Significance Level**											
3314												
3315	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3316						KM Mean	0.95			KM Standard Error of Mean	0.556	
3317						KM SD	1.345			95% KM (BCA) UCL	N/A	
3318						95% KM (t) UCL	1.985			95% KM (Percentile Bootstrap) UCL	N/A	
3319						95% KM (z) UCL	1.865			95% KM Bootstrap t UCL	N/A	
3320						90% KM Chebyshev UCL	2.619			95% KM Chebyshev UCL	3.375	
3321						97.5% KM Chebyshev UCL	4.425			99% KM Chebyshev UCL	6.485	
3322												
3323	**Gamma GOF Tests on Detected Observations Only**											
3324	**Not Enough Data to Perform GOF Test**											
3325												
3326	**Gamma Statistics on Detected Data Only**											
3327						k hat (MLE)	1.609			k star (bias corrected MLE)	N/A	
3328						Theta hat (MLE)	1.366			Theta star (bias corrected MLE)	N/A	

	A	B	C	D	E	F	G	H	I	J	K	L
3329					nu hat (MLE)	9.651				nu star (bias corrected)		N/A
3330					Mean (detects)	2.197						
3331												
3332					**Gamma ROS Statistics using Imputed Non-Detects**							
3333					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
3334					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
3335					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
3336					This is especially true when the sample size is small.							
3337					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
3338					Minimum	0.01				Mean		0.739
3339					Maximum	4.6				Median		0.01
3340					SD	1.523				CV		2.061
3341					k hat (MLE)	0.268				k star (bias corrected MLE)		0.253
3342					Theta hat (MLE)	2.756				Theta star (bias corrected MLE)		2.922
3343					nu hat (MLE)	4.826				nu star (bias corrected)		4.551
3344					Adjusted Level of Significance (β)	0.0231						
3345					Approximate Chi Square Value (4.55, α)	0.951				Adjusted Chi Square Value (4.55, β)		0.655
3346					95% Gamma Approximate UCL (use when n>=50)	3.537				95% Gamma Adjusted UCL (use when n<50)		N/A
3347												
3348					**Estimates of Gamma Parameters using KM Estimates**							
3349					Mean (KM)	0.95				SD (KM)		1.345
3350					Variance (KM)	1.81				SE of Mean (KM)		0.556
3351					k hat (KM)	0.499				k star (KM)		0.407
3352					nu hat (KM)	8.986				nu star (KM)		7.324
3353					theta hat (KM)	1.904				theta star (KM)		2.336
3354					80% gamma percentile (KM)	1.537				90% gamma percentile (KM)		2.677
3355					95% gamma percentile (KM)	3.926				99% gamma percentile (KM)		7.062
3356												
3357					**Gamma Kaplan-Meier (KM) Statistics**							
3358					Approximate Chi Square Value (7.32, α)	2.35				Adjusted Chi Square Value (7.32, β)		1.801
3359					95% Gamma Approximate KM-UCL (use when n>=50)	2.962				95% Gamma Adjusted KM-UCL (use when n<50)		3.865
3360												
3361					**Lognormal GOF Test on Detected Observations Only**							
3362					Shapiro Wilk Test Statistic	0.992				**Shapiro Wilk GOF Test**		
3363					5% Shapiro Wilk Critical Value	0.767				Detected Data appear Lognormal at 5% Significance Level		
3364					Lilliefors Test Statistic	0.209				**Lilliefors GOF Test**		
3365					5% Lilliefors Critical Value	0.425				Detected Data appear Lognormal at 5% Significance Level		
3366					**Detected Data appear Lognormal at 5% Significance Level**							
3367												
3368					**Lognormal ROS Statistics Using Imputed Non-Detects**							
3369					Mean in Original Scale	0.85				Mean in Log Scale		-1.042
3370					SD in Original Scale	1.465				SD in Log Scale		1.261
3371					95% t UCL (assumes normality of ROS data)	1.758				95% Percentile Bootstrap UCL		1.71
3372					95% BCA Bootstrap UCL	2.166				95% Bootstrap t UCL		6.988
3373					95% H-UCL (Log ROS)	4.334						
3374												
3375					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
3376					KM Mean (logged)	-0.691				KM Geo Mean		0.501
3377					KM SD (logged)	1.015				95% Critical H Value (KM-Log)		3.273
3378					KM Standard Error of Mean (logged)	0.462				95% H-UCL (KM -Log)		2.718
3379					KM SD (logged)	1.015				95% Critical H Value (KM-Log)		3.273
3380					KM Standard Error of Mean (logged)	0.462						

3381												
3382	**DL/2 Statistics**											
3383	**DL/2 Normal**						**DL/2 Log-Transformed**					
3384					Mean in Original Scale	1.037				Mean in Log Scale	-0.532	
3385					SD in Original Scale	1.396				SD in Log Scale	1.092	
3386					95% t UCL (Assumes normality)	1.903				95% H-Stat UCL	4.036	
3387	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3388												
3389	**Nonparametric Distribution Free UCL Statistics**											
3390	**Detected Data appear Normal Distributed at 5% Significance Level**											
3391												
3392	**Suggested UCL to Use**											
3393					95% KM (t) UCL	1.985						
3394												
3395	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3396	Recommendations are based upon data size, data distribution, and skewness.											
3397	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3398	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3399												
3400	**Copper (tw5r)**											
3401												
3402	**General Statistics**											
3403					Total Number of Observations	8				Number of Distinct Observations	8	
3404					Number of Detects	7				Number of Non-Detects	1	
3405					Number of Distinct Detects	7				Number of Distinct Non-Detects	1	
3406					Minimum Detect	0.79				Minimum Non-Detect	4.3	
3407					Maximum Detect	6				Maximum Non-Detect	4.3	
3408					Variance Detects	3.146				Percent Non-Detects	12.5%	
3409					Mean Detects	2.113				SD Detects	1.774	
3410					Median Detects	1.5				CV Detects	0.839	
3411					Skewness Detects	2.297				Kurtosis Detects	5.565	
3412					Mean of Logged Detects	0.54				SD of Logged Detects	0.639	
3413												
3414	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3415	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3416	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3417	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3418												
3419	**Normal GOF Test on Detects Only**											
3420					Shapiro Wilk Test Statistic	0.69	**Shapiro Wilk GOF Test**					
3421					5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level					
3422					Lilliefors Test Statistic	0.328	**Lilliefors GOF Test**					
3423					5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level					
3424	**Detected Data Not Normal at 5% Significance Level**											
3425												
3426	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3427					KM Mean	2.032				KM Standard Error of Mean	0.599	
3428					KM SD	1.559				95% KM (BCA) UCL	2.97	
3429					95% KM (t) UCL	3.167				95% KM (Percentile Bootstrap) UCL	3.081	
3430					95% KM (z) UCL	3.017				95% KM Bootstrap t UCL	6.202	
3431					90% KM Chebyshev UCL	3.829				95% KM Chebyshev UCL	4.643	
3432					97.5% KM Chebyshev UCL	5.774				99% KM Chebyshev UCL	7.993	

	A	B	C	D	E	F	G	H	I	J	K	L
3433												
3434	**Gamma GOF Tests on Detected Observations Only**											
3435					A-D Test Statistic	0.65	**Anderson-Darling GOF Test**					
3436					5% A-D Critical Value	0.713	Detected data appear Gamma Distributed at 5% Significance Level					
3437					K-S Test Statistic	0.298	**Kolmogorov-Smirnov GOF**					
3438					5% K-S Critical Value	0.314	Detected data appear Gamma Distributed at 5% Significance Level					
3439	**Detected data appear Gamma Distributed at 5% Significance Level**											
3440												
3441	**Gamma Statistics on Detected Data Only**											
3442					k hat (MLE)	2.563	k star (bias corrected MLE)	1.56				
3443					Theta hat (MLE)	0.824	Theta star (bias corrected MLE)	1.355				
3444					nu hat (MLE)	35.88	nu star (bias corrected)	21.84				
3445					Mean (detects)	2.113						
3446												
3447	**Gamma ROS Statistics using Imputed Non-Detects**											
3448	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3449	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3450	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3451	This is especially true when the sample size is small.											
3452	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3453					Minimum	0.79	Mean	2.037				
3454					Maximum	6	Median	1.505				
3455					SD	1.656	CV	0.813				
3456					k hat (MLE)	2.825	k star (bias corrected MLE)	1.849				
3457					Theta hat (MLE)	0.721	Theta star (bias corrected MLE)	1.102				
3458					nu hat (MLE)	45.2	nu star (bias corrected)	29.58				
3459					Adjusted Level of Significance (β)	0.0195						
3460					Approximate Chi Square Value (29.58, α)	18.16	Adjusted Chi Square Value (29.58, β)	15.94				
3461					95% Gamma Approximate UCL (use when n>=50)	3.318	95% Gamma Adjusted UCL (use when n<50)	3.78				
3462												
3463	**Estimates of Gamma Parameters using KM Estimates**											
3464					Mean (KM)	2.032	SD (KM)	1.559				
3465					Variance (KM)	2.431	SE of Mean (KM)	0.599				
3466					k hat (KM)	1.698	k star (KM)	1.145				
3467					nu hat (KM)	27.17	nu star (KM)	18.31				
3468					theta hat (KM)	1.197	theta star (KM)	1.775				
3469					80% gamma percentile (KM)	3.232	90% gamma percentile (KM)	4.525				
3470					95% gamma percentile (KM)	5.805	99% gamma percentile (KM)	8.749				
3471												
3472	**Gamma Kaplan-Meier (KM) Statistics**											
3473					Approximate Chi Square Value (18.31, α)	9.618	Adjusted Chi Square Value (18.31, β)	8.075				
3474					95% Gamma Approximate KM-UCL (use when n>=50)	3.869	95% Gamma Adjusted KM-UCL (use when n<50)	4.608				
3475												
3476	**Lognormal GOF Test on Detected Observations Only**											
3477					Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk GOF Test**					
3478					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
3479					Lilliefors Test Statistic	0.258	**Lilliefors GOF Test**					
3480					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
3481	**Detected Data appear Lognormal at 5% Significance Level**											
3482												
3483	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3484					Mean in Original Scale	2.034	Mean in Log Scale	0.522				

3485					SD in Original Scale	1.657					SD in Log Scale	0.593
3486				95% t UCL (assumes normality of ROS data)		3.144					95% Percentile Bootstrap UCL	3.074
3487					95% BCA Bootstrap UCL	3.686					95% Bootstrap t UCL	6.345
3488					95% H-UCL (Log ROS)	3.539						
3489												
3490	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3491					KM Mean (logged)	0.514					KM Geo Mean	1.673
3492					KM SD (logged)	0.569					95% Critical H Value (KM-Log)	2.476
3493				KM Standard Error of Mean (logged)		0.222					95% H-UCL (KM -Log)	3.348
3494					KM SD (logged)	0.569					95% Critical H Value (KM-Log)	2.476
3495				KM Standard Error of Mean (logged)		0.222						
3496												
3497	**DL/2 Statistics**											
3498	**DL/2 Normal**						**DL/2 Log-Transformed**					
3499					Mean in Original Scale	2.118					Mean in Log Scale	0.569
3500					SD in Original Scale	1.642					SD in Log Scale	0.597
3501				95% t UCL (Assumes normality)		3.217					95% H-Stat UCL	3.73
3502	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3503												
3504	**Nonparametric Distribution Free UCL Statistics**											
3505	**Detected Data appear Gamma Distributed at 5% Significance Level**											
3506												
3507	**Suggested UCL to Use**											
3508				95% KM Adjusted Gamma UCL		4.608					95% GROS Adjusted Gamma UCL	3.78
3509												
3510	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3511	Recommendations are based upon data size, data distribution, and skewness.											
3512	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3513	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3514												
3515												
3516	**Copper (waste water clarifier well)**											
3517												
3518	**General Statistics**											
3519					Total Number of Observations	1					Number of Distinct Observations	1
3520											Number of Missing Observations	0
3521					Minimum	16.3					Mean	16.3
3522					Maximum	16.3					Median	16.3
3523												
3524	**Warning: This data set only has 1 observations!**											
3525	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
3526	**The data set for variable Copper (waste water clarifier well) was not processed!**											
3527												
3528	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
3529	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:00:37 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Iron (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	2530	Mean	3169
Maximum	4920	Median	2840
SD	869.5	Std. Error of Mean	289.8
Coefficient of Variation	0.274	Skewness	1.615

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.701	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.39	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	3708	95% Adjusted-CLT UCL (Chen-1995)	3812
		95% Modified-t UCL (Johnson-1978)	3734

Gamma GOF Test

A-D Test Statistic	1.268	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.721	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.381	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	17.89	k star (bias corrected MLE)	12
Theta hat (MLE)	177.2	Theta star (bias corrected MLE)	264.1
nu hat (MLE)	321.9	nu star (bias corrected)	216
MLE Mean (bias corrected)	3169	MLE Sd (bias corrected)	914.9
		Approximate Chi Square Value (0.05)	182.9
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	176.5

53	**Assuming Gamma Distribution**											
54	95% Approximate Gamma UCL (use when n>=50))					3741	95% Adjusted Gamma UCL (use when n<50)					3877
55												
56	**Lognormal GOF Test**											
57	Shapiro Wilk Test Statistic					0.737	**Shapiro Wilk Lognormal GOF Test**					
58	5% Shapiro Wilk Critical Value					0.829	Data Not Lognormal at 5% Significance Level					
59	Lilliefors Test Statistic					0.366	**Lilliefors Lognormal GOF Test**					
60	5% Lilliefors Critical Value					0.274	Data Not Lognormal at 5% Significance Level					
61	**Data Not Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64	Minimum of Logged Data					7.836	Mean of logged Data					8.033
65	Maximum of Logged Data					8.501	SD of logged Data					0.241
66												
67	**Assuming Lognormal Distribution**											
68	95% H-UCL					3745	90% Chebyshev (MVUE) UCL					3926
69	95% Chebyshev (MVUE) UCL					4273	97.5% Chebyshev (MVUE) UCL					4754
70	99% Chebyshev (MVUE) UCL					5698						
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data do not follow a Discernible Distribution (0.05)**											
74												
75	**Nonparametric Distribution Free UCLs**											
76	95% CLT UCL					3646	95% Jackknife UCL					3708
77	95% Standard Bootstrap UCL					3611	95% Bootstrap-t UCL					5870
78	95% Hall's Bootstrap UCL					7457	95% Percentile Bootstrap UCL					3638
79	95% BCA Bootstrap UCL					3788						
80	90% Chebyshev(Mean, Sd) UCL					4038	95% Chebyshev(Mean, Sd) UCL					4432
81	97.5% Chebyshev(Mean, Sd) UCL					4979	99% Chebyshev(Mean, Sd) UCL					6053
82												
83	**Suggested UCL to Use**											
84	95% Student's-t UCL					3708	or 95% Modified-t UCL					3734
85												
86	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
87	Recommendations are based upon data size, data distribution, and skewness.											
88	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
89	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
90												
91												
92	**Iron (nfmw10)**											
93												
94	**General Statistics**											
95	Total Number of Observations					8	Number of Distinct Observations					8
96							Number of Missing Observations					0
97	Minimum					377	Mean					1023
98	Maximum					2700	Median					503
99	SD					995.6	Std. Error of Mean					352
100	Coefficient of Variation					0.973	Skewness					1.397
101												
102	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
103	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
104	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											

105	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
106												
107	**Normal GOF Test**											
108					Shapiro Wilk Test Statistic	0.663	**Shapiro Wilk GOF Test**					
109					5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level					
110					Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**					
111					5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level					
112	**Data Not Normal at 5% Significance Level**											
113												
114	**Assuming Normal Distribution**											
115	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
116					95% Student's-t UCL	1690				95% Adjusted-CLT UCL (Chen-1995)	1788	
117										95% Modified-t UCL (Johnson-1978)	1719	
118												
119	**Gamma GOF Test**											
120					A-D Test Statistic	1.124	**Anderson-Darling Gamma GOF Test**					
121					5% A-D Critical Value	0.727	Data Not Gamma Distributed at 5% Significance Level					
122					K-S Test Statistic	0.31	**Kolmogorov-Smirnov Gamma GOF Test**					
123					5% K-S Critical Value	0.299	Data Not Gamma Distributed at 5% Significance Level					
124	**Data Not Gamma Distributed at 5% Significance Level**											
125												
126	**Gamma Statistics**											
127					k hat (MLE)	1.627				k star (bias corrected MLE)	1.1	
128					Theta hat (MLE)	629				Theta star (bias corrected MLE)	930.2	
129					nu hat (MLE)	26.02				nu star (bias corrected)	17.6	
130					MLE Mean (bias corrected)	1023				MLE Sd (bias corrected)	975.5	
131										Approximate Chi Square Value (0.05)	9.101	
132					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	7.607	
133												
134	**Assuming Gamma Distribution**											
135					95% Approximate Gamma UCL (use when n>=50))	1978				95% Adjusted Gamma UCL (use when n<50)	2367	
136												
137	**Lognormal GOF Test**											
138					Shapiro Wilk Test Statistic	0.762	**Shapiro Wilk Lognormal GOF Test**					
139					5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level					
140					Lilliefors Test Statistic	0.264	**Lilliefors Lognormal GOF Test**					
141					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
142	**Data appear Approximate Lognormal at 5% Significance Level**											
143												
144	**Lognormal Statistics**											
145					Minimum of Logged Data	5.932				Mean of logged Data	6.593	
146					Maximum of Logged Data	7.901				SD of logged Data	0.817	
147												
148	**Assuming Lognormal Distribution**											
149					95% H-UCL	2565				90% Chebyshev (MVUE) UCL	1824	
150					95% Chebyshev (MVUE) UCL	2211				97.5% Chebyshev (MVUE) UCL	2749	
151					99% Chebyshev (MVUE) UCL	3805						
152												
153	**Nonparametric Distribution Free UCL Statistics**											
154	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
155												
156	**Nonparametric Distribution Free UCLs**											

157					95% CLT UCL	1602					95% Jackknife UCL	1690
158					95% Standard Bootstrap UCL	1558					95% Bootstrap-t UCL	5628
159					95% Hall's Bootstrap UCL	6200					95% Percentile Bootstrap UCL	1582
160					95% BCA Bootstrap UCL	1802						
161					90% Chebyshev(Mean, Sd) UCL	2079					95% Chebyshev(Mean, Sd) UCL	2557
162					97.5% Chebyshev(Mean, Sd) UCL	3221					99% Chebyshev(Mean, Sd) UCL	4525
163												
164					**Suggested UCL to Use**							
165					95% H-UCL	2565						
166												
167	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
168	Recommendations are based upon data size, data distribution, and skewness.											
169	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
170	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
171												
172	**ProUCL computes and outputs H-statistic based UCLs for historical reasons only.**											
173	**H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.**											
174	**It is therefore recommended to avoid the use of H-statistic based 95% UCLs.**											
175	**Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.**											
176												
177												
178	**Iron (nfmw11)**											
179												
180	**General Statistics**											
181					Total Number of Observations	8					Number of Distinct Observations	8
182											Number of Missing Observations	0
183					Minimum	388					Mean	466.3
184					Maximum	568					Median	442
185					SD	74.75					Std. Error of Mean	26.43
186					Coefficient of Variation	0.16					Skewness	0.423
187												
188	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
189	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
190	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
191	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
192												
193	**Normal GOF Test**											
194					Shapiro Wilk Test Statistic	0.858					**Shapiro Wilk GOF Test**	
195					5% Shapiro Wilk Critical Value	0.818					Data appear Normal at 5% Significance Level	
196					Lilliefors Test Statistic	0.2					**Lilliefors GOF Test**	
197					5% Lilliefors Critical Value	0.283					Data appear Normal at 5% Significance Level	
198	**Data appear Normal at 5% Significance Level**											
199												
200	**Assuming Normal Distribution**											
201	**95% Normal UCL**										**95% UCLs (Adjusted for Skewness)**	
202					95% Student's-t UCL	516.3					95% Adjusted-CLT UCL (Chen-1995)	513.9
203											95% Modified-t UCL (Johnson-1978)	517
204												
205	**Gamma GOF Test**											
206					A-D Test Statistic	0.551					**Anderson-Darling Gamma GOF Test**	
207					5% A-D Critical Value	0.715					Detected data appear Gamma Distributed at 5% Significance Level	
208					K-S Test Statistic	0.219					**Kolmogorov-Smirnov Gamma GOF Test**	

209				5% K-S Critical Value		0.293	Detected data appear Gamma Distributed at 5% Significance Level					
210	**Detected data appear Gamma Distributed at 5% Significance Level**											
211												
212	**Gamma Statistics**											
213				k hat (MLE)		45.5	k star (bias corrected MLE)					28.52
214				Theta hat (MLE)		10.25	Theta star (bias corrected MLE)					16.35
215				nu hat (MLE)		728	nu star (bias corrected)					456.3
216				MLE Mean (bias corrected)		466.3	MLE Sd (bias corrected)					87.31
217							Approximate Chi Square Value (0.05)					407.8
218				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					396.1
219												
220	**Assuming Gamma Distribution**											
221				95% Approximate Gamma UCL (use when n>=50))		521.7	95% Adjusted Gamma UCL (use when n<50)					537.1
222												
223	**Lognormal GOF Test**											
224				Shapiro Wilk Test Statistic		0.867	**Shapiro Wilk Lognormal GOF Test**					
225				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
226				Lilliefors Test Statistic		0.205	**Lilliefors Lognormal GOF Test**					
227				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
228	**Data appear Lognormal at 5% Significance Level**											
229												
230	**Lognormal Statistics**											
231				Minimum of Logged Data		5.961	Mean of logged Data					6.134
232				Maximum of Logged Data		6.342	SD of logged Data					0.158
233												
234	**Assuming Lognormal Distribution**											
235				95% H-UCL		523	90% Chebyshev (MVUE) UCL					544.4
236				95% Chebyshev (MVUE) UCL		579.8	97.5% Chebyshev (MVUE) UCL					629
237				99% Chebyshev (MVUE) UCL		725.5						
238												
239	**Nonparametric Distribution Free UCL Statistics**											
240	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
241												
242	**Nonparametric Distribution Free UCLs**											
243				95% CLT UCL		509.7	95% Jackknife UCL					516.3
244				95% Standard Bootstrap UCL		507	95% Bootstrap-t UCL					523.6
245				95% Hall's Bootstrap UCL		499.5	95% Percentile Bootstrap UCL					507.5
246				95% BCA Bootstrap UCL		510						
247				90% Chebyshev(Mean, Sd) UCL		545.5	95% Chebyshev(Mean, Sd) UCL					581.4
248				97.5% Chebyshev(Mean, Sd) UCL		631.3	99% Chebyshev(Mean, Sd) UCL					729.2
249												
250	**Suggested UCL to Use**											
251				95% Student's-t UCL		516.3						
252												
253	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
254	Recommendations are based upon data size, data distribution, and skewness.											
255	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
256	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
257												
258												
259	**Iron (nfmw12)**											
260												

261	**General Statistics**											
262					Total Number of Observations	8				Number of Distinct Observations		8
263										Number of Missing Observations		0
264					Minimum	1320				Mean		8648
265					Maximum	27200				Median		5830
266					SD	8235				Std. Error of Mean		2911
267					Coefficient of Variation	0.952				Skewness		1.968
268												
269	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
270	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
271	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
272	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
273												
274	**Normal GOF Test**											
275					Shapiro Wilk Test Statistic	0.782				**Shapiro Wilk GOF Test**		
276					5% Shapiro Wilk Critical Value	0.818				Data Not Normal at 5% Significance Level		
277					Lilliefors Test Statistic	0.275				**Lilliefors GOF Test**		
278					5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
279	**Data appear Approximate Normal at 5% Significance Level**											
280												
281	**Assuming Normal Distribution**											
282	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
283					95% Student's-t UCL	14163				95% Adjusted-CLT UCL (Chen-1995)		15600
284										95% Modified-t UCL (Johnson-1978)		14501
285												
286	**Gamma GOF Test**											
287					A-D Test Statistic	0.304				**Anderson-Darling Gamma GOF Test**		
288					5% A-D Critical Value	0.728				Detected data appear Gamma Distributed at 5% Significance Level		
289					K-S Test Statistic	0.187				**Kolmogorov-Smirnov Gamma GOF Test**		
290					5% K-S Critical Value	0.299				Detected data appear Gamma Distributed at 5% Significance Level		
291	**Detected data appear Gamma Distributed at 5% Significance Level**											
292												
293	**Gamma Statistics**											
294					k hat (MLE)	1.567				k star (bias corrected MLE)		1.063
295					Theta hat (MLE)	5519				Theta star (bias corrected MLE)		8137
296					nu hat (MLE)	25.07				nu star (bias corrected)		17
297					MLE Mean (bias corrected)	8648				MLE Sd (bias corrected)		8389
298										Approximate Chi Square Value (0.05)		8.674
299					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		7.221
300												
301	**Assuming Gamma Distribution**											
302					95% Approximate Gamma UCL (use when n>=50))	16950				95% Adjusted Gamma UCL (use when n<50)		20361
303												
304	**Lognormal GOF Test**											
305					Shapiro Wilk Test Statistic	0.972				**Shapiro Wilk Lognormal GOF Test**		
306					5% Shapiro Wilk Critical Value	0.818				Data appear Lognormal at 5% Significance Level		
307					Lilliefors Test Statistic	0.212				**Lilliefors Lognormal GOF Test**		
308					5% Lilliefors Critical Value	0.283				Data appear Lognormal at 5% Significance Level		
309	**Data appear Lognormal at 5% Significance Level**											
310												
311	**Lognormal Statistics**											
312					Minimum of Logged Data	7.185				Mean of logged Data		8.713

313	Maximum of Logged Data					10.21	SD of logged Data					0.916
314												
315	**Assuming Lognormal Distribution**											
316	95% H-UCL					28221	90% Chebyshev (MVUE) UCL					17244
317	95% Chebyshev (MVUE) UCL					21133	97.5% Chebyshev (MVUE) UCL					26530
318	99% Chebyshev (MVUE) UCL					37132						
319												
320	**Nonparametric Distribution Free UCL Statistics**											
321	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
322												
323	**Nonparametric Distribution Free UCLs**											
324	95% CLT UCL					13436	95% Jackknife UCL					14163
325	95% Standard Bootstrap UCL					13126	95% Bootstrap-t UCL					21977
326	95% Hall's Bootstrap UCL					38549	95% Percentile Bootstrap UCL					13363
327	95% BCA Bootstrap UCL					14629						
328	90% Chebyshev(Mean, Sd) UCL					17382	95% Chebyshev(Mean, Sd) UCL					21338
329	97.5% Chebyshev(Mean, Sd) UCL					26829	99% Chebyshev(Mean, Sd) UCL					37615
330												
331	**Suggested UCL to Use**											
332	95% Student's-t UCL					14163						
333												
334	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
335	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
336												
337	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
338	Recommendations are based upon data size, data distribution, and skewness.											
339	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
340	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
341												
342												
343	**Iron (nfmw19)**											
344												
345	**General Statistics**											
346	Total Number of Observations					8	Number of Distinct Observations					8
347							Number of Missing Observations					0
348	Minimum					8770	Mean					32946
349	Maximum					57300	Median					30100
350	SD					16994	Std. Error of Mean					6008
351	Coefficient of Variation					0.516	Skewness					0.111
352												
353	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
354	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
355	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
356	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
357												
358	**Normal GOF Test**											
359	Shapiro Wilk Test Statistic					0.96	**Shapiro Wilk GOF Test**					
360	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					
361	Lilliefors Test Statistic					0.175	**Lilliefors GOF Test**					
362	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
363	**Data appear Normal at 5% Significance Level**											
364												

	A	B	C	D	E	F	G	H	I	J	K	L
365	**Assuming Normal Distribution**											
366	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
367	95% Student's-t UCL					44329	95% Adjusted-CLT UCL (Chen-1995)					43081
368							95% Modified-t UCL (Johnson-1978)					44369
369												
370	**Gamma GOF Test**											
371	A-D Test Statistic					0.235	**Anderson-Darling Gamma GOF Test**					
372	5% A-D Critical Value					0.72	Detected data appear Gamma Distributed at 5% Significance Level					
373	K-S Test Statistic					0.159	**Kolmogorov-Smirnov Gamma GOF Test**					
374	5% K-S Critical Value					0.296	Detected data appear Gamma Distributed at 5% Significance Level					
375	**Detected data appear Gamma Distributed at 5% Significance Level**											
376												
377	**Gamma Statistics**											
378	k hat (MLE)					3.516	k star (bias corrected MLE)					2.281
379	Theta hat (MLE)					9370	Theta star (bias corrected MLE)					14444
380	nu hat (MLE)					56.26	nu star (bias corrected)					36.5
381	MLE Mean (bias corrected)					32946	MLE Sd (bias corrected)					21814
382							Approximate Chi Square Value (0.05)					23.67
383	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					21.09
384												
385	**Assuming Gamma Distribution**											
386	95% Approximate Gamma UCL (use when n>=50))					50802	95% Adjusted Gamma UCL (use when n<50)					57006
387												
388	**Lognormal GOF Test**											
389	Shapiro Wilk Test Statistic					0.93	**Shapiro Wilk Lognormal GOF Test**					
390	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
391	Lilliefors Test Statistic					0.17	**Lilliefors Lognormal GOF Test**					
392	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
393	**Data appear Lognormal at 5% Significance Level**											
394												
395	**Lognormal Statistics**											
396	Minimum of Logged Data					9.079	Mean of logged Data					10.25
397	Maximum of Logged Data					10.96	SD of logged Data					0.63
398												
399	**Assuming Lognormal Distribution**											
400	95% H-UCL					64190	90% Chebyshev (MVUE) UCL					56482
401	95% Chebyshev (MVUE) UCL					66818	97.5% Chebyshev (MVUE) UCL					81163
402	99% Chebyshev (MVUE) UCL					109340						
403												
404	**Nonparametric Distribution Free UCL Statistics**											
405	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
406												
407	**Nonparametric Distribution Free UCLs**											
408	95% CLT UCL					42829	95% Jackknife UCL					44329
409	95% Standard Bootstrap UCL					42097	95% Bootstrap-t UCL					44536
410	95% Hall's Bootstrap UCL					42707	95% Percentile Bootstrap UCL					42013
411	95% BCA Bootstrap UCL					42213						
412	90% Chebyshev(Mean, Sd) UCL					50971	95% Chebyshev(Mean, Sd) UCL					59135
413	97.5% Chebyshev(Mean, Sd) UCL					70467	99% Chebyshev(Mean, Sd) UCL					92726
414												
415	**Suggested UCL to Use**											
416	95% Student's-t UCL					44329						

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron (nfmw1d)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1370	Mean	1586
Maximum	1820	Median	1590
SD	180.4	Std. Error of Mean	60.14
Coefficient of Variation	0.114	Skewness	-0.0358

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1697	95% Adjusted-CLT UCL (Chen-1995)	1684
		95% Modified-t UCL (Johnson-1978)	1697

Gamma GOF Test

A-D Test Statistic	0.457	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.72	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.223	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	86.11	k star (bias corrected MLE)	57.48
Theta hat (MLE)	18.41	Theta star (bias corrected MLE)	27.58
nu hat (MLE)	1550	nu star (bias corrected)	1035
MLE Mean (bias corrected)	1586	MLE Sd (bias corrected)	209.1
		Approximate Chi Square Value (0.05)	961
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	946

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1707	95% Adjusted Gamma UCL (use when n<50)	1734

	A	B	C	D	E	F	G	H	I	J	K	L
469	**Lognormal GOF Test**											
470					Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk Lognormal GOF Test**					
471					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
472					Lilliefors Test Statistic	0.21	**Lilliefors Lognormal GOF Test**					
473					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
474	**Data appear Lognormal at 5% Significance Level**											
475												
476	**Lognormal Statistics**											
477					Minimum of Logged Data	7.223	Mean of logged Data	7.363				
478					Maximum of Logged Data	7.507	SD of logged Data	0.115				
479												
480	**Assuming Lognormal Distribution**											
481					95% H-UCL	1709	90% Chebyshev (MVUE) UCL	1768				
482					95% Chebyshev (MVUE) UCL	1850	97.5% Chebyshev (MVUE) UCL	1965				
483					99% Chebyshev (MVUE) UCL	2189						
484												
485	**Nonparametric Distribution Free UCL Statistics**											
486	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
487												
488	**Nonparametric Distribution Free UCLs**											
489					95% CLT UCL	1684	95% Jackknife UCL	1697				
490					95% Standard Bootstrap UCL	1676	95% Bootstrap-t UCL	1697				
491					95% Hall's Bootstrap UCL	1668	95% Percentile Bootstrap UCL	1677				
492					95% BCA Bootstrap UCL	1677						
493					90% Chebyshev(Mean, Sd) UCL	1766	95% Chebyshev(Mean, Sd) UCL	1848				
494					97.5% Chebyshev(Mean, Sd) UCL	1961	99% Chebyshev(Mean, Sd) UCL	2184				
495												
496	**Suggested UCL to Use**											
497					95% Student's-t UCL	1697						
498												
499	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
500	Recommendations are based upon data size, data distribution, and skewness.											
501	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
502	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
503												
504	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
505	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
506												
507												
508	**Iron (nfmw1s)**											
509												
510	**General Statistics**											
511					Total Number of Observations	7	Number of Distinct Observations	7				
512							Number of Missing Observations	0				
513					Minimum	212	Mean	708.6				
514					Maximum	2010	Median	516				
515					SD	615.2	Std. Error of Mean	232.5				
516					Coefficient of Variation	0.868	Skewness	1.955				
517												
518	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
519	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
520	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											

521	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
522												
523	**Normal GOF Test**											
524					Shapiro Wilk Test Statistic	0.775	**Shapiro Wilk GOF Test**					
525					5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level					
526					Lilliefors Test Statistic	0.284	**Lilliefors GOF Test**					
527					5% Lilliefors Critical Value	0.304	Data appear Normal at 5% Significance Level					
528	**Data appear Approximate Normal at 5% Significance Level**											
529												
530	**Assuming Normal Distribution**											
531				**95% Normal UCL**			**95% UCLs (Adjusted for Skewness)**					
532					95% Student's-t UCL	1160				95% Adjusted-CLT UCL (Chen-1995)	1275	
533										95% Modified-t UCL (Johnson-1978)	1189	
534												
535	**Gamma GOF Test**											
536					A-D Test Statistic	0.374	**Anderson-Darling Gamma GOF Test**					
537					5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level					
538					K-S Test Statistic	0.183	**Kolmogorov-Smirnov Gamma GOF Test**					
539					5% K-S Critical Value	0.315	Detected data appear Gamma Distributed at 5% Significance Level					
540	**Detected data appear Gamma Distributed at 5% Significance Level**											
541												
542	**Gamma Statistics**											
543					k hat (MLE)	2.003				k star (bias corrected MLE)	1.24	
544					Theta hat (MLE)	353.7				Theta star (bias corrected MLE)	571.4	
545					nu hat (MLE)	28.05				nu star (bias corrected)	17.36	
546					MLE Mean (bias corrected)	708.6				MLE Sd (bias corrected)	636.3	
547										Approximate Chi Square Value (0.05)	8.931	
548					Adjusted Level of Significance	0.0158				Adjusted Chi Square Value	7.182	
549												
550	**Assuming Gamma Distribution**											
551					95% Approximate Gamma UCL (use when n>=50))	1377				95% Adjusted Gamma UCL (use when n<50)	1713	
552												
553	**Lognormal GOF Test**											
554					Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk Lognormal GOF Test**					
555					5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level					
556					Lilliefors Test Statistic	0.18	**Lilliefors Lognormal GOF Test**					
557					5% Lilliefors Critical Value	0.304	Data appear Lognormal at 5% Significance Level					
558	**Data appear Lognormal at 5% Significance Level**											
559												
560	**Lognormal Statistics**											
561					Minimum of Logged Data	5.357				Mean of logged Data	6.293	
562					Maximum of Logged Data	7.606				SD of logged Data	0.779	
563												
564	**Assuming Lognormal Distribution**											
565					95% H-UCL	1964				90% Chebyshev (MVUE) UCL	1315	
566					95% Chebyshev (MVUE) UCL	1595				97.5% Chebyshev (MVUE) UCL	1984	
567					99% Chebyshev (MVUE) UCL	2749						
568												
569	**Nonparametric Distribution Free UCL Statistics**											
570	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
571												
572	**Nonparametric Distribution Free UCLs**											

573					95% CLT UCL	1091					95% Jackknife UCL	1160
574					95% Standard Bootstrap UCL	1057					95% Bootstrap-t UCL	1655
575					95% Hall's Bootstrap UCL	2872					95% Percentile Bootstrap UCL	1091
576					95% BCA Bootstrap UCL	1223						
577					90% Chebyshev(Mean, Sd) UCL	1406					95% Chebyshev(Mean, Sd) UCL	1722
578					97.5% Chebyshev(Mean, Sd) UCL	2161					99% Chebyshev(Mean, Sd) UCL	3022
579												
580					**Suggested UCL to Use**							
581					95% Student's-t UCL	1160						
582												
583	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
584	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
585												
586	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
587	Recommendations are based upon data size, data distribution, and skewness.											
588	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
589	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
590												
591												
592	**Iron (nfmw2)**											
593												
594	**General Statistics**											
595					Total Number of Observations	9					Number of Distinct Observations	9
596											Number of Missing Observations	0
597					Minimum	609					Mean	5124
598					Maximum	8410					Median	5940
599					SD	2870					Std. Error of Mean	956.6
600					Coefficient of Variation	0.56					Skewness	-0.425
601												
602	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
603	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
604	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
605	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
606												
607	**Normal GOF Test**											
608					Shapiro Wilk Test Statistic	0.916					**Shapiro Wilk GOF Test**	
609					5% Shapiro Wilk Critical Value	0.829					Data appear Normal at 5% Significance Level	
610					Lilliefors Test Statistic	0.167					**Lilliefors GOF Test**	
611					5% Lilliefors Critical Value	0.274					Data appear Normal at 5% Significance Level	
612	**Data appear Normal at 5% Significance Level**											
613												
614	**Assuming Normal Distribution**											
615	**95% Normal UCL**										**95% UCLs (Adjusted for Skewness)**	
616					95% Student's-t UCL	6903					95% Adjusted-CLT UCL (Chen-1995)	6553
617											95% Modified-t UCL (Johnson-1978)	6881
618												
619	**Gamma GOF Test**											
620					A-D Test Statistic	0.547					**Anderson-Darling Gamma GOF Test**	
621					5% A-D Critical Value	0.729					Detected data appear Gamma Distributed at 5% Significance Level	
622					K-S Test Statistic	0.229					**Kolmogorov-Smirnov Gamma GOF Test**	
623					5% K-S Critical Value	0.282					Detected data appear Gamma Distributed at 5% Significance Level	
624	**Detected data appear Gamma Distributed at 5% Significance Level**											

625												
626	**Gamma Statistics**											
627					k hat (MLE)	2.152		k star (bias corrected MLE)				1.509
628					Theta hat (MLE)	2381		Theta star (bias corrected MLE)				3396
629					nu hat (MLE)	38.74		nu star (bias corrected)				27.16
630					MLE Mean (bias corrected)	5124		MLE Sd (bias corrected)				4172
631								Approximate Chi Square Value (0.05)				16.27
632					Adjusted Level of Significance	0.0231		Adjusted Chi Square Value				14.52
633												
634	**Assuming Gamma Distribution**											
635				95% Approximate Gamma UCL (use when n>=50))		8552		95% Adjusted Gamma UCL (use when n<50)				9581
636												
637	**Lognormal GOF Test**											
638					Shapiro Wilk Test Statistic	0.825		**Shapiro Wilk Lognormal GOF Test**				
639					5% Shapiro Wilk Critical Value	0.829		Data Not Lognormal at 5% Significance Level				
640					Lilliefors Test Statistic	0.228		**Lilliefors Lognormal GOF Test**				
641					5% Lilliefors Critical Value	0.274		Data appear Lognormal at 5% Significance Level				
642	**Data appear Approximate Lognormal at 5% Significance Level**											
643												
644	**Lognormal Statistics**											
645					Minimum of Logged Data	6.412		Mean of logged Data				8.292
646					Maximum of Logged Data	9.037		SD of logged Data				0.889
647												
648	**Assuming Lognormal Distribution**											
649					95% H-UCL	15210		90% Chebyshev (MVUE) UCL				10754
650					95% Chebyshev (MVUE) UCL	13086		97.5% Chebyshev (MVUE) UCL				16322
651					99% Chebyshev (MVUE) UCL	22679						
652												
653	**Nonparametric Distribution Free UCL Statistics**											
654	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
655												
656	**Nonparametric Distribution Free UCLs**											
657					95% CLT UCL	6698		95% Jackknife UCL				6903
658					95% Standard Bootstrap UCL	6627		95% Bootstrap-t UCL				6745
659					95% Hall's Bootstrap UCL	6464		95% Percentile Bootstrap UCL				6609
660					95% BCA Bootstrap UCL	6506						
661					90% Chebyshev(Mean, Sd) UCL	7994		95% Chebyshev(Mean, Sd) UCL				9294
662					97.5% Chebyshev(Mean, Sd) UCL	11098		99% Chebyshev(Mean, Sd) UCL				14642
663												
664	**Suggested UCL to Use**											
665					95% Student's-t UCL	6903						
666												
667	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
668	Recommendations are based upon data size, data distribution, and skewness.											
669	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
670	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
671												
672	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
673	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
674												
675												
676	**Iron (nfmw20)**											

677												
678	**General Statistics**											
679					Total Number of Observations	8			Number of Distinct Observations	8		
680									Number of Missing Observations	0		
681					Minimum	2420			Mean	5288		
682					Maximum	9210			Median	4885		
683					SD	2107			Std. Error of Mean	744.8		
684					Coefficient of Variation	0.398			Skewness	0.88		
685												
686	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
687	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
688	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
689	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
690												
691	**Normal GOF Test**											
692					Shapiro Wilk Test Statistic	0.917			**Shapiro Wilk GOF Test**			
693					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
694					Lilliefors Test Statistic	0.267			**Lilliefors GOF Test**			
695					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
696	**Data appear Normal at 5% Significance Level**											
697												
698	**Assuming Normal Distribution**											
699					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
700					95% Student's-t UCL	6699			95% Adjusted-CLT UCL (Chen-1995)	6760		
701									95% Modified-t UCL (Johnson-1978)	6737		
702												
703	**Gamma GOF Test**											
704					A-D Test Statistic	0.332			**Anderson-Darling Gamma GOF Test**			
705					5% A-D Critical Value	0.717			Detected data appear Gamma Distributed at 5% Significance Level			
706					K-S Test Statistic	0.219			**Kolmogorov-Smirnov Gamma GOF Test**			
707					5% K-S Critical Value	0.295			Detected data appear Gamma Distributed at 5% Significance Level			
708	**Detected data appear Gamma Distributed at 5% Significance Level**											
709												
710	**Gamma Statistics**											
711					k hat (MLE)	7.419			k star (bias corrected MLE)	4.72		
712					Theta hat (MLE)	712.7			Theta star (bias corrected MLE)	1120		
713					nu hat (MLE)	118.7			nu star (bias corrected)	75.52		
714					MLE Mean (bias corrected)	5288			MLE Sd (bias corrected)	2434		
715									Approximate Chi Square Value (0.05)	56.5		
716					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	52.36		
717												
718	**Assuming Gamma Distribution**											
719					95% Approximate Gamma UCL (use when n>=50))	7067			95% Adjusted Gamma UCL (use when n<50)	7626		
720												
721	**Lognormal GOF Test**											
722					Shapiro Wilk Test Statistic	0.951			**Shapiro Wilk Lognormal GOF Test**			
723					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
724					Lilliefors Test Statistic	0.198			**Lilliefors Lognormal GOF Test**			
725					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
726	**Data appear Lognormal at 5% Significance Level**											
727												
728	**Lognormal Statistics**											

729	Minimum of Logged Data					7.792	Mean of logged Data					8.504
730	Maximum of Logged Data					9.128	SD of logged Data					0.401
731												
732	**Assuming Lognormal Distribution**											
733	95% H-UCL					7463	90% Chebyshev (MVUE) UCL					7560
734	95% Chebyshev (MVUE) UCL					8587	97.5% Chebyshev (MVUE) UCL					10013
735	99% Chebyshev (MVUE) UCL					12813						
736												
737	**Nonparametric Distribution Free UCL Statistics**											
738	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
739												
740	**Nonparametric Distribution Free UCLs**											
741	95% CLT UCL					6513	95% Jackknife UCL					6699
742	95% Standard Bootstrap UCL					6449	95% Bootstrap-t UCL					7771
743	95% Hall's Bootstrap UCL					17923	95% Percentile Bootstrap UCL					6450
744	95% BCA Bootstrap UCL					6630						
745	90% Chebyshev(Mean, Sd) UCL					7522	95% Chebyshev(Mean, Sd) UCL					8534
746	97.5% Chebyshev(Mean, Sd) UCL					9939	99% Chebyshev(Mean, Sd) UCL					12698
747												
748	**Suggested UCL to Use**											
749	95% Student's-t UCL					6699						
750												
751	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
752	Recommendations are based upon data size, data distribution, and skewness.											
753	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
754	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
755												
756												
757	**Iron (nfmw22)**											
758												
759	**General Statistics**											
760	Total Number of Observations					4	Number of Distinct Observations					3
761							Number of Missing Observations					0
762	Minimum					1280	Mean					1303
763	Maximum					1350	Median					1290
764	SD					33.04	Std. Error of Mean					16.52
765	Coefficient of Variation					0.0254	Skewness					1.56
766												
767	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
768	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
769	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
770	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
771												
772	**Normal GOF Test**											
773	Shapiro Wilk Test Statistic					0.809	**Shapiro Wilk GOF Test**					
774	5% Shapiro Wilk Critical Value					0.748	Data appear Normal at 5% Significance Level					
775	Lilliefors Test Statistic					0.28	**Lilliefors GOF Test**					
776	5% Lilliefors Critical Value					0.375	Data appear Normal at 5% Significance Level					
777	**Data appear Normal at 5% Significance Level**											
778												
779	**Assuming Normal Distribution**											
780	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					

781				95% Student's-t UCL	1341			95% Adjusted-CLT UCL (Chen-1995)				1343
782								95% Modified-t UCL (Johnson-1978)				1344
783												
784	**Gamma GOF Test**											
785				A-D Test Statistic	0.545	**Anderson-Darling Gamma GOF Test**						
786				5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level						
787				K-S Test Statistic	0.294	**Kolmogorov-Smirnov Gamma GOF Test**						
788				5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level						
789	**Detected data appear Gamma Distributed at 5% Significance Level**											
790												
791	**Gamma Statistics**											
792				k hat (MLE)	2099			k star (bias corrected MLE)				524.9
793				Theta hat (MLE)	0.621			Theta star (bias corrected MLE)				2.481
794				nu hat (MLE)	16791			nu star (bias corrected)				4199
795				MLE Mean (bias corrected)	1303			MLE Sd (bias corrected)				56.85
796								Approximate Chi Square Value (0.05)				4049
797				Adjusted Level of Significance	N/A			Adjusted Chi Square Value				N/A
798												
799	**Assuming Gamma Distribution**											
800			95% Approximate Gamma UCL (use when n>=50))		1351			95% Adjusted Gamma UCL (use when n<50)				N/A
801												
802	**Lognormal GOF Test**											
803				Shapiro Wilk Test Statistic	0.811	**Shapiro Wilk Lognormal GOF Test**						
804				5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level						
805				Lilliefors Test Statistic	0.277	**Lilliefors Lognormal GOF Test**						
806				5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level						
807	**Data appear Lognormal at 5% Significance Level**											
808												
809	**Lognormal Statistics**											
810				Minimum of Logged Data	7.155			Mean of logged Data				7.172
811				Maximum of Logged Data	7.208			SD of logged Data				0.0251
812												
813	**Assuming Lognormal Distribution**											
814				95% H-UCL	N/A			90% Chebyshev (MVUE) UCL				1352
815				95% Chebyshev (MVUE) UCL	1374			97.5% Chebyshev (MVUE) UCL				1405
816				99% Chebyshev (MVUE) UCL	1465							
817												
818	**Nonparametric Distribution Free UCL Statistics**											
819	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
820												
821	**Nonparametric Distribution Free UCLs**											
822				95% CLT UCL	1330			95% Jackknife UCL				1341
823				95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL				N/A
824				95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL				N/A
825				95% BCA Bootstrap UCL	N/A							
826				90% Chebyshev(Mean, Sd) UCL	1352			95% Chebyshev(Mean, Sd) UCL				1375
827				97.5% Chebyshev(Mean, Sd) UCL	1406			99% Chebyshev(Mean, Sd) UCL				1467
828												
829	**Suggested UCL to Use**											
830				95% Student's-t UCL	1341							
831												
832	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
833	Recommendations are based upon data size, data distribution, and skewness.											
834	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
835	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
836												
837												
838	**Iron (nfmw23)**											
839												
840	**General Statistics**											
841						Total Number of Observations	4			Number of Distinct Observations	4	
842										Number of Missing Observations	0	
843						Minimum	9270			Mean	9945	
844						Maximum	10600			Median	9955	
845						SD	555.8			Std. Error of Mean	277.9	
846						Coefficient of Variation	0.0559			Skewness	-0.0981	
847												
848	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
849	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
850	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
851	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
852												
853	**Normal GOF Test**											
854						Shapiro Wilk Test Statistic	1			**Shapiro Wilk GOF Test**		
855						5% Shapiro Wilk Critical Value	0.748			Data appear Normal at 5% Significance Level		
856						Lilliefors Test Statistic	0.154			**Lilliefors GOF Test**		
857						5% Lilliefors Critical Value	0.375			Data appear Normal at 5% Significance Level		
858	**Data appear Normal at 5% Significance Level**											
859												
860	**Assuming Normal Distribution**											
861	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
862						95% Student's-t UCL	10599			95% Adjusted-CLT UCL (Chen-1995)	10388	
863										95% Modified-t UCL (Johnson-1978)	10597	
864												
865	**Gamma GOF Test**											
866						A-D Test Statistic	0.195			**Anderson-Darling Gamma GOF Test**		
867						5% A-D Critical Value	0.657			Detected data appear Gamma Distributed at 5% Significance Level		
868						K-S Test Statistic	0.172			**Kolmogorov-Smirnov Gamma GOF Test**		
869						5% K-S Critical Value	0.394			Detected data appear Gamma Distributed at 5% Significance Level		
870	**Detected data appear Gamma Distributed at 5% Significance Level**											
871												
872	**Gamma Statistics**											
873						k hat (MLE)	425.3			k star (bias corrected MLE)	106.5	
874						Theta hat (MLE)	23.38			Theta star (bias corrected MLE)	93.39	
875						nu hat (MLE)	3402			nu star (bias corrected)	851.9	
876						MLE Mean (bias corrected)	9945			MLE Sd (bias corrected)	963.7	
877										Approximate Chi Square Value (0.05)	785.2	
878						Adjusted Level of Significance	N/A			Adjusted Chi Square Value	N/A	
879												
880	**Assuming Gamma Distribution**											
881						95% Approximate Gamma UCL (use when n>=50))	10790			95% Adjusted Gamma UCL (use when n<50)	N/A	
882												
883	**Lognormal GOF Test**											
884						Shapiro Wilk Test Statistic	0.998			**Shapiro Wilk Lognormal GOF Test**		

885				5% Shapiro Wilk Critical Value		0.748		Data appear Lognormal at 5% Significance Level				
886				Lilliefors Test Statistic		0.162		**Lilliefors Lognormal GOF Test**				
887				5% Lilliefors Critical Value		0.375		Data appear Lognormal at 5% Significance Level				
888	**Data appear Lognormal at 5% Significance Level**											
889												
890	**Lognormal Statistics**											
891				Minimum of Logged Data		9.135		Mean of logged Data				9.204
892				Maximum of Logged Data		9.269		SD of logged Data				0.0561
893												
894	**Assuming Lognormal Distribution**											
895				95% H-UCL		N/A		90% Chebyshev (MVUE) UCL				10781
896				95% Chebyshev (MVUE) UCL		11160		97.5% Chebyshev (MVUE) UCL				11686
897				99% Chebyshev (MVUE) UCL		12718						
898												
899	**Nonparametric Distribution Free UCL Statistics**											
900	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
901												
902	**Nonparametric Distribution Free UCLs**											
903				95% CLT UCL		10402		95% Jackknife UCL				10599
904				95% Standard Bootstrap UCL		N/A		95% Bootstrap-t UCL				N/A
905				95% Hall's Bootstrap UCL		N/A		95% Percentile Bootstrap UCL				N/A
906				95% BCA Bootstrap UCL		N/A						
907				90% Chebyshev(Mean, Sd) UCL		10779		95% Chebyshev(Mean, Sd) UCL				11156
908				97.5% Chebyshev(Mean, Sd) UCL		11681		99% Chebyshev(Mean, Sd) UCL				12710
909												
910	**Suggested UCL to Use**											
911				95% Student's-t UCL		10599						
912												
913	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
914	Recommendations are based upon data size, data distribution, and skewness.											
915	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
916	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
917												
918	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
919	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
920												
921												
922	**Iron (nfmw3)**											
923												
924	**General Statistics**											
925				Total Number of Observations		9		Number of Distinct Observations				9
926								Number of Missing Observations				0
927				Minimum		298		Mean				3078
928				Maximum		9980		Median				1730
929				SD		3287		Std. Error of Mean				1096
930				Coefficient of Variation		1.068		Skewness				1.51
931												
932	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
933	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
934	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
935	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
936												

	A	B	C	D	E	F	G	H	I	J	K	L
937	**Normal GOF Test**											
938					Shapiro Wilk Test Statistic	0.797	**Shapiro Wilk GOF Test**					
939					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
940					Lilliefors Test Statistic	0.284	**Lilliefors GOF Test**					
941					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
942	**Data Not Normal at 5% Significance Level**											
943												
944	**Assuming Normal Distribution**											
945	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
946					95% Student's-t UCL	5115				95% Adjusted-CLT UCL (Chen-1995)	5470	
947										95% Modified-t UCL (Johnson-1978)	5207	
948												
949	**Gamma GOF Test**											
950					A-D Test Statistic	0.315	**Anderson-Darling Gamma GOF Test**					
951					5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level					
952					K-S Test Statistic	0.189	**Kolmogorov-Smirnov Gamma GOF Test**					
953					5% K-S Critical Value	0.286	Detected data appear Gamma Distributed at 5% Significance Level					
954	**Detected data appear Gamma Distributed at 5% Significance Level**											
955												
956	**Gamma Statistics**											
957					k hat (MLE)	1.125				k star (bias corrected MLE)	0.824	
958					Theta hat (MLE)	2736				Theta star (bias corrected MLE)	3735	
959					nu hat (MLE)	20.25				nu star (bias corrected)	14.83	
960					MLE Mean (bias corrected)	3078				MLE Sd (bias corrected)	3391	
961										Approximate Chi Square Value (0.05)	7.146	
962					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	6.056	
963												
964	**Assuming Gamma Distribution**											
965					95% Approximate Gamma UCL (use when n>=50)	6389				95% Adjusted Gamma UCL (use when n<50)	7539	
966												
967	**Lognormal GOF Test**											
968					Shapiro Wilk Test Statistic	0.977	**Shapiro Wilk Lognormal GOF Test**					
969					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
970					Lilliefors Test Statistic	0.122	**Lilliefors Lognormal GOF Test**					
971					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
972	**Data appear Lognormal at 5% Significance Level**											
973												
974	**Lognormal Statistics**											
975					Minimum of Logged Data	5.697				Mean of logged Data	7.526	
976					Maximum of Logged Data	9.208				SD of logged Data	1.101	
977												
978	**Assuming Lognormal Distribution**											
979					95% H-UCL	13129				90% Chebyshev (MVUE) UCL	6641	
980					95% Chebyshev (MVUE) UCL	8245				97.5% Chebyshev (MVUE) UCL	10472	
981					99% Chebyshev (MVUE) UCL	14847						
982												
983	**Nonparametric Distribution Free UCL Statistics**											
984	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
985												
986	**Nonparametric Distribution Free UCLs**											
987					95% CLT UCL	4880				95% Jackknife UCL	5115	
988					95% Standard Bootstrap UCL	4793				95% Bootstrap-t UCL	8265	

989				95% Hall's Bootstrap UCL		13539				95% Percentile Bootstrap UCL		4875
990				95% BCA Bootstrap UCL		5289						
991				90% Chebyshev(Mean, Sd) UCL		6365				95% Chebyshev(Mean, Sd) UCL		7854
992				97.5% Chebyshev(Mean, Sd) UCL		9920				99% Chebyshev(Mean, Sd) UCL		13980
993												
994					**Suggested UCL to Use**							
995				95% Adjusted Gamma UCL		7539						
996												
997	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
998	Recommendations are based upon data size, data distribution, and skewness.											
999	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1000	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1001												
1002												
1003	**Iron (nfmw4)**											
1004												
1005					**General Statistics**							
1006				Total Number of Observations		9				Number of Distinct Observations		9
1007										Number of Missing Observations		0
1008				Minimum		7460				Mean		11380
1009				Maximum		21000				Median		10300
1010				SD		4068				Std. Error of Mean		1356
1011				Coefficient of Variation		0.357				Skewness		1.843
1012												
1013	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1014	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1015	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1016	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1017												
1018					**Normal GOF Test**							
1019				Shapiro Wilk Test Statistic		0.811				**Shapiro Wilk GOF Test**		
1020				5% Shapiro Wilk Critical Value		0.829				Data Not Normal at 5% Significance Level		
1021				Lilliefors Test Statistic		0.234				**Lilliefors GOF Test**		
1022				5% Lilliefors Critical Value		0.274				Data appear Normal at 5% Significance Level		
1023	**Data appear Approximate Normal at 5% Significance Level**											
1024												
1025					**Assuming Normal Distribution**							
1026				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
1027				95% Student's-t UCL		13901				95% Adjusted-CLT UCL (Chen-1995)		14501
1028										95% Modified-t UCL (Johnson-1978)		14040
1029												
1030					**Gamma GOF Test**							
1031				A-D Test Statistic		0.469				**Anderson-Darling Gamma GOF Test**		
1032				5% A-D Critical Value		0.722				Detected data appear Gamma Distributed at 5% Significance Level		
1033				K-S Test Statistic		0.182				**Kolmogorov-Smirnov Gamma GOF Test**		
1034				5% K-S Critical Value		0.279				Detected data appear Gamma Distributed at 5% Significance Level		
1035	**Detected data appear Gamma Distributed at 5% Significance Level**											
1036												
1037					**Gamma Statistics**							
1038				k hat (MLE)		10.81				k star (bias corrected MLE)		7.281
1039				Theta hat (MLE)		1053				Theta star (bias corrected MLE)		1563
1040				nu hat (MLE)		194.6				nu star (bias corrected)		131.1

1041				MLE Mean (bias corrected)		11380				MLE Sd (bias corrected)		4217
1042										Approximate Chi Square Value (0.05)		105.6
1043				Adjusted Level of Significance		0.0231				Adjusted Chi Square Value		100.8
1044												
1045				**Assuming Gamma Distribution**								
1046				95% Approximate Gamma UCL (use when n>=50))		14122				95% Adjusted Gamma UCL (use when n<50)		14796
1047												
1048				**Lognormal GOF Test**								
1049				Shapiro Wilk Test Statistic		0.909				**Shapiro Wilk Lognormal GOF Test**		
1050				5% Shapiro Wilk Critical Value		0.829				Data appear Lognormal at 5% Significance Level		
1051				Lilliefors Test Statistic		0.171				**Lilliefors Lognormal GOF Test**		
1052				5% Lilliefors Critical Value		0.274				Data appear Lognormal at 5% Significance Level		
1053				**Data appear Lognormal at 5% Significance Level**								
1054												
1055				**Lognormal Statistics**								
1056				Minimum of Logged Data		8.917				Mean of logged Data		9.293
1057				Maximum of Logged Data		9.952				SD of logged Data		0.312
1058												
1059				**Assuming Lognormal Distribution**								
1060				95% H-UCL		14255				90% Chebyshev (MVUE) UCL		14897
1061				95% Chebyshev (MVUE) UCL		16510				97.5% Chebyshev (MVUE) UCL		18749
1062				99% Chebyshev (MVUE) UCL		23146						
1063												
1064				**Nonparametric Distribution Free UCL Statistics**								
1065				**Data appear to follow a Discernible Distribution at 5% Significance Level**								
1066												
1067				**Nonparametric Distribution Free UCLs**								
1068				95% CLT UCL		13610				95% Jackknife UCL		13901
1069				95% Standard Bootstrap UCL		13523				95% Bootstrap-t UCL		15665
1070				95% Hall's Bootstrap UCL		24329				95% Percentile Bootstrap UCL		13596
1071				95% BCA Bootstrap UCL		14253						
1072				90% Chebyshev(Mean, Sd) UCL		15448				95% Chebyshev(Mean, Sd) UCL		17290
1073				97.5% Chebyshev(Mean, Sd) UCL		19848				99% Chebyshev(Mean, Sd) UCL		24872
1074												
1075				**Suggested UCL to Use**								
1076				95% Student's-t UCL		13901						
1077												
1078				When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test								
1079				When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL								
1080												
1081				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
1082				Recommendations are based upon data size, data distribution, and skewness.								
1083				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
1084				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
1085												
1086												
1087	**Iron (nfmw7)**											
1088												
1089				**General Statistics**								
1090				Total Number of Observations		9				Number of Distinct Observations		9
1091										Number of Missing Observations		0
1092				Minimum		127				Mean		565

1093					Maximum	1300					Median	522
1094					SD	408.5					Std. Error of Mean	136.2
1095					Coefficient of Variation	0.723					Skewness	0.617
1096												
1097	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1098	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1099	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1100	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1101												
1102	**Normal GOF Test**											
1103					Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk GOF Test**					
1104					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
1105					Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**					
1106					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
1107	**Data appear Normal at 5% Significance Level**											
1108												
1109	**Assuming Normal Distribution**											
1110	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1111					95% Student's-t UCL	818.2					95% Adjusted-CLT UCL (Chen-1995)	818.9
1112											95% Modified-t UCL (Johnson-1978)	822.9
1113												
1114	**Gamma GOF Test**											
1115					A-D Test Statistic	0.412	**Anderson-Darling Gamma GOF Test**					
1116					5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level					
1117					K-S Test Statistic	0.238	**Kolmogorov-Smirnov Gamma GOF Test**					
1118					5% K-S Critical Value	0.283	Detected data appear Gamma Distributed at 5% Significance Level					
1119	**Detected data appear Gamma Distributed at 5% Significance Level**											
1120												
1121	**Gamma Statistics**											
1122					k hat (MLE)	1.956					k star (bias corrected MLE)	1.378
1123					Theta hat (MLE)	288.9					Theta star (bias corrected MLE)	410
1124					nu hat (MLE)	35.21					nu star (bias corrected)	24.8
1125					MLE Mean (bias corrected)	565					MLE Sd (bias corrected)	481.3
1126											Approximate Chi Square Value (0.05)	14.46
1127					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	12.83
1128												
1129	**Assuming Gamma Distribution**											
1130					95% Approximate Gamma UCL (use when n>=50))	969.1					95% Adjusted Gamma UCL (use when n<50)	1093
1131												
1132	**Lognormal GOF Test**											
1133					Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk Lognormal GOF Test**					
1134					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1135					Lilliefors Test Statistic	0.21	**Lilliefors Lognormal GOF Test**					
1136					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1137	**Data appear Lognormal at 5% Significance Level**											
1138												
1139	**Lognormal Statistics**											
1140					Minimum of Logged Data	4.844					Mean of logged Data	6.06
1141					Maximum of Logged Data	7.17					SD of logged Data	0.828
1142												
1143	**Assuming Lognormal Distribution**											
1144					95% H-UCL	1398					90% Chebyshev (MVUE) UCL	1067

1145				95% Chebyshev (MVUE) UCL		1290				97.5% Chebyshev (MVUE) UCL		1598
1146				99% Chebyshev (MVUE) UCL		2205						
1147												
1148						**Nonparametric Distribution Free UCL Statistics**							
1149						**Data appear to follow a Discernible Distribution at 5% Significance Level**						
1150												
1151						**Nonparametric Distribution Free UCLs**						
1152				95% CLT UCL		789				95% Jackknife UCL		818.2
1153				95% Standard Bootstrap UCL		777				95% Bootstrap-t UCL		842.3
1154				95% Hall's Bootstrap UCL		800.5				95% Percentile Bootstrap UCL		776.3
1155				95% BCA Bootstrap UCL		794.3						
1156				90% Chebyshev(Mean, Sd) UCL		973.5				95% Chebyshev(Mean, Sd) UCL		1159
1157				97.5% Chebyshev(Mean, Sd) UCL		1415				99% Chebyshev(Mean, Sd) UCL		1920
1158												
1159						**Suggested UCL to Use**						
1160				95% Student's-t UCL		818.2						
1161												
1162						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1163						Recommendations are based upon data size, data distribution, and skewness.						
1164						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1165						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1166												
1167												
1168	**Iron (nfmw8)**											
1169												
1170						**General Statistics**						
1171				Total Number of Observations		8				Number of Distinct Observations		8
1172										Number of Missing Observations		0
1173				Minimum		887				Mean		2725
1174				Maximum		5450				Median		2020
1175				SD		1783				Std. Error of Mean		630.3
1176				Coefficient of Variation		0.654				Skewness		0.556
1177												
1178						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1179						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
1180						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
1181						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
1182												
1183						**Normal GOF Test**						
1184				Shapiro Wilk Test Statistic		0.873				**Shapiro Wilk GOF Test**		
1185				5% Shapiro Wilk Critical Value		0.818				Data appear Normal at 5% Significance Level		
1186				Lilliefors Test Statistic		0.236				**Lilliefors GOF Test**		
1187				5% Lilliefors Critical Value		0.283				Data appear Normal at 5% Significance Level		
1188						**Data appear Normal at 5% Significance Level**						
1189												
1190						**Assuming Normal Distribution**						
1191				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
1192				95% Student's-t UCL		3919				95% Adjusted-CLT UCL (Chen-1995)		3894
1193										95% Modified-t UCL (Johnson-1978)		3939
1194												
1195						**Gamma GOF Test**						
1196				A-D Test Statistic		0.413				**Anderson-Darling Gamma GOF Test**		

1197				5% A-D Critical Value		0.722	Detected data appear Gamma Distributed at 5% Significance Level					
1198				K-S Test Statistic		0.217	**Kolmogorov-Smirnov Gamma GOF Test**					
1199				5% K-S Critical Value		0.297	Detected data appear Gamma Distributed at 5% Significance Level					
1200	**Detected data appear Gamma Distributed at 5% Significance Level**											
1201												
1202	**Gamma Statistics**											
1203				k hat (MLE)		2.604	k star (bias corrected MLE)					1.711
1204				Theta hat (MLE)		1046	Theta star (bias corrected MLE)					1592
1205				nu hat (MLE)		41.67	nu star (bias corrected)					27.38
1206				MLE Mean (bias corrected)		2725	MLE Sd (bias corrected)					2083
1207							Approximate Chi Square Value (0.05)					16.44
1208				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					14.34
1209												
1210	**Assuming Gamma Distribution**											
1211				95% Approximate Gamma UCL (use when n>=50))		4536	95% Adjusted Gamma UCL (use when n<50)					5200
1212												
1213	**Lognormal GOF Test**											
1214				Shapiro Wilk Test Statistic		0.917	**Shapiro Wilk Lognormal GOF Test**					
1215				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
1216				Lilliefors Test Statistic		0.197	**Lilliefors Lognormal GOF Test**					
1217				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
1218	**Data appear Lognormal at 5% Significance Level**											
1219												
1220	**Lognormal Statistics**											
1221				Minimum of Logged Data		6.788	Mean of logged Data					7.706
1222				Maximum of Logged Data		8.603	SD of logged Data					0.696
1223												
1224	**Assuming Lognormal Distribution**											
1225				95% H-UCL		5805	90% Chebyshev (MVUE) UCL					4786
1226				95% Chebyshev (MVUE) UCL		5715	97.5% Chebyshev (MVUE) UCL					7005
1227				99% Chebyshev (MVUE) UCL		9539						
1228												
1229	**Nonparametric Distribution Free UCL Statistics**											
1230	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1231												
1232	**Nonparametric Distribution Free UCLs**											
1233				95% CLT UCL		3761	95% Jackknife UCL					3919
1234				95% Standard Bootstrap UCL		3682	95% Bootstrap-t UCL					4168
1235				95% Hall's Bootstrap UCL		3557	95% Percentile Bootstrap UCL					3701
1236				95% BCA Bootstrap UCL		3837						
1237				90% Chebyshev(Mean, Sd) UCL		4615	95% Chebyshev(Mean, Sd) UCL					5472
1238				97.5% Chebyshev(Mean, Sd) UCL		6661	99% Chebyshev(Mean, Sd) UCL					8996
1239												
1240	**Suggested UCL to Use**											
1241				95% Student's-t UCL		3919						
1242												
1243	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1244	Recommendations are based upon data size, data distribution, and skewness.											
1245	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1246	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1247												
1248												

	A	B	C	D	E	F	G	H	I	J	K	L
1249	**Iron (nfmw9)**											
1250												
1251						**General Statistics**						
1252					Total Number of Observations	8			Number of Distinct Observations	8		
1253									Number of Missing Observations	0		
1254					Minimum	2200			Mean	23226		
1255					Maximum	45700			Median	22100		
1256					SD	17360			Std. Error of Mean	6138		
1257					Coefficient of Variation	0.747			Skewness	0.0932		
1258												
1259					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1260					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1261					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1262					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1263												
1264						**Normal GOF Test**						
1265					Shapiro Wilk Test Statistic	0.894			**Shapiro Wilk GOF Test**			
1266					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
1267					Lilliefors Test Statistic	0.196			**Lilliefors GOF Test**			
1268					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
1269						**Data appear Normal at 5% Significance Level**						
1270												
1271						**Assuming Normal Distribution**						
1272						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
1273						95% Student's-t UCL	34855			95% Adjusted-CLT UCL (Chen-1995)	33538	
1274										95% Modified-t UCL (Johnson-1978)	34889	
1275												
1276						**Gamma GOF Test**						
1277					A-D Test Statistic	0.395			**Anderson-Darling Gamma GOF Test**			
1278					5% A-D Critical Value	0.73			Detected data appear Gamma Distributed at 5% Significance Level			
1279					K-S Test Statistic	0.204			**Kolmogorov-Smirnov Gamma GOF Test**			
1280					5% K-S Critical Value	0.299			Detected data appear Gamma Distributed at 5% Significance Level			
1281						**Detected data appear Gamma Distributed at 5% Significance Level**						
1282												
1283						**Gamma Statistics**						
1284					k hat (MLE)	1.388			k star (bias corrected MLE)	0.951		
1285					Theta hat (MLE)	16731			Theta star (bias corrected MLE)	24424		
1286					nu hat (MLE)	22.21			nu star (bias corrected)	15.22		
1287					MLE Mean (bias corrected)	23226			MLE Sd (bias corrected)	23818		
1288									Approximate Chi Square Value (0.05)	7.411		
1289					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	6.087		
1290												
1291						**Assuming Gamma Distribution**						
1292					95% Approximate Gamma UCL (use when n>=50))	47682			95% Adjusted Gamma UCL (use when n<50)	58054		
1293												
1294						**Lognormal GOF Test**						
1295					Shapiro Wilk Test Statistic	0.891			**Shapiro Wilk Lognormal GOF Test**			
1296					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
1297					Lilliefors Test Statistic	0.194			**Lilliefors Lognormal GOF Test**			
1298					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
1299						**Data appear Lognormal at 5% Significance Level**						
1300												

1301	**Lognormal Statistics**											
1302					Minimum of Logged Data	7.696			Mean of logged Data	9.651		
1303					Maximum of Logged Data	10.73			SD of logged Data	1.103		
1304												
1305	**Assuming Lognormal Distribution**											
1306					95% H-UCL	132439			90% Chebyshev (MVUE) UCL	56438		
1307					95% Chebyshev (MVUE) UCL	70348			97.5% Chebyshev (MVUE) UCL	89656		
1308					99% Chebyshev (MVUE) UCL	127581						
1309												
1310	**Nonparametric Distribution Free UCL Statistics**											
1311	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1312												
1313	**Nonparametric Distribution Free UCLs**											
1314					95% CLT UCL	33322			95% Jackknife UCL	34855		
1315					95% Standard Bootstrap UCL	32740			95% Bootstrap-t UCL	36147		
1316					95% Hall's Bootstrap UCL	31304			95% Percentile Bootstrap UCL	32670		
1317					95% BCA Bootstrap UCL	32595						
1318					90% Chebyshev(Mean, Sd) UCL	41640			95% Chebyshev(Mean, Sd) UCL	49981		
1319					97.5% Chebyshev(Mean, Sd) UCL	61557			99% Chebyshev(Mean, Sd) UCL	84297		
1320												
1321	**Suggested UCL to Use**											
1322					95% Student's-t UCL	34855						
1323												
1324	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1325	Recommendations are based upon data size, data distribution, and skewness.											
1326	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1327	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1328												
1329												
1330	**Iron (smw10)**											
1331												
1332	**General Statistics**											
1333					Total Number of Observations	8			Number of Distinct Observations	8		
1334									Number of Missing Observations	0		
1335					Minimum	1630			Mean	2129		
1336					Maximum	3050			Median	2085		
1337					SD	457.4			Std. Error of Mean	161.7		
1338					Coefficient of Variation	0.215			Skewness	1.157		
1339												
1340	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1341	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1342	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1343	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1344												
1345	**Normal GOF Test**											
1346					Shapiro Wilk Test Statistic	0.914			**Shapiro Wilk GOF Test**			
1347					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
1348					Lilliefors Test Statistic	0.188			**Lilliefors GOF Test**			
1349					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
1350	**Data appear Normal at 5% Significance Level**											
1351												
1352	**Assuming Normal Distribution**											

1353	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1354				95% Student's-t UCL		2435				95% Adjusted-CLT UCL (Chen-1995)		2465
1355										95% Modified-t UCL (Johnson-1978)		2446
1356												
1357	**Gamma GOF Test**											
1358				A-D Test Statistic		0.252	**Anderson-Darling Gamma GOF Test**					
1359				5% A-D Critical Value		0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1360				K-S Test Statistic		0.157	**Kolmogorov-Smirnov Gamma GOF Test**					
1361				5% K-S Critical Value		0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1362	**Detected data appear Gamma Distributed at 5% Significance Level**											
1363												
1364	**Gamma Statistics**											
1365				k hat (MLE)		26.89	k star (bias corrected MLE)					16.89
1366				Theta hat (MLE)		79.15	Theta star (bias corrected MLE)					126
1367				nu hat (MLE)		430.3	nu star (bias corrected)					270.3
1368				MLE Mean (bias corrected)		2129	MLE Sd (bias corrected)					517.9
1369							Approximate Chi Square Value (0.05)					233.2
1370				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					224.5
1371												
1372	**Assuming Gamma Distribution**											
1373				95% Approximate Gamma UCL (use when n>=50))		2467	95% Adjusted Gamma UCL (use when n<50)					2563
1374												
1375	**Lognormal GOF Test**											
1376				Shapiro Wilk Test Statistic		0.954	**Shapiro Wilk Lognormal GOF Test**					
1377				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
1378				Lilliefors Test Statistic		0.15	**Lilliefors Lognormal GOF Test**					
1379				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
1380	**Data appear Lognormal at 5% Significance Level**											
1381												
1382	**Lognormal Statistics**											
1383				Minimum of Logged Data		7.396	Mean of logged Data					7.645
1384				Maximum of Logged Data		8.023	SD of logged Data					0.203
1385												
1386	**Assuming Lognormal Distribution**											
1387				95% H-UCL		2477	90% Chebyshev (MVUE) UCL					2587
1388				95% Chebyshev (MVUE) UCL		2795	97.5% Chebyshev (MVUE) UCL					3084
1389				99% Chebyshev (MVUE) UCL		3652						
1390												
1391	**Nonparametric Distribution Free UCL Statistics**											
1392	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1393												
1394	**Nonparametric Distribution Free UCLs**											
1395				95% CLT UCL		2395	95% Jackknife UCL					2435
1396				95% Standard Bootstrap UCL		2378	95% Bootstrap-t UCL					2573
1397				95% Hall's Bootstrap UCL		3772	95% Percentile Bootstrap UCL					2389
1398				95% BCA Bootstrap UCL		2448						
1399				90% Chebyshev(Mean, Sd) UCL		2614	95% Chebyshev(Mean, Sd) UCL					2834
1400				97.5% Chebyshev(Mean, Sd) UCL		3139	99% Chebyshev(Mean, Sd) UCL					3738
1401												
1402	**Suggested UCL to Use**											
1403				95% Student's-t UCL		2435						
1404												

1405	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1406	Recommendations are based upon data size, data distribution, and skewness.											
1407	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1408	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1409												
1410												
1411	**Iron (smw11)**											
1412												
1413	**General Statistics**											
1414						Total Number of Observations	9			Number of Distinct Observations	9	
1415										Number of Missing Observations	0	
1416						Minimum	1530			Mean	2587	
1417						Maximum	6190			Median	1980	
1418						SD	1461			Std. Error of Mean	486.8	
1419						Coefficient of Variation	0.565			Skewness	2.314	
1420												
1421	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1422	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1423	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1424	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1425												
1426	**Normal GOF Test**											
1427						Shapiro Wilk Test Statistic	0.678			**Shapiro Wilk GOF Test**		
1428						5% Shapiro Wilk Critical Value	0.829			Data Not Normal at 5% Significance Level		
1429						Lilliefors Test Statistic	0.361			**Lilliefors GOF Test**		
1430						5% Lilliefors Critical Value	0.274			Data Not Normal at 5% Significance Level		
1431	**Data Not Normal at 5% Significance Level**											
1432												
1433	**Assuming Normal Distribution**											
1434						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
1435						95% Student's-t UCL	3492			95% Adjusted-CLT UCL (Chen-1995)	3789	
1436										95% Modified-t UCL (Johnson-1978)	3555	
1437												
1438	**Gamma GOF Test**											
1439						A-D Test Statistic	0.995			**Anderson-Darling Gamma GOF Test**		
1440						5% A-D Critical Value	0.723			Data Not Gamma Distributed at 5% Significance Level		
1441						K-S Test Statistic	0.332			**Kolmogorov-Smirnov Gamma GOF Test**		
1442						5% K-S Critical Value	0.28			Data Not Gamma Distributed at 5% Significance Level		
1443	**Data Not Gamma Distributed at 5% Significance Level**											
1444												
1445	**Gamma Statistics**											
1446						k hat (MLE)	5.256			k star (bias corrected MLE)	3.578	
1447						Theta hat (MLE)	492.1			Theta star (bias corrected MLE)	722.9	
1448						nu hat (MLE)	94.61			nu star (bias corrected)	64.41	
1449						MLE Mean (bias corrected)	2587			MLE Sd (bias corrected)	1367	
1450										Approximate Chi Square Value (0.05)	46.94	
1451						Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	43.81	
1452												
1453	**Assuming Gamma Distribution**											
1454						95% Approximate Gamma UCL (use when n>=50))	3549			95% Adjusted Gamma UCL (use when n<50)	3802	
1455												
1456	**Lognormal GOF Test**											

1457	Shapiro Wilk Test Statistic				0.809	**Shapiro Wilk Lognormal GOF Test**						
1458	5% Shapiro Wilk Critical Value				0.829	Data Not Lognormal at 5% Significance Level						
1459	Lilliefors Test Statistic				0.304	**Lilliefors Lognormal GOF Test**						
1460	5% Lilliefors Critical Value				0.274	Data Not Lognormal at 5% Significance Level						
1461	**Data Not Lognormal at 5% Significance Level**											
1462												
1463	**Lognormal Statistics**											
1464	Minimum of Logged Data				7.333	Mean of logged Data					7.76	
1465	Maximum of Logged Data				8.731	SD of logged Data					0.429	
1466												
1467	**Assuming Lognormal Distribution**											
1468	95% H-UCL				3571	90% Chebyshev (MVUE) UCL					3647	
1469	95% Chebyshev (MVUE) UCL				4148	97.5% Chebyshev (MVUE) UCL					4842	
1470	99% Chebyshev (MVUE) UCL				6205							
1471												
1472	**Nonparametric Distribution Free UCL Statistics**											
1473	**Data do not follow a Discernible Distribution (0.05)**											
1474												
1475	**Nonparametric Distribution Free UCLs**											
1476	95% CLT UCL				3387	95% Jackknife UCL					3492	
1477	95% Standard Bootstrap UCL				3366	95% Bootstrap-t UCL					6632	
1478	95% Hall's Bootstrap UCL				7948	95% Percentile Bootstrap UCL					3399	
1479	95% BCA Bootstrap UCL				3807							
1480	90% Chebyshev(Mean, Sd) UCL				4047	95% Chebyshev(Mean, Sd) UCL					4709	
1481	97.5% Chebyshev(Mean, Sd) UCL				5627	99% Chebyshev(Mean, Sd) UCL					7431	
1482												
1483	**Suggested UCL to Use**											
1484	95% Student's-t UCL				3492	or 95% Modified-t UCL					3555	
1485												
1486	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1487	Recommendations are based upon data size, data distribution, and skewness.											
1488	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1489	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1490												
1491	**Iron (smw12)**											
1492												
1493	**General Statistics**											
1494	Total Number of Observations				8	Number of Distinct Observations					8	
1495	Number of Detects				7	Number of Non-Detects					1	
1496	Number of Distinct Detects				7	Number of Distinct Non-Detects					1	
1497	Minimum Detect				36.5	Minimum Non-Detect					109	
1498	Maximum Detect				112	Maximum Non-Detect					109	
1499	Variance Detects				601.2	Percent Non-Detects					12.5%	
1500	Mean Detects				65.44	SD Detects					24.52	
1501	Median Detects				58.6	CV Detects					0.375	
1502	Skewness Detects				1.204	Kurtosis Detects					1.713	
1503	Mean of Logged Detects				4.126	SD of Logged Detects					0.355	
1504												
1505	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1506	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1507	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1508	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											

1509												
1510	**Normal GOF Test on Detects Only**											
1511					Shapiro Wilk Test Statistic	0.907	**Shapiro Wilk GOF Test**					
1512					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level					
1513					Lilliefors Test Statistic	0.233	**Lilliefors GOF Test**					
1514					5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level					
1515	**Detected Data appear Normal at 5% Significance Level**											
1516												
1517	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1518					KM Mean	64.47			KM Standard Error of Mean	8.592		
1519					KM SD	21.91			95% KM (BCA) UCL	80.24		
1520					95% KM (t) UCL	80.75			95% KM (Percentile Bootstrap) UCL	77.89		
1521					95% KM (z) UCL	78.6			95% KM Bootstrap t UCL	94.58		
1522					90% KM Chebyshev UCL	90.25			95% KM Chebyshev UCL	101.9		
1523					97.5% KM Chebyshev UCL	118.1			99% KM Chebyshev UCL	150		
1524												
1525	**Gamma GOF Tests on Detected Observations Only**											
1526					A-D Test Statistic	0.28	**Anderson-Darling GOF Test**					
1527					5% A-D Critical Value	0.709	Detected data appear Gamma Distributed at 5% Significance Level					
1528					K-S Test Statistic	0.191	**Kolmogorov-Smirnov GOF**					
1529					5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level					
1530	**Detected data appear Gamma Distributed at 5% Significance Level**											
1531												
1532	**Gamma Statistics on Detected Data Only**											
1533					k hat (MLE)	9.18			k star (bias corrected MLE)	5.341		
1534					Theta hat (MLE)	7.129			Theta star (bias corrected MLE)	12.25		
1535					nu hat (MLE)	128.5			nu star (bias corrected)	74.77		
1536					Mean (detects)	65.44						
1537												
1538	**Gamma ROS Statistics using Imputed Non-Detects**											
1539	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1540	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1541	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1542	This is especially true when the sample size is small.											
1543	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1544					Minimum	36.5			Mean	64.52		
1545					Maximum	112			Median	58.33		
1546					SD	22.85			CV	0.354		
1547					k hat (MLE)	10.31			k star (bias corrected MLE)	6.527		
1548					Theta hat (MLE)	6.258			Theta star (bias corrected MLE)	9.885		
1549					nu hat (MLE)	165			nu star (bias corrected)	104.4		
1550					Adjusted Level of Significance (β)	0.0195						
1551					Approximate Chi Square Value (104.43, α)	81.85			Adjusted Chi Square Value (104.43, β)	76.8		
1552					95% Gamma Approximate UCL (use when n>=50)	82.32			95% Gamma Adjusted UCL (use when n<50)	87.73		
1553												
1554	**Estimates of Gamma Parameters using KM Estimates**											
1555					Mean (KM)	64.47			SD (KM)	21.91		
1556					Variance (KM)	480			SE of Mean (KM)	8.592		
1557					k hat (KM)	8.661			k star (KM)	5.496		
1558					nu hat (KM)	138.6			nu star (KM)	87.94		
1559					theta hat (KM)	7.444			theta star (KM)	11.73		
1560					80% gamma percentile (KM)	85.76			90% gamma percentile (KM)	101.3		

1561				95% gamma percentile (KM)		115.3				99% gamma percentile (KM)		145
1562												
1563						Gamma Kaplan-Meier (KM) Statistics						
1564				Approximate Chi Square Value (87.94, α)		67.32				Adjusted Chi Square Value (87.94, β)		62.77
1565				95% Gamma Approximate KM-UCL (use when n>=50)		84.22				95% Gamma Adjusted KM-UCL (use when n<50)		90.32
1566												
1567						Lognormal GOF Test on Detected Observations Only						
1568				Shapiro Wilk Test Statistic		0.969				Shapiro Wilk GOF Test		
1569				5% Shapiro Wilk Critical Value		0.803				Detected Data appear Lognormal at 5% Significance Level		
1570				Lilliefors Test Statistic		0.178				Lilliefors GOF Test		
1571				5% Lilliefors Critical Value		0.304				Detected Data appear Lognormal at 5% Significance Level		
1572						Detected Data appear Lognormal at 5% Significance Level						
1573												
1574						Lognormal ROS Statistics Using Imputed Non-Detects						
1575				Mean in Original Scale		64.38				Mean in Log Scale		4.115
1576				SD in Original Scale		22.9				SD in Log Scale		0.33
1577				95% t UCL (assumes normality of ROS data)		79.72				95% Percentile Bootstrap UCL		77.59
1578				95% BCA Bootstrap UCL		80.5				95% Bootstrap t UCL		94.09
1579				95% H-UCL (Log ROS)		84.04						
1580												
1581						Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution						
1582				KM Mean (logged)		4.113				KM Geo Mean		61.15
1583				KM SD (logged)		0.321				95% Critical H Value (KM-Log)		2.084
1584				KM Standard Error of Mean (logged)		0.127				95% H-UCL (KM -Log)		82.88
1585				KM SD (logged)		0.321				95% Critical H Value (KM-Log)		2.084
1586				KM Standard Error of Mean (logged)		0.127						
1587												
1588						DL/2 Statistics						
1589				DL/2 Normal						DL/2 Log-Transformed		
1590				Mean in Original Scale		64.08				Mean in Log Scale		4.11
1591				SD in Original Scale		23.03				SD in Log Scale		0.332
1592				95% t UCL (Assumes normality)		79.5				95% H-Stat UCL		83.77
1593						DL/2 is not a recommended method, provided for comparisons and historical reasons						
1594												
1595						Nonparametric Distribution Free UCL Statistics						
1596						Detected Data appear Normal Distributed at 5% Significance Level						
1597												
1598						Suggested UCL to Use						
1599				95% KM (t) UCL		80.75						
1600												
1601						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1602						Recommendations are based upon data size, data distribution, and skewness.						
1603						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1604						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1605												
1606												
1607	Iron (smw13)											
1608												
1609						General Statistics						
1610				Total Number of Observations		8				Number of Distinct Observations		8
1611										Number of Missing Observations		0
1612				Minimum		51				Mean		1220

1613					Maximum	6210					Median	475.5
1614					SD	2067					Std. Error of Mean	730.7
1615					Coefficient of Variation	1.694					Skewness	2.572
1616												
1617	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1618	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1619	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1620	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1621												
1622	**Normal GOF Test**											
1623					Shapiro Wilk Test Statistic	0.607	**Shapiro Wilk GOF Test**					
1624					5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level					
1625					Lilliefors Test Statistic	0.338	**Lilliefors GOF Test**					
1626					5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level					
1627	**Data Not Normal at 5% Significance Level**											
1628												
1629	**Assuming Normal Distribution**											
1630	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1631					95% Student's-t UCL	2604					95% Adjusted-CLT UCL (Chen-1995)	3132
1632											95% Modified-t UCL (Johnson-1978)	2715
1633												
1634	**Gamma GOF Test**											
1635					A-D Test Statistic	0.433	**Anderson-Darling Gamma GOF Test**					
1636					5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level					
1637					K-S Test Statistic	0.2	**Kolmogorov-Smirnov Gamma GOF Test**					
1638					5% K-S Critical Value	0.307	Detected data appear Gamma Distributed at 5% Significance Level					
1639	**Detected data appear Gamma Distributed at 5% Significance Level**											
1640												
1641	**Gamma Statistics**											
1642					k hat (MLE)	0.617					k star (bias corrected MLE)	0.469
1643					Theta hat (MLE)	1978					Theta star (bias corrected MLE)	2602
1644					nu hat (MLE)	9.87					nu star (bias corrected)	7.502
1645					MLE Mean (bias corrected)	1220					MLE Sd (bias corrected)	1782
1646											Approximate Chi Square Value (0.05)	2.45
1647					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	1.784
1648												
1649	**Assuming Gamma Distribution**											
1650					95% Approximate Gamma UCL (use when n>=50)	3736					95% Adjusted Gamma UCL (use when n<50)	5129
1651												
1652	**Lognormal GOF Test**											
1653					Shapiro Wilk Test Statistic	0.981	**Shapiro Wilk Lognormal GOF Test**					
1654					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1655					Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**					
1656					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1657	**Data appear Lognormal at 5% Significance Level**											
1658												
1659	**Lognormal Statistics**											
1660					Minimum of Logged Data	3.932					Mean of logged Data	6.109
1661					Maximum of Logged Data	8.734					SD of logged Data	1.512
1662												
1663	**Assuming Lognormal Distribution**											
1664					95% H-UCL	21569					90% Chebyshev (MVUE) UCL	2919

1665				95% Chebyshev (MVUE) UCL		3735				97.5% Chebyshev (MVUE) UCL		4867
1666				99% Chebyshev (MVUE) UCL		7092						
1667												
1668						**Nonparametric Distribution Free UCL Statistics**							
1669						**Data appear to follow a Discernible Distribution at 5% Significance Level**						
1670												
1671						**Nonparametric Distribution Free UCLs**						
1672				95% CLT UCL		2422				95% Jackknife UCL		2604
1673				95% Standard Bootstrap UCL		2374				95% Bootstrap-t UCL		7324
1674				95% Hall's Bootstrap UCL		7281				95% Percentile Bootstrap UCL		2565
1675				95% BCA Bootstrap UCL		3045						
1676				90% Chebyshev(Mean, Sd) UCL		3412				95% Chebyshev(Mean, Sd) UCL		4405
1677				97.5% Chebyshev(Mean, Sd) UCL		5783				99% Chebyshev(Mean, Sd) UCL		8490
1678												
1679						**Suggested UCL to Use**						
1680				95% Adjusted Gamma UCL		5129						
1681												
1682						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1683						Recommendations are based upon data size, data distribution, and skewness.						
1684						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1685						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1686												
1687												
1688	**Iron (smw14)**											
1689												
1690						**General Statistics**						
1691				Total Number of Observations		8				Number of Distinct Observations		8
1692										Number of Missing Observations		0
1693				Minimum		291				Mean		901.4
1694				Maximum		1760				Median		755.5
1695				SD		563				Std. Error of Mean		199.1
1696				Coefficient of Variation		0.625				Skewness		0.778
1697												
1698						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1699						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
1700						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
1701						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
1702												
1703						**Normal GOF Test**						
1704				Shapiro Wilk Test Statistic		0.87				**Shapiro Wilk GOF Test**		
1705				5% Shapiro Wilk Critical Value		0.818				Data appear Normal at 5% Significance Level		
1706				Lilliefors Test Statistic		0.21				**Lilliefors GOF Test**		
1707				5% Lilliefors Critical Value		0.283				Data appear Normal at 5% Significance Level		
1708						**Data appear Normal at 5% Significance Level**						
1709												
1710						**Assuming Normal Distribution**						
1711				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
1712				95% Student's-t UCL		1279				95% Adjusted-CLT UCL (Chen-1995)		1287
1713										95% Modified-t UCL (Johnson-1978)		1288
1714												
1715						**Gamma GOF Test**						
1716				A-D Test Statistic		0.326				**Anderson-Darling Gamma GOF Test**		

1717				5% A-D Critical Value		0.721	Detected data appear Gamma Distributed at 5% Significance Level					
1718				K-S Test Statistic		0.186	**Kolmogorov-Smirnov Gamma GOF Test**					
1719				5% K-S Critical Value		0.296	Detected data appear Gamma Distributed at 5% Significance Level					
1720	**Detected data appear Gamma Distributed at 5% Significance Level**											
1721												
1722	**Gamma Statistics**											
1723				k hat (MLE)		2.993	k star (bias corrected MLE)					1.954
1724				Theta hat (MLE)		301.1	Theta star (bias corrected MLE)					461.3
1725				nu hat (MLE)		47.89	nu star (bias corrected)					31.27
1726				MLE Mean (bias corrected)		901.4	MLE Sd (bias corrected)					644.8
1727							Approximate Chi Square Value (0.05)					19.49
1728				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					17.18
1729												
1730	**Assuming Gamma Distribution**											
1731			95% Approximate Gamma UCL (use when n>=50))			1446	95% Adjusted Gamma UCL (use when n<50)					1640
1732												
1733	**Lognormal GOF Test**											
1734				Shapiro Wilk Test Statistic		0.944	**Shapiro Wilk Lognormal GOF Test**					
1735				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
1736				Lilliefors Test Statistic		0.15	**Lilliefors Lognormal GOF Test**					
1737				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
1738	**Data appear Lognormal at 5% Significance Level**											
1739												
1740	**Lognormal Statistics**											
1741				Minimum of Logged Data		5.673	Mean of logged Data					6.628
1742				Maximum of Logged Data		7.473	SD of logged Data					0.644
1743												
1744	**Assuming Lognormal Distribution**											
1745				95% H-UCL		1758	90% Chebyshev (MVUE) UCL					1528
1746				95% Chebyshev (MVUE) UCL		1811	97.5% Chebyshev (MVUE) UCL					2204
1747				99% Chebyshev (MVUE) UCL		2976						
1748												
1749	**Nonparametric Distribution Free UCL Statistics**											
1750	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1751												
1752	**Nonparametric Distribution Free UCLs**											
1753				95% CLT UCL		1229	95% Jackknife UCL					1279
1754				95% Standard Bootstrap UCL		1211	95% Bootstrap-t UCL					1470
1755				95% Hall's Bootstrap UCL		1516	95% Percentile Bootstrap UCL					1213
1756				95% BCA Bootstrap UCL		1251						
1757				90% Chebyshev(Mean, Sd) UCL		1499	95% Chebyshev(Mean, Sd) UCL					1769
1758				97.5% Chebyshev(Mean, Sd) UCL		2145	99% Chebyshev(Mean, Sd) UCL					2882
1759												
1760	**Suggested UCL to Use**											
1761				95% Student's-t UCL		1279						
1762												
1763	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1764	Recommendations are based upon data size, data distribution, and skewness.											
1765	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1766	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1767												
1768												

1769	**Iron (smw15)**											
1770												
1771	**General Statistics**											
1772					Total Number of Observations	9			Number of Distinct Observations	9		
1773									Number of Missing Observations	0		
1774					Minimum	252			Mean	7460		
1775					Maximum	20800			Median	6620		
1776					SD	6022			Std. Error of Mean	2007		
1777					Coefficient of Variation	0.807			Skewness	1.377		
1778												
1779	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1780	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1781	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1782	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1783												
1784	**Normal GOF Test**											
1785					Shapiro Wilk Test Statistic	0.895			**Shapiro Wilk GOF Test**			
1786					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
1787					Lilliefors Test Statistic	0.173			**Lilliefors GOF Test**			
1788					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
1789	**Data appear Normal at 5% Significance Level**											
1790												
1791	**Assuming Normal Distribution**											
1792					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
1793					95% Student's-t UCL	11193			95% Adjusted-CLT UCL (Chen-1995)	11747		
1794									95% Modified-t UCL (Johnson-1978)	11347		
1795												
1796	**Gamma GOF Test**											
1797					A-D Test Statistic	0.305			**Anderson-Darling Gamma GOF Test**			
1798					5% A-D Critical Value	0.738			Detected data appear Gamma Distributed at 5% Significance Level			
1799					K-S Test Statistic	0.176			**Kolmogorov-Smirnov Gamma GOF Test**			
1800					5% K-S Critical Value	0.285			Detected data appear Gamma Distributed at 5% Significance Level			
1801	**Detected data appear Gamma Distributed at 5% Significance Level**											
1802												
1803	**Gamma Statistics**											
1804					k hat (MLE)	1.284			k star (bias corrected MLE)	0.93		
1805					Theta hat (MLE)	5810			Theta star (bias corrected MLE)	8021		
1806					nu hat (MLE)	23.11			nu star (bias corrected)	16.74		
1807					MLE Mean (bias corrected)	7460			MLE Sd (bias corrected)	7736		
1808									Approximate Chi Square Value (0.05)	8.487		
1809					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	7.282		
1810												
1811	**Assuming Gamma Distribution**											
1812					95% Approximate Gamma UCL (use when n>=50))	14715			95% Adjusted Gamma UCL (use when n<50)	17150		
1813												
1814	**Lognormal GOF Test**											
1815					Shapiro Wilk Test Statistic	0.839			**Shapiro Wilk Lognormal GOF Test**			
1816					5% Shapiro Wilk Critical Value	0.829			Data appear Lognormal at 5% Significance Level			
1817					Lilliefors Test Statistic	0.25			**Lilliefors Lognormal GOF Test**			
1818					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
1819	**Data appear Lognormal at 5% Significance Level**											
1820												

1821	**Lognormal Statistics**											
1822					Minimum of Logged Data	5.529			Mean of logged Data	8.48		
1823					Maximum of Logged Data	9.943			SD of logged Data	1.257		
1824												
1825	**Assuming Lognormal Distribution**											
1826					95% H-UCL	58325			90% Chebyshev (MVUE) UCL	21461		
1827					95% Chebyshev (MVUE) UCL	26965			97.5% Chebyshev (MVUE) UCL	34605		
1828					99% Chebyshev (MVUE) UCL	49610						
1829												
1830	**Nonparametric Distribution Free UCL Statistics**											
1831	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1832												
1833	**Nonparametric Distribution Free UCLs**											
1834					95% CLT UCL	10762			95% Jackknife UCL	11193		
1835					95% Standard Bootstrap UCL	10572			95% Bootstrap-t UCL	12814		
1836					95% Hall's Bootstrap UCL	26883			95% Percentile Bootstrap UCL	10553		
1837					95% BCA Bootstrap UCL	11419						
1838					90% Chebyshev(Mean, Sd) UCL	13483			95% Chebyshev(Mean, Sd) UCL	16211		
1839					97.5% Chebyshev(Mean, Sd) UCL	19997			99% Chebyshev(Mean, Sd) UCL	27434		
1840												
1841	**Suggested UCL to Use**											
1842					95% Student's-t UCL	11193						
1843												
1844	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1845	Recommendations are based upon data size, data distribution, and skewness.											
1846	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1847	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1848												
1849												
1850	**Iron (smw16)**											
1851												
1852	**General Statistics**											
1853					Total Number of Observations	9			Number of Distinct Observations	9		
1854									Number of Missing Observations	0		
1855					Minimum	3200			Mean	5682		
1856					Maximum	7750			Median	5020		
1857					SD	1676			Std. Error of Mean	558.8		
1858					Coefficient of Variation	0.295			Skewness	0.0535		
1859												
1860	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1861	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1862	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1863	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1864												
1865	**Normal GOF Test**											
1866					Shapiro Wilk Test Statistic	0.895			**Shapiro Wilk GOF Test**			
1867					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
1868					Lilliefors Test Statistic	0.209			**Lilliefors GOF Test**			
1869					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
1870	**Data appear Normal at 5% Significance Level**											
1871												
1872	**Assuming Normal Distribution**											

	A	B	C	D	E	F	G	H	I	J	K	L
1873	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1874					95% Student's-t UCL	6721					95% Adjusted-CLT UCL (Chen-1995)	6612
1875											95% Modified-t UCL (Johnson-1978)	6723
1876												
1877	**Gamma GOF Test**											
1878					A-D Test Statistic	0.466	**Anderson-Darling Gamma GOF Test**					
1879					5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level					
1880					K-S Test Statistic	0.192	**Kolmogorov-Smirnov Gamma GOF Test**					
1881					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
1882	**Detected data appear Gamma Distributed at 5% Significance Level**											
1883												
1884	**Gamma Statistics**											
1885					k hat (MLE)	12.35					k star (bias corrected MLE)	8.31
1886					Theta hat (MLE)	459.9					Theta star (bias corrected MLE)	683.8
1887					nu hat (MLE)	222.4					nu star (bias corrected)	149.6
1888					MLE Mean (bias corrected)	5682					MLE Sd (bias corrected)	1971
1889											Approximate Chi Square Value (0.05)	122.3
1890					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	117.1
1891												
1892	**Assuming Gamma Distribution**											
1893			95% Approximate Gamma UCL (use when n>=50))			6949					95% Adjusted Gamma UCL (use when n<50)	7257
1894												
1895	**Lognormal GOF Test**											
1896					Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk Lognormal GOF Test**					
1897					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1898					Lilliefors Test Statistic	0.186	**Lilliefors Lognormal GOF Test**					
1899					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1900	**Data appear Lognormal at 5% Significance Level**											
1901												
1902	**Lognormal Statistics**											
1903					Minimum of Logged Data	8.071					Mean of logged Data	8.604
1904					Maximum of Logged Data	8.955					SD of logged Data	0.309
1905												
1906	**Assuming Lognormal Distribution**											
1907					95% H-UCL	7133					90% Chebyshev (MVUE) UCL	7456
1908					95% Chebyshev (MVUE) UCL	8257					97.5% Chebyshev (MVUE) UCL	9368
1909					99% Chebyshev (MVUE) UCL	11551						
1910												
1911	**Nonparametric Distribution Free UCL Statistics**											
1912	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1913												
1914	**Nonparametric Distribution Free UCLs**											
1915					95% CLT UCL	6601					95% Jackknife UCL	6721
1916					95% Standard Bootstrap UCL	6565					95% Bootstrap-t UCL	6775
1917					95% Hall's Bootstrap UCL	6445					95% Percentile Bootstrap UCL	6496
1918					95% BCA Bootstrap UCL	6530						
1919					90% Chebyshev(Mean, Sd) UCL	7359					95% Chebyshev(Mean, Sd) UCL	8118
1920					97.5% Chebyshev(Mean, Sd) UCL	9172					99% Chebyshev(Mean, Sd) UCL	11242
1921												
1922	**Suggested UCL to Use**											
1923					95% Student's-t UCL	6721						
1924												

	A	B	C	D	E	F	G	H	I	J	K	L
1925	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1926	Recommendations are based upon data size, data distribution, and skewness.											
1927	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1928	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1929												
1930	**Iron (smw16d)**											
1931												
1932	**General Statistics**											
1933						Total Number of Observations	8			Number of Distinct Observations	7	
1934						Number of Detects	2			Number of Non-Detects	6	
1935						Number of Distinct Detects	2			Number of Distinct Non-Detects	5	
1936						Minimum Detect	83.2			Minimum Non-Detect	6.8	
1937						Maximum Detect	594			Maximum Non-Detect	109	
1938						Variance Detects	130458			Percent Non-Detects	75%	
1939						Mean Detects	338.6			SD Detects	361.2	
1940						Median Detects	338.6			CV Detects	1.067	
1941						Skewness Detects	N/A			Kurtosis Detects	N/A	
1942						Mean of Logged Detects	5.404			SD of Logged Detects	1.39	
1943												
1944	**Warning: Data set has only 2 Detected Values.**											
1945	**This is not enough to compute meaningful or reliable statistics and estimates.**											
1946												
1947												
1948	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1949	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1950	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1951	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1952												
1953	**Normal GOF Test on Detects Only**											
1954	**Not Enough Data to Perform GOF Test**											
1955												
1956	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1957						KM Mean	91.34			KM Standard Error of Mean	96.08	
1958						KM SD	191.8			95% KM (BCA) UCL	N/A	
1959						95% KM (t) UCL	273.4			95% KM (Percentile Bootstrap) UCL	N/A	
1960						95% KM (z) UCL	249.4			95% KM Bootstrap t UCL	N/A	
1961						90% KM Chebyshev UCL	379.6			95% KM Chebyshev UCL	510.1	
1962						97.5% KM Chebyshev UCL	691.3			99% KM Chebyshev UCL	1047	
1963												
1964	**Gamma GOF Tests on Detected Observations Only**											
1965	**Not Enough Data to Perform GOF Test**											
1966												
1967	**Gamma Statistics on Detected Data Only**											
1968						k hat (MLE)	1.33			k star (bias corrected MLE)	N/A	
1969						Theta hat (MLE)	254.5			Theta star (bias corrected MLE)	N/A	
1970						nu hat (MLE)	5.321			nu star (bias corrected)	N/A	
1971						Mean (detects)	338.6					
1972												
1973	**Estimates of Gamma Parameters using KM Estimates**											
1974						Mean (KM)	91.34			SD (KM)	191.8	
1975						Variance (KM)	36804			SE of Mean (KM)	96.08	
1976						k hat (KM)	0.227			k star (KM)	0.225	

1977					nu hat (KM)	3.627				nu star (KM)	3.6	
1978					theta hat (KM)	402.9				theta star (KM)	405.9	
1979					80% gamma percentile (KM)	127.3				90% gamma percentile (KM)	275.7	
1980					95% gamma percentile (KM)	455.8				99% gamma percentile (KM)	942.6	
1981												
1982					**Gamma Kaplan-Meier (KM) Statistics**							
1983										Adjusted Level of Significance (β)	0.0195	
1984					Approximate Chi Square Value (3.60, α)	0.57				Adjusted Chi Square Value (3.60, β)	0.339	
1985					95% Gamma Approximate KM-UCL (use when n>=50)	576.5				95% Gamma Adjusted KM-UCL (use when n<50)	969.6	
1986												
1987					**Lognormal GOF Test on Detected Observations Only**							
1988					**Not Enough Data to Perform GOF Test**							
1989												
1990					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1991					Mean in Original Scale	87.19				Mean in Log Scale	2.148	
1992					SD in Original Scale	206.7				SD in Log Scale	2.147	
1993					95% t UCL (assumes normality of ROS data)	225.6				95% Percentile Bootstrap UCL	225.2	
1994					95% BCA Bootstrap UCL	298.6				95% Bootstrap t UCL	9559	
1995					95% H-UCL (Log ROS)	17504						
1996												
1997					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1998					KM Mean (logged)	2.841				KM Geo Mean	17.13	
1999					KM SD (logged)	1.6				95% Critical H Value (KM-Log)	5.014	
2000					KM Standard Error of Mean (logged)	0.819				95% H-UCL (KM -Log)	1276	
2001					KM SD (logged)	1.6				95% Critical H Value (KM-Log)	5.014	
2002					KM Standard Error of Mean (logged)	0.819						
2003												
2004					**DL/2 Statistics**							
2005					**DL/2 Normal**					**DL/2 Log-Transformed**		
2006					Mean in Original Scale	95.23				Mean in Log Scale	2.943	
2007					SD in Original Scale	203.7				SD in Log Scale	1.805	
2008					95% t UCL (Assumes normality)	231.7				95% H-Stat UCL	4371	
2009					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2010												
2011					**Nonparametric Distribution Free UCL Statistics**							
2012					**Data do not follow a Discernible Distribution at 5% Significance Level**							
2013												
2014					**Suggested UCL to Use**							
2015					95% KM (Chebyshev) UCL	510.1						
2016												
2017					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2018					Recommendations are based upon data size, data distribution, and skewness.							
2019					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2020					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2021												
2022												
2023	**Iron (smw17)**											
2024												
2025					**General Statistics**							
2026					Total Number of Observations	8				Number of Distinct Observations	8	
2027										Number of Missing Observations	0	
2028					Minimum	135				Mean	2396	

2029					Maximum	15400					Median	406
2030					SD	5284					Std. Error of Mean	1868
2031					Coefficient of Variation	2.205					Skewness	2.768
2032												
2033	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2034	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2035	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2036	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2037												
2038	**Normal GOF Test**											
2039					Shapiro Wilk Test Statistic	0.498	**Shapiro Wilk GOF Test**					
2040					5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level					
2041					Lilliefors Test Statistic	0.418	**Lilliefors GOF Test**					
2042					5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level					
2043	**Data Not Normal at 5% Significance Level**											
2044												
2045	**Assuming Normal Distribution**											
2046	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2047					95% Student's-t UCL	5935					95% Adjusted-CLT UCL (Chen-1995)	7422
2048											95% Modified-t UCL (Johnson-1978)	6240
2049												
2050	**Gamma GOF Test**											
2051					A-D Test Statistic	1.053	**Anderson-Darling Gamma GOF Test**					
2052					5% A-D Critical Value	0.771	Data Not Gamma Distributed at 5% Significance Level					
2053					K-S Test Statistic	0.329	**Kolmogorov-Smirnov Gamma GOF Test**					
2054					5% K-S Critical Value	0.311	Data Not Gamma Distributed at 5% Significance Level					
2055	**Data Not Gamma Distributed at 5% Significance Level**											
2056												
2057	**Gamma Statistics**											
2058					k hat (MLE)	0.449					k star (bias corrected MLE)	0.364
2059					Theta hat (MLE)	5338					Theta star (bias corrected MLE)	6585
2060					nu hat (MLE)	7.181					nu star (bias corrected)	5.822
2061					MLE Mean (bias corrected)	2396					MLE Sd (bias corrected)	3972
2062											Approximate Chi Square Value (0.05)	1.549
2063					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	1.06
2064												
2065	**Assuming Gamma Distribution**											
2066					95% Approximate Gamma UCL (use when n>=50))	9003					95% Adjusted Gamma UCL (use when n<50)	13161
2067												
2068	**Lognormal GOF Test**											
2069					Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk Lognormal GOF Test**					
2070					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
2071					Lilliefors Test Statistic	0.219	**Lilliefors Lognormal GOF Test**					
2072					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
2073	**Data appear Lognormal at 5% Significance Level**											
2074												
2075	**Lognormal Statistics**											
2076					Minimum of Logged Data	4.905					Mean of logged Data	6.342
2077					Maximum of Logged Data	9.642					SD of logged Data	1.59
2078												
2079	**Assuming Lognormal Distribution**											
2080					95% H-UCL	40386					90% Chebyshev (MVUE) UCL	4142

2081				95% Chebyshev (MVUE) UCL	5320					97.5% Chebyshev (MVUE) UCL	6955	
2082				99% Chebyshev (MVUE) UCL	10167							
2083												
2084				**Nonparametric Distribution Free UCL Statistics**								
2085				**Data appear to follow a Discernible Distribution at 5% Significance Level**								
2086												
2087				**Nonparametric Distribution Free UCLs**								
2088				95% CLT UCL	5469					95% Jackknife UCL	5935	
2089				95% Standard Bootstrap UCL	5211					95% Bootstrap-t UCL	58608	
2090				95% Hall's Bootstrap UCL	32180					95% Percentile Bootstrap UCL	5993	
2091				95% BCA Bootstrap UCL	7828							
2092				90% Chebyshev(Mean, Sd) UCL	8000					95% Chebyshev(Mean, Sd) UCL	10539	
2093				97.5% Chebyshev(Mean, Sd) UCL	14063					99% Chebyshev(Mean, Sd) UCL	20984	
2094												
2095				**Suggested UCL to Use**								
2096				99% Chebyshev (Mean, Sd) UCL	20984							
2097												
2098				**Recommended UCL exceeds the maximum observation**								
2099												
2100				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
2101				Recommendations are based upon data size, data distribution, and skewness.								
2102				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
2103				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
2104												
2105	**Iron (smw17d)**											
2106												
2107				**General Statistics**								
2108				Total Number of Observations	8					Number of Distinct Observations	8	
2109				Number of Detects	5					Number of Non-Detects	3	
2110				Number of Distinct Detects	5					Number of Distinct Non-Detects	3	
2111				Minimum Detect	11.5					Minimum Non-Detect	14.1	
2112				Maximum Detect	24.6					Maximum Non-Detect	109	
2113				Variance Detects	27.87					Percent Non-Detects	37.5%	
2114				Mean Detects	16.24					SD Detects	5.279	
2115				Median Detects	14.7					CV Detects	0.325	
2116				Skewness Detects	1.208					Kurtosis Detects	1.01	
2117				Mean of Logged Detects	2.749					SD of Logged Detects	0.305	
2118												
2119				**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**								
2120				**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**								
2121				**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**								
2122				**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**								
2123												
2124				**Normal GOF Test on Detects Only**								
2125				Shapiro Wilk Test Statistic	0.899					**Shapiro Wilk GOF Test**		
2126				5% Shapiro Wilk Critical Value	0.762					Detected Data appear Normal at 5% Significance Level		
2127				Lilliefors Test Statistic	0.215					**Lilliefors GOF Test**		
2128				5% Lilliefors Critical Value	0.343					Detected Data appear Normal at 5% Significance Level		
2129				**Detected Data appear Normal at 5% Significance Level**								
2130												
2131				**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**								
2132				KM Mean	15.53					KM Standard Error of Mean	2.101	

2133				KM SD	4.595				95% KM (BCA) UCL	19.5		
2134				95% KM (t) UCL	19.51				95% KM (Percentile Bootstrap) UCL	18.92		
2135				95% KM (z) UCL	18.99				95% KM Bootstrap t UCL	24.77		
2136				90% KM Chebyshev UCL	21.84				95% KM Chebyshev UCL	24.69		
2137				97.5% KM Chebyshev UCL	28.65				99% KM Chebyshev UCL	36.43		
2138												
2139				**Gamma GOF Tests on Detected Observations Only**								
2140				A-D Test Statistic	0.291	**Anderson-Darling GOF Test**						
2141				5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level						
2142				K-S Test Statistic	0.203	**Kolmogorov-Smirnov GOF**						
2143				5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level						
2144				**Detected data appear Gamma Distributed at 5% Significance Level**								
2145												
2146				**Gamma Statistics on Detected Data Only**								
2147				k hat (MLE)	13.06				k star (bias corrected MLE)	5.356		
2148				Theta hat (MLE)	1.244				Theta star (bias corrected MLE)	3.032		
2149				nu hat (MLE)	130.6				nu star (bias corrected)	53.56		
2150				Mean (detects)	16.24							
2151												
2152				**Gamma ROS Statistics using Imputed Non-Detects**								
2153				GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs								
2154				GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)								
2155				For such situations, GROS method may yield incorrect values of UCLs and BTVs								
2156				This is especially true when the sample size is small.								
2157				For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates								
2158				Minimum	11.45				Mean	15.35		
2159				Maximum	24.6				Median	14.88		
2160				SD	4.322				CV	0.282		
2161				k hat (MLE)	16.74				k star (bias corrected MLE)	10.54		
2162				Theta hat (MLE)	0.917				Theta star (bias corrected MLE)	1.456		
2163				nu hat (MLE)	267.8				nu star (bias corrected)	168.7		
2164				Adjusted Level of Significance (β)	0.0195							
2165				Approximate Chi Square Value (168.71, α)	139.7				Adjusted Chi Square Value (168.71, β)	133		
2166				95% Gamma Approximate UCL (use when n>=50)	18.54				95% Gamma Adjusted UCL (use when n<50)	19.47		
2167												
2168				**Estimates of Gamma Parameters using KM Estimates**								
2169				Mean (KM)	15.53				SD (KM)	4.595		
2170				Variance (KM)	21.12				SE of Mean (KM)	2.101		
2171				k hat (KM)	11.43				k star (KM)	7.225		
2172				nu hat (KM)	182.8				nu star (KM)	115.6		
2173				theta hat (KM)	1.359				theta star (KM)	2.15		
2174				80% gamma percentile (KM)	20.07				90% gamma percentile (KM)	23.25		
2175				95% gamma percentile (KM)	26.1				99% gamma percentile (KM)	32.02		
2176												
2177				**Gamma Kaplan-Meier (KM) Statistics**								
2178				Approximate Chi Square Value (115.59, α)	91.77				Adjusted Chi Square Value (115.59, β)	86.41		
2179				95% Gamma Approximate KM-UCL (use when n>=50)	19.57				95% Gamma Adjusted KM-UCL (use when n<50)	20.78		
2180												
2181				**Lognormal GOF Test on Detected Observations Only**								
2182				Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**						
2183				5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level						
2184				Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**						

2185				5% Lilliefors Critical Value		0.343	Detected Data appear Lognormal at 5% Significance Level					
2186	**Detected Data appear Lognormal at 5% Significance Level**											
2187												
2188	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2189				Mean in Original Scale		15.34				Mean in Log Scale		2.701
2190				SD in Original Scale		4.286				SD in Log Scale		0.25
2191			95% t UCL (assumes normality of ROS data)			18.21				95% Percentile Bootstrap UCL		17.81
2192				95% BCA Bootstrap UCL		18.79				95% Bootstrap t UCL		20.66
2193				95% H-UCL (Log ROS)		18.56						
2194												
2195	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2196				KM Mean (logged)		2.705				KM Geo Mean		14.95
2197				KM SD (logged)		0.268				95% Critical H Value (KM-Log)		2.019
2198			KM Standard Error of Mean (logged)			0.123				95% H-UCL (KM -Log)		19.02
2199				KM SD (logged)		0.268				95% Critical H Value (KM-Log)		2.019
2200			KM Standard Error of Mean (logged)			0.123						
2201												
2202	**DL/2 Statistics**											
2203	**DL/2 Normal**						**DL/2 Log-Transformed**					
2204				Mean in Original Scale		20.97				Mean in Log Scale		2.864
2205				SD in Original Scale		14.92				SD in Log Scale		0.619
2206				95% t UCL (Assumes normality)		30.96				95% H-Stat UCL		38.74
2207	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2208												
2209	**Nonparametric Distribution Free UCL Statistics**											
2210	**Detected Data appear Normal Distributed at 5% Significance Level**											
2211												
2212	**Suggested UCL to Use**											
2213				95% KM (t) UCL		19.51						
2214												
2215	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2216	Recommendations are based upon data size, data distribution, and skewness.											
2217	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2218	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2219												
2220												
2221	**Iron (smw18)**											
2222												
2223	**General Statistics**											
2224				Total Number of Observations		8				Number of Distinct Observations		8
2225										Number of Missing Observations		0
2226				Minimum		479				Mean		1191
2227				Maximum		3140				Median		955
2228				SD		867.7				Std. Error of Mean		306.8
2229				Coefficient of Variation		0.729				Skewness		1.937
2230												
2231	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2232	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2233	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2234	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2235												
2236	**Normal GOF Test**											

	A	B	C	D	E	F	G	H	I	J	K	L
2237					Shapiro Wilk Test Statistic	0.786	**Shapiro Wilk GOF Test**					
2238					5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level					
2239					Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**					
2240					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
2241	**Data appear Approximate Normal at 5% Significance Level**											
2242												
2243	**Assuming Normal Distribution**											
2244	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2245					95% Student's-t UCL	1772				95% Adjusted-CLT UCL (Chen-1995)	1920	
2246										95% Modified-t UCL (Johnson-1978)	1807	
2247												
2248	**Gamma GOF Test**											
2249					A-D Test Statistic	0.372	**Anderson-Darling Gamma GOF Test**					
2250					5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level					
2251					K-S Test Statistic	0.2	**Kolmogorov-Smirnov Gamma GOF Test**					
2252					5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level					
2253	**Detected data appear Gamma Distributed at 5% Significance Level**											
2254												
2255	**Gamma Statistics**											
2256					k hat (MLE)	2.877				k star (bias corrected MLE)	1.881	
2257					Theta hat (MLE)	413.9				Theta star (bias corrected MLE)	632.9	
2258					nu hat (MLE)	46.03				nu star (bias corrected)	30.1	
2259					MLE Mean (bias corrected)	1191				MLE Sd (bias corrected)	868.1	
2260										Approximate Chi Square Value (0.05)	18.57	
2261					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	16.32	
2262												
2263	**Assuming Gamma Distribution**											
2264					95% Approximate Gamma UCL (use when n>=50))	1930				95% Adjusted Gamma UCL (use when n<50)	2196	
2265												
2266	**Lognormal GOF Test**											
2267					Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk Lognormal GOF Test**					
2268					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
2269					Lilliefors Test Statistic	0.161	**Lilliefors Lognormal GOF Test**					
2270					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
2271	**Data appear Lognormal at 5% Significance Level**											
2272												
2273	**Lognormal Statistics**											
2274					Minimum of Logged Data	6.172				Mean of logged Data	6.899	
2275					Maximum of Logged Data	8.052				SD of logged Data	0.621	
2276												
2277	**Assuming Lognormal Distribution**											
2278					95% H-UCL	2200				90% Chebyshev (MVUE) UCL	1951	
2279					95% Chebyshev (MVUE) UCL	2305				97.5% Chebyshev (MVUE) UCL	2796	
2280					99% Chebyshev (MVUE) UCL	3761						
2281												
2282	**Nonparametric Distribution Free UCL Statistics**											
2283	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2284												
2285	**Nonparametric Distribution Free UCLs**											
2286					95% CLT UCL	1695				95% Jackknife UCL	1772	
2287					95% Standard Bootstrap UCL	1661				95% Bootstrap-t UCL	2563	
2288					95% Hall's Bootstrap UCL	4181				95% Percentile Bootstrap UCL	1752	

2289				95% BCA Bootstrap UCL		1975						
2290				90% Chebyshev(Mean, Sd) UCL		2111				95% Chebyshev(Mean, Sd) UCL		2528
2291				97.5% Chebyshev(Mean, Sd) UCL		3107				99% Chebyshev(Mean, Sd) UCL		4243
2292												
2293					**Suggested UCL to Use**							
2294				95% Student's-t UCL		1772						
2295												
2296	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2297	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2298												
2299	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2300	Recommendations are based upon data size, data distribution, and skewness.											
2301	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2302	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2303												
2304	**Iron (smw18d)**											
2305												
2306	**General Statistics**											
2307				Total Number of Observations		8				Number of Distinct Observations		8
2308				Number of Detects		7				Number of Non-Detects		1
2309				Number of Distinct Detects		7				Number of Distinct Non-Detects		1
2310				Minimum Detect		24.7				Minimum Non-Detect		109
2311				Maximum Detect		132				Maximum Non-Detect		109
2312				Variance Detects		1496				Percent Non-Detects		12.5%
2313				Mean Detects		70.24				SD Detects		38.68
2314				Median Detects		60				CV Detects		0.551
2315				Skewness Detects		0.502				Kurtosis Detects		-0.765
2316				Mean of Logged Detects		4.106				SD of Logged Detects		0.605
2317												
2318	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2319	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2320	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2321	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2322												
2323	**Normal GOF Test on Detects Only**											
2324				Shapiro Wilk Test Statistic		0.956				**Shapiro Wilk GOF Test**		
2325				5% Shapiro Wilk Critical Value		0.803				Detected Data appear Normal at 5% Significance Level		
2326				Lilliefors Test Statistic		0.176				**Lilliefors GOF Test**		
2327				5% Lilliefors Critical Value		0.304				Detected Data appear Normal at 5% Significance Level		
2328	**Detected Data appear Normal at 5% Significance Level**											
2329												
2330	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2331				KM Mean		68.96				KM Standard Error of Mean		13.97
2332				KM SD		35.04				95% KM (BCA) UCL		90.36
2333				95% KM (t) UCL		95.42				95% KM (Percentile Bootstrap) UCL		90.86
2334				95% KM (z) UCL		91.93				95% KM Bootstrap t UCL		98.69
2335				90% KM Chebyshev UCL		110.9				95% KM Chebyshev UCL		129.8
2336				97.5% KM Chebyshev UCL		156.2				99% KM Chebyshev UCL		207.9
2337												
2338	**Gamma GOF Tests on Detected Observations Only**											
2339				A-D Test Statistic		0.187				**Anderson-Darling GOF Test**		
2340				5% A-D Critical Value		0.711				Detected data appear Gamma Distributed at 5% Significance Level		

2341					K-S Test Statistic	0.149	**Kolmogorov-Smirnov GOF**					
2342					5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level					
2343	**Detected data appear Gamma Distributed at 5% Significance Level**											
2344												
2345	**Gamma Statistics on Detected Data Only**											
2346					k hat (MLE)	3.587	k star (bias corrected MLE)	2.145				
2347					Theta hat (MLE)	19.58	Theta star (bias corrected MLE)	32.75				
2348					nu hat (MLE)	50.22	nu star (bias corrected)	30.03				
2349					Mean (detects)	70.24						
2350												
2351	**Gamma ROS Statistics using Imputed Non-Detects**											
2352	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2353	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2354	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2355	This is especially true when the sample size is small.											
2356	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2357					Minimum	24.7	Mean	68.61				
2358					Maximum	132	Median	58.61				
2359					SD	36.1	CV	0.526				
2360					k hat (MLE)	4.012	k star (bias corrected MLE)	2.591				
2361					Theta hat (MLE)	17.1	Theta star (bias corrected MLE)	26.49				
2362					nu hat (MLE)	64.18	nu star (bias corrected)	41.45				
2363					Adjusted Level of Significance (β)	0.0195						
2364					Approximate Chi Square Value (41.45, α)	27.69	Adjusted Chi Square Value (41.45, β)	24.88				
2365					95% Gamma Approximate UCL (use when n>=50)	102.7	95% Gamma Adjusted UCL (use when n<50)	114.3				
2366												
2367	**Estimates of Gamma Parameters using KM Estimates**											
2368					Mean (KM)	68.96	SD (KM)	35.04				
2369					Variance (KM)	1228	SE of Mean (KM)	13.97				
2370					k hat (KM)	3.873	k star (KM)	2.504				
2371					nu hat (KM)	61.97	nu star (KM)	40.06				
2372					theta hat (KM)	17.81	theta star (KM)	27.54				
2373					80% gamma percentile (KM)	100.5	90% gamma percentile (KM)	127.3				
2374					95% gamma percentile (KM)	152.6	99% gamma percentile (KM)	207.9				
2375												
2376	**Gamma Kaplan-Meier (KM) Statistics**											
2377					Approximate Chi Square Value (40.06, α)	26.56	Adjusted Chi Square Value (40.06, β)	23.81				
2378					95% Gamma Approximate KM-UCL (use when n>=50)	104	95% Gamma Adjusted KM-UCL (use when n<50)	116				
2379												
2380	**Lognormal GOF Test on Detected Observations Only**											
2381					Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**					
2382					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
2383					Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**					
2384					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
2385	**Detected Data appear Lognormal at 5% Significance Level**											
2386												
2387	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2388					Mean in Original Scale	68.06	Mean in Log Scale	4.089				
2389					SD in Original Scale	36.34	SD in Log Scale	0.563				
2390					95% t UCL (assumes normality of ROS data)	92.4	95% Percentile Bootstrap UCL	90.59				
2391					95% BCA Bootstrap UCL	90.56	95% Bootstrap t UCL	100				
2392					95% H-UCL (Log ROS)	118						

2393												
2394	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2395				KM Mean (logged)		4.09				KM Geo Mean		59.74
2396				KM SD (logged)		0.555				95% Critical H Value (KM-Log)		2.45
2397				KM Standard Error of Mean (logged)		0.224				95% H-UCL (KM -Log)		116.5
2398				KM SD (logged)		0.555				95% Critical H Value (KM-Log)		2.45
2399				KM Standard Error of Mean (logged)		0.224						
2400												
2401	**DL/2 Statistics**											
2402	**DL/2 Normal**									**DL/2 Log-Transformed**		
2403				Mean in Original Scale		68.28				Mean in Log Scale		4.093
2404				SD in Original Scale		36.24				SD in Log Scale		0.562
2405				95% t UCL (Assumes normality)		92.55				95% H-Stat UCL		118.3
2406	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2407												
2408	**Nonparametric Distribution Free UCL Statistics**											
2409	**Detected Data appear Normal Distributed at 5% Significance Level**											
2410												
2411	**Suggested UCL to Use**											
2412				95% KM (t) UCL		95.42						
2413												
2414	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2415	Recommendations are based upon data size, data distribution, and skewness.											
2416	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2417	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2418												
2419												
2420	**Iron (smw19)**											
2421												
2422	**General Statistics**											
2423				Total Number of Observations		8				Number of Distinct Observations		8
2424										Number of Missing Observations		0
2425				Minimum		192				Mean		5417
2426				Maximum		24500				Median		549.5
2427				SD		8620				Std. Error of Mean		3048
2428				Coefficient of Variation		1.591				Skewness		1.911
2429												
2430	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2431	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2432	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2433	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2434												
2435	**Normal GOF Test**											
2436				Shapiro Wilk Test Statistic		0.702				**Shapiro Wilk GOF Test**		
2437				5% Shapiro Wilk Critical Value		0.818				Data Not Normal at 5% Significance Level		
2438				Lilliefors Test Statistic		0.329				**Lilliefors GOF Test**		
2439				5% Lilliefors Critical Value		0.283				Data Not Normal at 5% Significance Level		
2440	**Data Not Normal at 5% Significance Level**											
2441												
2442	**Assuming Normal Distribution**											
2443	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
2444				95% Student's-t UCL		11191				95% Adjusted-CLT UCL (Chen-1995)		12630

2445											95% Modified-t UCL (Johnson-1978)	11534
2446												
2447	**Gamma GOF Test**											
2448					A-D Test Statistic	0.734	**Anderson-Darling Gamma GOF Test**					
2449					5% A-D Critical Value	0.775	Detected data appear Gamma Distributed at 5% Significance Level					
2450					K-S Test Statistic	0.286	**Kolmogorov-Smirnov Gamma GOF Test**					
2451					5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level					
2452	**Detected data appear Gamma Distributed at 5% Significance Level**											
2453												
2454	**Gamma Statistics**											
2455					k hat (MLE)	0.428	k star (bias corrected MLE)					0.351
2456					Theta hat (MLE)	12661	Theta star (bias corrected MLE)					15444
2457					nu hat (MLE)	6.846	nu star (bias corrected)					5.612
2458					MLE Mean (bias corrected)	5417	MLE Sd (bias corrected)					9147
2459							Approximate Chi Square Value (0.05)					1.445
2460					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value					0.978
2461												
2462	**Assuming Gamma Distribution**											
2463					95% Approximate Gamma UCL (use when n>=50)	21040	95% Adjusted Gamma UCL (use when n<50)					31069
2464												
2465	**Lognormal GOF Test**											
2466					Shapiro Wilk Test Statistic	0.833	**Shapiro Wilk Lognormal GOF Test**					
2467					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
2468					Lilliefors Test Statistic	0.253	**Lilliefors Lognormal GOF Test**					
2469					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
2470	**Data appear Lognormal at 5% Significance Level**											
2471												
2472	**Lognormal Statistics**											
2473					Minimum of Logged Data	5.257	Mean of logged Data					7.076
2474					Maximum of Logged Data	10.11	SD of logged Data					1.996
2475												
2476	**Assuming Lognormal Distribution**											
2477					95% H-UCL	879390	90% Chebyshev (MVUE) UCL					16090
2478					95% Chebyshev (MVUE) UCL	20976	97.5% Chebyshev (MVUE) UCL					27759
2479					99% Chebyshev (MVUE) UCL	41081						
2480												
2481	**Nonparametric Distribution Free UCL Statistics**											
2482	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2483												
2484	**Nonparametric Distribution Free UCLs**											
2485					95% CLT UCL	10430	95% Jackknife UCL					11191
2486					95% Standard Bootstrap UCL	9980	95% Bootstrap-t UCL					22084
2487					95% Hall's Bootstrap UCL	27486	95% Percentile Bootstrap UCL					10624
2488					95% BCA Bootstrap UCL	12700						
2489					90% Chebyshev(Mean, Sd) UCL	14560	95% Chebyshev(Mean, Sd) UCL					18702
2490					97.5% Chebyshev(Mean, Sd) UCL	24450	99% Chebyshev(Mean, Sd) UCL					35742
2491												
2492	**Suggested UCL to Use**											
2493					95% Adjusted Gamma UCL	31069						
2494												
2495	**Recommended UCL exceeds the maximum observation**											
2496												

	A	B	C	D	E	F	G	H	I	J	K	L
2497	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2498	Recommendations are based upon data size, data distribution, and skewness.											
2499	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2500	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2501												
2502	**Iron (smw7)**											
2503												
2504	**General Statistics**											
2505						Total Number of Observations	8				Number of Distinct Observations	7	
2506						Number of Detects	1				Number of Non-Detects	7	
2507						Number of Distinct Detects	1				Number of Distinct Non-Detects	6	
2508													
2509	**Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!**											
2510	**It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).**											
2511												
2512	**The data set for variable Iron (smw7) was not processed!**											
2513												
2514												
2515												
2516	**Iron (smw8)**											
2517												
2518	**General Statistics**											
2519						Total Number of Observations	8				Number of Distinct Observations	8	
2520											Number of Missing Observations	0	
2521						Minimum	1070				Mean	1333	
2522						Maximum	1640				Median	1340	
2523						SD	214.7				Std. Error of Mean	75.92	
2524						Coefficient of Variation	0.161				Skewness	0.107	
2525													
2526	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2527	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2528	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2529	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2530												
2531	**Normal GOF Test**											
2532						Shapiro Wilk Test Statistic	0.917				**Shapiro Wilk GOF Test**		
2533						5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level		
2534						Lilliefors Test Statistic	0.19				**Lilliefors GOF Test**		
2535						5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
2536	**Data appear Normal at 5% Significance Level**											
2537													
2538	**Assuming Normal Distribution**											
2539	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**			
2540						95% Student's-t UCL	1476				95% Adjusted-CLT UCL (Chen-1995)	1460	
2541											95% Modified-t UCL (Johnson-1978)	1477	
2542													
2543	**Gamma GOF Test**											
2544						A-D Test Statistic	0.396				**Anderson-Darling Gamma GOF Test**		
2545						5% A-D Critical Value	0.715				Detected data appear Gamma Distributed at 5% Significance Level		
2546						K-S Test Statistic	0.205				**Kolmogorov-Smirnov Gamma GOF Test**		
2547						5% K-S Critical Value	0.294				Detected data appear Gamma Distributed at 5% Significance Level		
2548	**Detected data appear Gamma Distributed at 5% Significance Level**											

2549												
2550	**Gamma Statistics**											
2551					k hat (MLE)	43.83			k star (bias corrected MLE)	27.48		
2552					Theta hat (MLE)	30.4			Theta star (bias corrected MLE)	48.5		
2553					nu hat (MLE)	701.2			nu star (bias corrected)	439.6		
2554					MLE Mean (bias corrected)	1333			MLE Sd (bias corrected)	254.2		
2555									Approximate Chi Square Value (0.05)	392		
2556					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	380.6		
2557												
2558	**Assuming Gamma Distribution**											
2559					95% Approximate Gamma UCL (use when n>=50))	1494			95% Adjusted Gamma UCL (use when n<50)	1539		
2560												
2561	**Lognormal GOF Test**											
2562					Shapiro Wilk Test Statistic	0.915			**Shapiro Wilk Lognormal GOF Test**			
2563					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
2564					Lilliefors Test Statistic	0.194			**Lilliefors Lognormal GOF Test**			
2565					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
2566	**Data appear Lognormal at 5% Significance Level**											
2567												
2568	**Lognormal Statistics**											
2569					Minimum of Logged Data	6.975			Mean of logged Data	7.183		
2570					Maximum of Logged Data	7.402			SD of logged Data	0.162		
2571												
2572	**Assuming Lognormal Distribution**											
2573					95% H-UCL	1500			90% Chebyshev (MVUE) UCL	1562		
2574					95% Chebyshev (MVUE) UCL	1666			97.5% Chebyshev (MVUE) UCL	1810		
2575					99% Chebyshev (MVUE) UCL	2093						
2576												
2577	**Nonparametric Distribution Free UCL Statistics**											
2578	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2579												
2580	**Nonparametric Distribution Free UCLs**											
2581					95% CLT UCL	1457			95% Jackknife UCL	1476		
2582					95% Standard Bootstrap UCL	1451			95% Bootstrap-t UCL	1490		
2583					95% Hall's Bootstrap UCL	1436			95% Percentile Bootstrap UCL	1449		
2584					95% BCA Bootstrap UCL	1454						
2585					90% Chebyshev(Mean, Sd) UCL	1560			95% Chebyshev(Mean, Sd) UCL	1663		
2586					97.5% Chebyshev(Mean, Sd) UCL	1807			99% Chebyshev(Mean, Sd) UCL	2088		
2587												
2588	**Suggested UCL to Use**											
2589					95% Student's-t UCL	1476						
2590												
2591	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2592	Recommendations are based upon data size, data distribution, and skewness.											
2593	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2594	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2595												
2596	**Iron (smw9)**											
2597												
2598	**General Statistics**											
2599					Total Number of Observations	9			Number of Distinct Observations	9		
2600					Number of Detects	6			Number of Non-Detects	3		

2601				Number of Distinct Detects	6					Number of Distinct Non-Detects	3	
2602				Minimum Detect	15					Minimum Non-Detect	11.5	
2603				Maximum Detect	68.6					Maximum Non-Detect	109	
2604				Variance Detects	345					Percent Non-Detects	33.33%	
2605				Mean Detects	40.03					SD Detects	18.57	
2606				Median Detects	40.2					CV Detects	0.464	
2607				Skewness Detects	0.298					Kurtosis Detects	0.158	
2608				Mean of Logged Detects	3.585					SD of Logged Detects	0.529	
2609												
2610	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2611	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2612	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2613	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2614												
2615	**Normal GOF Test on Detects Only**											
2616				Shapiro Wilk Test Statistic	0.988					**Shapiro Wilk GOF Test**		
2617				5% Shapiro Wilk Critical Value	0.788					Detected Data appear Normal at 5% Significance Level		
2618				Lilliefors Test Statistic	0.156					**Lilliefors GOF Test**		
2619				5% Lilliefors Critical Value	0.325					Detected Data appear Normal at 5% Significance Level		
2620	**Detected Data appear Normal at 5% Significance Level**											
2621												
2622	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2623				KM Mean	33.12					KM Standard Error of Mean	7.35	
2624				KM SD	18.96					95% KM (BCA) UCL	45.63	
2625				95% KM (t) UCL	46.79					95% KM (Percentile Bootstrap) UCL	44.68	
2626				95% KM (z) UCL	45.21					95% KM Bootstrap t UCL	47.3	
2627				90% KM Chebyshev UCL	55.17					95% KM Chebyshev UCL	65.16	
2628				97.5% KM Chebyshev UCL	79.02					99% KM Chebyshev UCL	106.3	
2629												
2630	**Gamma GOF Tests on Detected Observations Only**											
2631				A-D Test Statistic	0.185					**Anderson-Darling GOF Test**		
2632				5% A-D Critical Value	0.698					Detected data appear Gamma Distributed at 5% Significance Level		
2633				K-S Test Statistic	0.168					**Kolmogorov-Smirnov GOF**		
2634				5% K-S Critical Value	0.333					Detected data appear Gamma Distributed at 5% Significance Level		
2635	**Detected data appear Gamma Distributed at 5% Significance Level**											
2636												
2637	**Gamma Statistics on Detected Data Only**											
2638				k hat (MLE)	4.925					k star (bias corrected MLE)	2.574	
2639				Theta hat (MLE)	8.128					Theta star (bias corrected MLE)	15.55	
2640				nu hat (MLE)	59.1					nu star (bias corrected)	30.88	
2641				Mean (detects)	40.03							
2642												
2643	**Gamma ROS Statistics using Imputed Non-Detects**											
2644	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2645	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2646	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2647	This is especially true when the sample size is small.											
2648	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2649				Minimum	1.936					Mean	31.17	
2650				Maximum	68.6					Median	29.01	
2651				SD	21					CV	0.674	
2652				k hat (MLE)	1.562					k star (bias corrected MLE)	1.116	

2653					Theta hat (MLE)	19.95					Theta star (bias corrected MLE)	27.94
2654					nu hat (MLE)	28.12					nu star (bias corrected)	20.08
2655					Adjusted Level of Significance (β)	0.0231						
2656					Approximate Chi Square Value (20.08, α)	10.91					Adjusted Chi Square Value (20.08, β)	9.517
2657					95% Gamma Approximate UCL (use when n>=50)	57.37					95% Gamma Adjusted UCL (use when n<50)	65.77
2658												
2659					**Estimates of Gamma Parameters using KM Estimates**							
2660					Mean (KM)	33.12					SD (KM)	18.96
2661					Variance (KM)	359.6					SE of Mean (KM)	7.35
2662					k hat (KM)	3.05					k star (KM)	2.107
2663					nu hat (KM)	54.9					nu star (KM)	37.93
2664					theta hat (KM)	10.86					theta star (KM)	15.71
2665					80% gamma percentile (KM)	49.28					90% gamma percentile (KM)	63.63
2666					95% gamma percentile (KM)	77.27					99% gamma percentile (KM)	107.4
2667												
2668					**Gamma Kaplan-Meier (KM) Statistics**							
2669					Approximate Chi Square Value (37.93, α)	24.83					Adjusted Chi Square Value (37.93, β)	22.62
2670					95% Gamma Approximate KM-UCL (use when n>=50)	50.6					95% Gamma Adjusted KM-UCL (use when n<50)	55.54
2671												
2672					**Lognormal GOF Test on Detected Observations Only**							
2673					Shapiro Wilk Test Statistic	0.962					**Shapiro Wilk GOF Test**	
2674					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Lognormal at 5% Significance Level	
2675					Lilliefors Test Statistic	0.169					**Lilliefors GOF Test**	
2676					5% Lilliefors Critical Value	0.325					Detected Data appear Lognormal at 5% Significance Level	
2677					**Detected Data appear Lognormal at 5% Significance Level**							
2678												
2679					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2680					Mean in Original Scale	32.23					Mean in Log Scale	3.294
2681					SD in Original Scale	19.34					SD in Log Scale	0.661
2682					95% t UCL (assumes normality of ROS data)	44.22					95% Percentile Bootstrap UCL	42.57
2683					95% BCA Bootstrap UCL	43.99					95% Bootstrap t UCL	46.46
2684					95% H-UCL (Log ROS)	60.9						
2685												
2686					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2687					KM Mean (logged)	3.316					KM Geo Mean	27.54
2688					KM SD (logged)	0.629					95% Critical H Value (KM-Log)	2.493
2689					KM Standard Error of Mean (logged)	0.244					95% H-UCL (KM -Log)	58.41
2690					KM SD (logged)	0.629					95% Critical H Value (KM-Log)	2.493
2691					KM Standard Error of Mean (logged)	0.244						
2692												
2693					**DL/2 Statistics**							
2694					**DL/2 Normal**						**DL/2 Log-Transformed**	
2695					Mean in Original Scale	34.41					Mean in Log Scale	3.276
2696					SD in Original Scale	21.72					SD in Log Scale	0.861
2697					95% t UCL (Assumes normality)	47.87					95% H-Stat UCL	93.71
2698					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2699												
2700					**Nonparametric Distribution Free UCL Statistics**							
2701					**Detected Data appear Normal Distributed at 5% Significance Level**							
2702												
2703					**Suggested UCL to Use**							
2704					95% KM (t) UCL	46.79						

2705												
2706	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2707	Recommendations are based upon data size, data distribution, and skewness.											
2708	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2709	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2710												
2711												
2712	**Iron (tw2r)**											
2713												
2714	**General Statistics**											
2715						Total Number of Observations	9			Number of Distinct Observations	9	
2716										Number of Missing Observations	0	
2717						Minimum	940			Mean	7348	
2718						Maximum	32800			Median	4820	
2719						SD	9792			Std. Error of Mean	3264	
2720						Coefficient of Variation	1.333			Skewness	2.717	
2721												
2722	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2723	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2724	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2725	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2726												
2727	**Normal GOF Test**											
2728						Shapiro Wilk Test Statistic	0.606			**Shapiro Wilk GOF Test**		
2729						5% Shapiro Wilk Critical Value	0.829			Data Not Normal at 5% Significance Level		
2730						Lilliefors Test Statistic	0.375			**Lilliefors GOF Test**		
2731						5% Lilliefors Critical Value	0.274			Data Not Normal at 5% Significance Level		
2732	**Data Not Normal at 5% Significance Level**											
2733												
2734	**Assuming Normal Distribution**											
2735						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
2736						95% Student's-t UCL	13417			95% Adjusted-CLT UCL (Chen-1995)	15875	
2737										95% Modified-t UCL (Johnson-1978)	13910	
2738												
2739	**Gamma GOF Test**											
2740						A-D Test Statistic	0.584			**Anderson-Darling Gamma GOF Test**		
2741						5% A-D Critical Value	0.741			Detected data appear Gamma Distributed at 5% Significance Level		
2742						K-S Test Statistic	0.247			**Kolmogorov-Smirnov Gamma GOF Test**		
2743						5% K-S Critical Value	0.286			Detected data appear Gamma Distributed at 5% Significance Level		
2744	**Detected data appear Gamma Distributed at 5% Significance Level**											
2745												
2746	**Gamma Statistics**											
2747						k hat (MLE)	1.123			k star (bias corrected MLE)	0.823	
2748						Theta hat (MLE)	6542			Theta star (bias corrected MLE)	8930	
2749						nu hat (MLE)	20.22			nu star (bias corrected)	14.81	
2750						MLE Mean (bias corrected)	7348			MLE Sd (bias corrected)	8100	
2751										Approximate Chi Square Value (0.05)	7.13	
2752						Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	6.042	
2753												
2754	**Assuming Gamma Distribution**											
2755						95% Approximate Gamma UCL (use when n>=50)	15263			95% Adjusted Gamma UCL (use when n<50)	18011	
2756												

2757	**Lognormal GOF Test**											
2758					Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**					
2759					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
2760					Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**					
2761					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
2762	**Data appear Lognormal at 5% Significance Level**											
2763												
2764	**Lognormal Statistics**											
2765					Minimum of Logged Data	6.846	Mean of logged Data	8.395				
2766					Maximum of Logged Data	10.4	SD of logged Data	1.013				
2767												
2768	**Assuming Lognormal Distribution**											
2769					95% H-UCL	23837	90% Chebyshev (MVUE) UCL	14045				
2770					95% Chebyshev (MVUE) UCL	17303	97.5% Chebyshev (MVUE) UCL	21826				
2771					99% Chebyshev (MVUE) UCL	30709						
2772												
2773	**Nonparametric Distribution Free UCL Statistics**											
2774	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2775												
2776	**Nonparametric Distribution Free UCLs**											
2777					95% CLT UCL	12716	95% Jackknife UCL	13417				
2778					95% Standard Bootstrap UCL	12519	95% Bootstrap-t UCL	27727				
2779					95% Hall's Bootstrap UCL	35782	95% Percentile Bootstrap UCL	13317				
2780					95% BCA Bootstrap UCL	16376						
2781					90% Chebyshev(Mean, Sd) UCL	17139	95% Chebyshev(Mean, Sd) UCL	21575				
2782					97.5% Chebyshev(Mean, Sd) UCL	27731	99% Chebyshev(Mean, Sd) UCL	39823				
2783												
2784	**Suggested UCL to Use**											
2785					95% Adjusted Gamma UCL	18011						
2786												
2787	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2788	Recommendations are based upon data size, data distribution, and skewness.											
2789	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2790	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2791												
2792												
2793	**Iron (tw5r)**											
2794												
2795	**General Statistics**											
2796					Total Number of Observations	8	Number of Distinct Observations	8				
2797							Number of Missing Observations	0				
2798					Minimum	2600	Mean	3255				
2799					Maximum	4050	Median	3245				
2800					SD	547.9	Std. Error of Mean	193.7				
2801					Coefficient of Variation	0.168	Skewness	0.197				
2802												
2803	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2804	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2805	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2806	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2807												
2808	**Normal GOF Test**											

2809				Shapiro Wilk Test Statistic		0.932	**Shapiro Wilk GOF Test**					
2810				5% Shapiro Wilk Critical Value		0.818	Data appear Normal at 5% Significance Level					
2811				Lilliefors Test Statistic		0.172	**Lilliefors GOF Test**					
2812				5% Lilliefors Critical Value		0.283	Data appear Normal at 5% Significance Level					
2813	**Data appear Normal at 5% Significance Level**											
2814												
2815	**Assuming Normal Distribution**											
2816	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2817				95% Student's-t UCL		3622	95% Adjusted-CLT UCL (Chen-1995)					3588
2818							95% Modified-t UCL (Johnson-1978)					3624
2819												
2820	**Gamma GOF Test**											
2821				A-D Test Statistic		0.302	**Anderson-Darling Gamma GOF Test**					
2822				5% A-D Critical Value		0.715	Detected data appear Gamma Distributed at 5% Significance Level					
2823				K-S Test Statistic		0.186	**Kolmogorov-Smirnov Gamma GOF Test**					
2824				5% K-S Critical Value		0.294	Detected data appear Gamma Distributed at 5% Significance Level					
2825	**Detected data appear Gamma Distributed at 5% Significance Level**											
2826												
2827	**Gamma Statistics**											
2828				k hat (MLE)		40.41	k star (bias corrected MLE)					25.34
2829				Theta hat (MLE)		80.55	Theta star (bias corrected MLE)					128.5
2830				nu hat (MLE)		646.5	nu star (bias corrected)					405.4
2831				MLE Mean (bias corrected)		3255	MLE Sd (bias corrected)					646.6
2832							Approximate Chi Square Value (0.05)					359.7
2833				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					348.8
2834												
2835	**Assuming Gamma Distribution**											
2836				95% Approximate Gamma UCL (use when n>=50))		3668	95% Adjusted Gamma UCL (use when n<50)					3783
2837												
2838	**Lognormal GOF Test**											
2839				Shapiro Wilk Test Statistic		0.931	**Shapiro Wilk Lognormal GOF Test**					
2840				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
2841				Lilliefors Test Statistic		0.169	**Lilliefors Lognormal GOF Test**					
2842				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
2843	**Data appear Lognormal at 5% Significance Level**											
2844												
2845	**Lognormal Statistics**											
2846				Minimum of Logged Data		7.863	Mean of logged Data					8.076
2847				Maximum of Logged Data		8.306	SD of logged Data					0.169
2848												
2849	**Assuming Lognormal Distribution**											
2850				95% H-UCL		3683	90% Chebyshev (MVUE) UCL					3838
2851				95% Chebyshev (MVUE) UCL		4102	97.5% Chebyshev (MVUE) UCL					4469
2852				99% Chebyshev (MVUE) UCL		5188						
2853												
2854	**Nonparametric Distribution Free UCL Statistics**											
2855	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2856												
2857	**Nonparametric Distribution Free UCLs**											
2858				95% CLT UCL		3574	95% Jackknife UCL					3622
2859				95% Standard Bootstrap UCL		3548	95% Bootstrap-t UCL					3673
2860				95% Hall's Bootstrap UCL		3513	95% Percentile Bootstrap UCL					3556

	A	B	C	D	E	F	G	H	I	J	K	L
2861				95% BCA Bootstrap UCL		3563						
2862				90% Chebyshev(Mean, Sd) UCL		3836				95% Chebyshev(Mean, Sd) UCL		4099
2863				97.5% Chebyshev(Mean, Sd) UCL		4465				99% Chebyshev(Mean, Sd) UCL		5182
2864												
2865						**Suggested UCL to Use**						
2866				95% Student's-t UCL		3622						
2867												
2868						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
2869						Recommendations are based upon data size, data distribution, and skewness.						
2870						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
2871						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
2872												
2873												
2874	**Iron (waste water clarifier well)**											
2875												
2876						**General Statistics**						
2877					Total Number of Observations	1				Number of Distinct Observations		1
2878										Number of Missing Observations		0
2879					Minimum	11200				Mean		11200
2880					Maximum	11200				Median		11200
2881												
2882						**Warning: This data set only has 1 observations!**						
2883						**Data set is too small to compute reliable and meaningful statistics and estimates!**						
2884						**The data set for variable Iron (waste water clarifier well) was not processed!**						
2885												
2886						**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**						
2887						**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**						
2888												
2889												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:02:48 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Manganese (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	1670	Mean	2673
Maximum	4100	Median	2470
SD	796.9	Std. Error of Mean	265.6
Coefficient of Variation	0.298	Skewness	0.573

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	3167	95% Adjusted-CLT UCL (Chen-1995)	3164
		95% Modified-t UCL (Johnson-1978)	3176

Gamma GOF Test

A-D Test Statistic	0.302	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.18	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.92	k star (bias corrected MLE)	8.689
Theta hat (MLE)	206.9	Theta star (bias corrected MLE)	307.7
nu hat (MLE)	232.6	nu star (bias corrected)	156.4
MLE Mean (bias corrected)	2673	MLE Sd (bias corrected)	906.9
		Approximate Chi Square Value (0.05)	128.5
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	123.2

53	**Assuming Gamma Distribution**											
54	95% Approximate Gamma UCL (use when n>=50))					3254	95% Adjusted Gamma UCL (use when n<50)					3395
55												
56	**Lognormal GOF Test**											
57	Shapiro Wilk Test Statistic					0.948	**Shapiro Wilk Lognormal GOF Test**					
58	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
59	Lilliefors Test Statistic					0.181	**Lilliefors Lognormal GOF Test**					
60	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64	Minimum of Logged Data					7.421	Mean of logged Data					7.852
65	Maximum of Logged Data					8.319	SD of logged Data					0.297
66												
67	**Assuming Lognormal Distribution**											
68	95% H-UCL					3319	90% Chebyshev (MVUE) UCL					3473
69	95% Chebyshev (MVUE) UCL					3835	97.5% Chebyshev (MVUE) UCL					4338
70	99% Chebyshev (MVUE) UCL					5326						
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
74												
75	**Nonparametric Distribution Free UCLs**											
76	95% CLT UCL					3110	95% Jackknife UCL					3167
77	95% Standard Bootstrap UCL					3084	95% Bootstrap-t UCL					3248
78	95% Hall's Bootstrap UCL					3299	95% Percentile Bootstrap UCL					3123
79	95% BCA Bootstrap UCL					3151						
80	90% Chebyshev(Mean, Sd) UCL					3470	95% Chebyshev(Mean, Sd) UCL					3831
81	97.5% Chebyshev(Mean, Sd) UCL					4332	99% Chebyshev(Mean, Sd) UCL					5316
82												
83	**Suggested UCL to Use**											
84	95% Student's-t UCL					3167						
85												
86	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
87	Recommendations are based upon data size, data distribution, and skewness.											
88	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
89	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
90												
91												
92	**Manganese (nfmw10)**											
93												
94	**General Statistics**											
95	Total Number of Observations					8	Number of Distinct Observations					8
96							Number of Missing Observations					0
97	Minimum					2520	Mean					6263
98	Maximum					8510	Median					6785
99	SD					1941	Std. Error of Mean					686.3
100	Coefficient of Variation					0.31	Skewness					-0.972
101												
102	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
103	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
104	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											

105	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
106												
107	**Normal GOF Test**											
108					Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**					
109					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
110					Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**					
111					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
112	**Data appear Normal at 5% Significance Level**											
113												
114	**Assuming Normal Distribution**											
115	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
116					95% Student's-t UCL	7563				95% Adjusted-CLT UCL (Chen-1995)	7139	
117										95% Modified-t UCL (Johnson-1978)	7523	
118												
119	**Gamma GOF Test**											
120					A-D Test Statistic	0.504	**Anderson-Darling Gamma GOF Test**					
121					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
122					K-S Test Statistic	0.245	**Kolmogorov-Smirnov Gamma GOF Test**					
123					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
124	**Detected data appear Gamma Distributed at 5% Significance Level**											
125												
126	**Gamma Statistics**											
127					k hat (MLE)	8.949				k star (bias corrected MLE)	5.677	
128					Theta hat (MLE)	699.8				Theta star (bias corrected MLE)	1103	
129					nu hat (MLE)	143.2				nu star (bias corrected)	90.83	
130					MLE Mean (bias corrected)	6263				MLE Sd (bias corrected)	2628	
131										Approximate Chi Square Value (0.05)	69.85	
132					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	65.21	
133												
134	**Assuming Gamma Distribution**											
135					95% Approximate Gamma UCL (use when n>=50))	8143				95% Adjusted Gamma UCL (use when n<50)	8722	
136												
137	**Lognormal GOF Test**											
138					Shapiro Wilk Test Statistic	0.829	**Shapiro Wilk Lognormal GOF Test**					
139					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
140					Lilliefors Test Statistic	0.247	**Lilliefors Lognormal GOF Test**					
141					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
142	**Data appear Lognormal at 5% Significance Level**											
143												
144	**Lognormal Statistics**											
145					Minimum of Logged Data	7.832				Mean of logged Data	8.685	
146					Maximum of Logged Data	9.049				SD of logged Data	0.392	
147												
148	**Assuming Lognormal Distribution**											
149					95% H-UCL	8829				90% Chebyshev (MVUE) UCL	8972	
150					95% Chebyshev (MVUE) UCL	10171				97.5% Chebyshev (MVUE) UCL	11835	
151					99% Chebyshev (MVUE) UCL	15105						
152												
153	**Nonparametric Distribution Free UCL Statistics**											
154	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
155												
156	**Nonparametric Distribution Free UCLs**											

157				95% CLT UCL	7391					95% Jackknife UCL	7563	
158				95% Standard Bootstrap UCL	7323					95% Bootstrap-t UCL	7332	
159				95% Hall's Bootstrap UCL	7216					95% Percentile Bootstrap UCL	7314	
160				95% BCA Bootstrap UCL	7163							
161				90% Chebyshev(Mean, Sd) UCL	8321					95% Chebyshev(Mean, Sd) UCL	9254	
162				97.5% Chebyshev(Mean, Sd) UCL	10548					99% Chebyshev(Mean, Sd) UCL	13091	
163												
164					**Suggested UCL to Use**							
165				95% Student's-t UCL	7563							
166												
167	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
168	Recommendations are based upon data size, data distribution, and skewness.											
169	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
170	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
171												
172	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
173	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
174												
175												
176	**Manganese (nfmw11)**											
177												
178					**General Statistics**							
179				Total Number of Observations	8					Number of Distinct Observations	8	
180										Number of Missing Observations	0	
181				Minimum	2500					Mean	3753	
182				Maximum	4570					Median	3715	
183				SD	730.4					Std. Error of Mean	258.2	
184				Coefficient of Variation	0.195					Skewness	-0.518	
185												
186	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
187	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
188	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
189	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
190												
191					**Normal GOF Test**							
192				Shapiro Wilk Test Statistic	0.925					**Shapiro Wilk GOF Test**		
193				5% Shapiro Wilk Critical Value	0.818					Data appear Normal at 5% Significance Level		
194				Lilliefors Test Statistic	0.162					**Lilliefors GOF Test**		
195				5% Lilliefors Critical Value	0.283					Data appear Normal at 5% Significance Level		
196	**Data appear Normal at 5% Significance Level**											
197												
198					**Assuming Normal Distribution**							
199					**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**	
200				95% Student's-t UCL	4242					95% Adjusted-CLT UCL (Chen-1995)	4127	
201										95% Modified-t UCL (Johnson-1978)	4234	
202												
203					**Gamma GOF Test**							
204				A-D Test Statistic	0.359					**Anderson-Darling Gamma GOF Test**		
205				5% A-D Critical Value	0.716					Detected data appear Gamma Distributed at 5% Significance Level		
206				K-S Test Statistic	0.183					**Kolmogorov-Smirnov Gamma GOF Test**		
207				5% K-S Critical Value	0.294					Detected data appear Gamma Distributed at 5% Significance Level		
208	**Detected data appear Gamma Distributed at 5% Significance Level**											

	A	B	C	D	E	F	G	H	I	J	K	L
209												
210	**Gamma Statistics**											
211					k hat (MLE)	27.76			k star (bias corrected MLE)			17.43
212					Theta hat (MLE)	135.2			Theta star (bias corrected MLE)			215.2
213					nu hat (MLE)	444.2			nu star (bias corrected)			279
214					MLE Mean (bias corrected)	3753			MLE Sd (bias corrected)			898.7
215									Approximate Chi Square Value (0.05)			241.3
216					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value			232.4
217												
218	**Assuming Gamma Distribution**											
219					95% Approximate Gamma UCL (use when n>=50))	4339			95% Adjusted Gamma UCL (use when n<50)			4505
220												
221	**Lognormal GOF Test**											
222					Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk Lognormal GOF Test**					
223					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
224					Lilliefors Test Statistic	0.2	**Lilliefors Lognormal GOF Test**					
225					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
226	**Data appear Lognormal at 5% Significance Level**											
227												
228	**Lognormal Statistics**											
229					Minimum of Logged Data	7.824			Mean of logged Data			8.212
230					Maximum of Logged Data	8.427			SD of logged Data			0.208
231												
232	**Assuming Lognormal Distribution**											
233					95% H-UCL	4392			90% Chebyshev (MVUE) UCL			4588
234					95% Chebyshev (MVUE) UCL	4965			97.5% Chebyshev (MVUE) UCL			5488
235					99% Chebyshev (MVUE) UCL	6515						
236												
237	**Nonparametric Distribution Free UCL Statistics**											
238	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
239												
240	**Nonparametric Distribution Free UCLs**											
241					95% CLT UCL	4177			95% Jackknife UCL			4242
242					95% Standard Bootstrap UCL	4160			95% Bootstrap-t UCL			4171
243					95% Hall's Bootstrap UCL	4123			95% Percentile Bootstrap UCL			4133
244					95% BCA Bootstrap UCL	4098						
245					90% Chebyshev(Mean, Sd) UCL	4527			95% Chebyshev(Mean, Sd) UCL			4878
246					97.5% Chebyshev(Mean, Sd) UCL	5365			99% Chebyshev(Mean, Sd) UCL			6322
247												
248	**Suggested UCL to Use**											
249					95% Student's-t UCL	4242						
250												
251	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
252	Recommendations are based upon data size, data distribution, and skewness.											
253	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
254	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
255												
256	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
257	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
258												
259												
260	**Manganese (nfmw12)**											

261												
262	**General Statistics**											
263					Total Number of Observations	8			Number of Distinct Observations	8		
264									Number of Missing Observations	0		
265					Minimum	1880			Mean	4796		
266					Maximum	8100			Median	4515		
267					SD	2235			Std. Error of Mean	790.4		
268					Coefficient of Variation	0.466			Skewness	0.209		
269												
270	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
271	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
272	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
273	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
274												
275	**Normal GOF Test**											
276					Shapiro Wilk Test Statistic	0.938			**Shapiro Wilk GOF Test**			
277					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
278					Lilliefors Test Statistic	0.158			**Lilliefors GOF Test**			
279					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
280	**Data appear Normal at 5% Significance Level**											
281												
282	**Assuming Normal Distribution**											
283					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
284					95% Student's-t UCL	6294			95% Adjusted-CLT UCL (Chen-1995)	6159		
285									95% Modified-t UCL (Johnson-1978)	6303		
286												
287	**Gamma GOF Test**											
288					A-D Test Statistic	0.315			**Anderson-Darling Gamma GOF Test**			
289					5% A-D Critical Value	0.719			Detected data appear Gamma Distributed at 5% Significance Level			
290					K-S Test Statistic	0.181			**Kolmogorov-Smirnov Gamma GOF Test**			
291					5% K-S Critical Value	0.295			Detected data appear Gamma Distributed at 5% Significance Level			
292	**Detected data appear Gamma Distributed at 5% Significance Level**											
293												
294	**Gamma Statistics**											
295					k hat (MLE)	4.663			k star (bias corrected MLE)	2.998		
296					Theta hat (MLE)	1029			Theta star (bias corrected MLE)	1600		
297					nu hat (MLE)	74.61			nu star (bias corrected)	47.96		
298					MLE Mean (bias corrected)	4796			MLE Sd (bias corrected)	2770		
299									Approximate Chi Square Value (0.05)	33.07		
300					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	29.97		
301												
302	**Assuming Gamma Distribution**											
303					95% Approximate Gamma UCL (use when n>=50))	6957			95% Adjusted Gamma UCL (use when n<50)	7676		
304												
305	**Lognormal GOF Test**											
306					Shapiro Wilk Test Statistic	0.914			**Shapiro Wilk Lognormal GOF Test**			
307					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
308					Lilliefors Test Statistic	0.215			**Lilliefors Lognormal GOF Test**			
309					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
310	**Data appear Lognormal at 5% Significance Level**											
311												
312	**Lognormal Statistics**											

313				Minimum of Logged Data		7.539				Mean of logged Data		8.365
314				Maximum of Logged Data		9				SD of logged Data		0.528
315												
316	**Assuming Lognormal Distribution**											
317				95% H-UCL		7972				90% Chebyshev (MVUE) UCL		7584
318				95% Chebyshev (MVUE) UCL		8826				97.5% Chebyshev (MVUE) UCL		10550
319				99% Chebyshev (MVUE) UCL		13936						
320												
321	**Nonparametric Distribution Free UCL Statistics**											
322	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
323												
324	**Nonparametric Distribution Free UCLs**											
325				95% CLT UCL		6096				95% Jackknife UCL		6294
326				95% Standard Bootstrap UCL		6024				95% Bootstrap-t UCL		6366
327				95% Hall's Bootstrap UCL		6629				95% Percentile Bootstrap UCL		6050
328				95% BCA Bootstrap UCL		6064						
329				90% Chebyshev(Mean, Sd) UCL		7167				95% Chebyshev(Mean, Sd) UCL		8241
330				97.5% Chebyshev(Mean, Sd) UCL		9732				99% Chebyshev(Mean, Sd) UCL		12660
331												
332	**Suggested UCL to Use**											
333				95% Student's-t UCL		6294						
334												
335	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
336	Recommendations are based upon data size, data distribution, and skewness.											
337	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
338	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
339												
340												
341	**Manganese (nfmw19)**											
342												
343	**General Statistics**											
344				Total Number of Observations		8				Number of Distinct Observations		8
345										Number of Missing Observations		0
346				Minimum		22500				Mean		40238
347				Maximum		51500				Median		41100
348				SD		9584				Std. Error of Mean		3389
349				Coefficient of Variation		0.238				Skewness		-0.742
350												
351	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
352	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
353	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
354	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
355												
356	**Normal GOF Test**											
357				Shapiro Wilk Test Statistic		0.944				**Shapiro Wilk GOF Test**		
358				5% Shapiro Wilk Critical Value		0.818				Data appear Normal at 5% Significance Level		
359				Lilliefors Test Statistic		0.138				**Lilliefors GOF Test**		
360				5% Lilliefors Critical Value		0.283				Data appear Normal at 5% Significance Level		
361	**Data appear Normal at 5% Significance Level**											
362												
363	**Assuming Normal Distribution**											
364	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		

365				95% Student's-t UCL	46657			95% Adjusted-CLT UCL (Chen-1995)			44861	
366								95% Modified-t UCL (Johnson-1978)			46509	
367												
368	**Gamma GOF Test**											
369				A-D Test Statistic	0.336	**Anderson-Darling Gamma GOF Test**						
370				5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level						
371				K-S Test Statistic	0.155	**Kolmogorov-Smirnov Gamma GOF Test**						
372				5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level						
373	**Detected data appear Gamma Distributed at 5% Significance Level**											
374												
375	**Gamma Statistics**											
376				k hat (MLE)	17.33	k star (bias corrected MLE)	10.91					
377				Theta hat (MLE)	2322	Theta star (bias corrected MLE)	3687					
378				nu hat (MLE)	277.2	nu star (bias corrected)	174.6					
379				MLE Mean (bias corrected)	40238	MLE Sd (bias corrected)	12180					
380						Approximate Chi Square Value (0.05)	145					
381				Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	138.2					
382												
383	**Assuming Gamma Distribution**											
384				95% Approximate Gamma UCL (use when n>=50))	48438	95% Adjusted Gamma UCL (use when n<50)	50828					
385												
386	**Lognormal GOF Test**											
387				Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk Lognormal GOF Test**						
388				5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level						
389				Lilliefors Test Statistic	0.181	**Lilliefors Lognormal GOF Test**						
390				5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level						
391	**Data appear Lognormal at 5% Significance Level**											
392												
393	**Lognormal Statistics**											
394				Minimum of Logged Data	10.02	Mean of logged Data	10.57					
395				Maximum of Logged Data	10.85	SD of logged Data	0.27					
396												
397	**Assuming Lognormal Distribution**											
398				95% H-UCL	49796	90% Chebyshev (MVUE) UCL	51915					
399				95% Chebyshev (MVUE) UCL	57158	97.5% Chebyshev (MVUE) UCL	64434					
400				99% Chebyshev (MVUE) UCL	78728							
401												
402	**Nonparametric Distribution Free UCL Statistics**											
403	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
404												
405	**Nonparametric Distribution Free UCLs**											
406				95% CLT UCL	45811	95% Jackknife UCL	46657					
407				95% Standard Bootstrap UCL	45580	95% Bootstrap-t UCL	45708					
408				95% Hall's Bootstrap UCL	44683	95% Percentile Bootstrap UCL	45363					
409				95% BCA Bootstrap UCL	44613							
410				90% Chebyshev(Mean, Sd) UCL	50403	95% Chebyshev(Mean, Sd) UCL	55008					
411				97.5% Chebyshev(Mean, Sd) UCL	61399	99% Chebyshev(Mean, Sd) UCL	73953					
412												
413	**Suggested UCL to Use**											
414				95% Student's-t UCL	46657							
415												
416	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

417	Recommendations are based upon data size, data distribution, and skewness.											
418	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
419	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
420												
421	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
422	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
423												
424												
425	**Manganese (nfmw1d)**											
426												
427	**General Statistics**											
428					Total Number of Observations	9			Number of Distinct Observations	8		
429									Number of Missing Observations	0		
430					Minimum	2700			Mean	3637		
431					Maximum	5250			Median	3310		
432					SD	768.6			Std. Error of Mean	256.2		
433					Coefficient of Variation	0.211			Skewness	1.167		
434												
435	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
436	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
437	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
438	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
439												
440	**Normal GOF Test**											
441					Shapiro Wilk Test Statistic	0.913			**Shapiro Wilk GOF Test**			
442					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
443					Lilliefors Test Statistic	0.22			**Lilliefors GOF Test**			
444					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
445	**Data appear Normal at 5% Significance Level**											
446												
447	**Assuming Normal Distribution**											
448	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
449					95% Student's-t UCL	4113			95% Adjusted-CLT UCL (Chen-1995)	4165		
450									95% Modified-t UCL (Johnson-1978)	4130		
451												
452	**Gamma GOF Test**											
453					A-D Test Statistic	0.314			**Anderson-Darling Gamma GOF Test**			
454					5% A-D Critical Value	0.721			Detected data appear Gamma Distributed at 5% Significance Level			
455					K-S Test Statistic	0.219			**Kolmogorov-Smirnov Gamma GOF Test**			
456					5% K-S Critical Value	0.279			Detected data appear Gamma Distributed at 5% Significance Level			
457	**Detected data appear Gamma Distributed at 5% Significance Level**											
458												
459	**Gamma Statistics**											
460					k hat (MLE)	27.44			k star (bias corrected MLE)	18.37		
461					Theta hat (MLE)	132.5			Theta star (bias corrected MLE)	198		
462					nu hat (MLE)	494			nu star (bias corrected)	330.6		
463					MLE Mean (bias corrected)	3637			MLE Sd (bias corrected)	848.5		
464									Approximate Chi Square Value (0.05)	289.5		
465					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	281.4		
466												
467	**Assuming Gamma Distribution**											
468					95% Approximate Gamma UCL (use when n>=50))	4153			95% Adjusted Gamma UCL (use when n<50)	4273		

469												
470	**Lognormal GOF Test**											
471					Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk Lognormal GOF Test**					
472					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
473					Lilliefors Test Statistic	0.204	**Lilliefors Lognormal GOF Test**					
474					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
475	**Data appear Lognormal at 5% Significance Level**											
476												
477	**Lognormal Statistics**											
478					Minimum of Logged Data	7.901	Mean of logged Data	8.18				
479					Maximum of Logged Data	8.566	SD of logged Data	0.2				
480												
481	**Assuming Lognormal Distribution**											
482					95% H-UCL	4167	90% Chebyshev (MVUE) UCL	4361				
483					95% Chebyshev (MVUE) UCL	4691	97.5% Chebyshev (MVUE) UCL	5148				
484					99% Chebyshev (MVUE) UCL	6046						
485												
486	**Nonparametric Distribution Free UCL Statistics**											
487	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
488												
489	**Nonparametric Distribution Free UCLs**											
490					95% CLT UCL	4058	95% Jackknife UCL	4113				
491					95% Standard Bootstrap UCL	4028	95% Bootstrap-t UCL	4355				
492					95% Hall's Bootstrap UCL	5258	95% Percentile Bootstrap UCL	4062				
493					95% BCA Bootstrap UCL	4122						
494					90% Chebyshev(Mean, Sd) UCL	4405	95% Chebyshev(Mean, Sd) UCL	4753				
495					97.5% Chebyshev(Mean, Sd) UCL	5237	99% Chebyshev(Mean, Sd) UCL	6186				
496												
497	**Suggested UCL to Use**											
498					95% Student's-t UCL	4113						
499												
500	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
501	Recommendations are based upon data size, data distribution, and skewness.											
502	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
503	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
504												
505												
506	**Manganese (nfmw1s)**											
507												
508	**General Statistics**											
509					Total Number of Observations	7	Number of Distinct Observations	7				
510							Number of Missing Observations	0				
511					Minimum	42.3	Mean	93.53				
512					Maximum	200	Median	83.6				
513					SD	55.57	Std. Error of Mean	21				
514					Coefficient of Variation	0.594	Skewness	1.286				
515												
516	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
517	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
518	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
519	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
520												

521	**Normal GOF Test**											
522					Shapiro Wilk Test Statistic	0.872	**Shapiro Wilk GOF Test**					
523					5% Shapiro Wilk Critical Value	0.803	Data appear Normal at 5% Significance Level					
524					Lilliefors Test Statistic	0.202	**Lilliefors GOF Test**					
525					5% Lilliefors Critical Value	0.304	Data appear Normal at 5% Significance Level					
526	**Data appear Normal at 5% Significance Level**											
527												
528	**Assuming Normal Distribution**											
529	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
530					95% Student's-t UCL	134.3	95% Adjusted-CLT UCL (Chen-1995)	139				
531							95% Modified-t UCL (Johnson-1978)	136				
532												
533	**Gamma GOF Test**											
534					A-D Test Statistic	0.317	**Anderson-Darling Gamma GOF Test**					
535					5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance Level					
536					K-S Test Statistic	0.235	**Kolmogorov-Smirnov Gamma GOF Test**					
537					5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level					
538	**Detected data appear Gamma Distributed at 5% Significance Level**											
539												
540	**Gamma Statistics**											
541					k hat (MLE)	3.763	k star (bias corrected MLE)	2.245				
542					Theta hat (MLE)	24.86	Theta star (bias corrected MLE)	41.65				
543					nu hat (MLE)	52.68	nu star (bias corrected)	31.44				
544					MLE Mean (bias corrected)	93.53	MLE Sd (bias corrected)	62.42				
545							Approximate Chi Square Value (0.05)	19.62				
546					Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	16.87				
547												
548	**Assuming Gamma Distribution**											
549					95% Approximate Gamma UCL (use when n>=50))	149.8	95% Adjusted Gamma UCL (use when n<50)	174.3				
550												
551	**Lognormal GOF Test**											
552					Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk Lognormal GOF Test**					
553					5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level					
554					Lilliefors Test Statistic	0.219	**Lilliefors Lognormal GOF Test**					
555					5% Lilliefors Critical Value	0.304	Data appear Lognormal at 5% Significance Level					
556	**Data appear Lognormal at 5% Significance Level**											
557												
558	**Lognormal Statistics**											
559					Minimum of Logged Data	3.745	Mean of logged Data	4.4				
560					Maximum of Logged Data	5.298	SD of logged Data	0.56				
561												
562	**Assuming Lognormal Distribution**											
563					95% H-UCL	172.2	90% Chebyshev (MVUE) UCL	152.3				
564					95% Chebyshev (MVUE) UCL	179.2	97.5% Chebyshev (MVUE) UCL	216.5				
565					99% Chebyshev (MVUE) UCL	289.9						
566												
567	**Nonparametric Distribution Free UCL Statistics**											
568	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
569												
570	**Nonparametric Distribution Free UCLs**											
571					95% CLT UCL	128.1	95% Jackknife UCL	134.3				
572					95% Standard Bootstrap UCL	125.1	95% Bootstrap-t UCL	157.5				

573				95% Hall's Bootstrap UCL		162.9				95% Percentile Bootstrap UCL		126.1
574				95% BCA Bootstrap UCL		133.1						
575				90% Chebyshev(Mean, Sd) UCL		156.5				95% Chebyshev(Mean, Sd) UCL		185.1
576				97.5% Chebyshev(Mean, Sd) UCL		224.7				99% Chebyshev(Mean, Sd) UCL		302.5
577												
578					**Suggested UCL to Use**							
579				95% Student's-t UCL		134.3						
580												
581	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
582	Recommendations are based upon data size, data distribution, and skewness.											
583	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
584	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
585												
586												
587	**Manganese (nfmw2)**											
588												
589					**General Statistics**							
590				Total Number of Observations		9				Number of Distinct Observations		9
591										Number of Missing Observations		0
592				Minimum		3420				Mean		4452
593				Maximum		6330				Median		4240
594				SD		878.2				Std. Error of Mean		292.7
595				Coefficient of Variation		0.197				Skewness		1.316
596												
597	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
598	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
599	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
600	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
601												
602					**Normal GOF Test**							
603				Shapiro Wilk Test Statistic		0.896				**Shapiro Wilk GOF Test**		
604				5% Shapiro Wilk Critical Value		0.829				Data appear Normal at 5% Significance Level		
605				Lilliefors Test Statistic		0.222				**Lilliefors GOF Test**		
606				5% Lilliefors Critical Value		0.274				Data appear Normal at 5% Significance Level		
607	**Data appear Normal at 5% Significance Level**											
608												
609					**Assuming Normal Distribution**							
610				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
611				95% Student's-t UCL		4997				95% Adjusted-CLT UCL (Chen-1995)		5071
612										95% Modified-t UCL (Johnson-1978)		5018
613												
614					**Gamma GOF Test**							
615				A-D Test Statistic		0.354				**Anderson-Darling Gamma GOF Test**		
616				5% A-D Critical Value		0.721				Detected data appear Gamma Distributed at 5% Significance Level		
617				K-S Test Statistic		0.205				**Kolmogorov-Smirnov Gamma GOF Test**		
618				5% K-S Critical Value		0.279				Detected data appear Gamma Distributed at 5% Significance Level		
619	**Detected data appear Gamma Distributed at 5% Significance Level**											
620												
621					**Gamma Statistics**							
622				k hat (MLE)		31.86				k star (bias corrected MLE)		21.32
623				Theta hat (MLE)		139.7				Theta star (bias corrected MLE)		208.9
624				nu hat (MLE)		573.5				nu star (bias corrected)		383.7

625				MLE Mean (bias corrected)		4452				MLE Sd (bias corrected)		964.3
626										Approximate Chi Square Value (0.05)		339.3
627				Adjusted Level of Significance		0.0231				Adjusted Chi Square Value		330.5
628												
629	**Assuming Gamma Distribution**											
630				95% Approximate Gamma UCL (use when n>=50))		5035				95% Adjusted Gamma UCL (use when n<50)		5169
631												
632	**Lognormal GOF Test**											
633				Shapiro Wilk Test Statistic		0.944				**Shapiro Wilk Lognormal GOF Test**		
634				5% Shapiro Wilk Critical Value		0.829				Data appear Lognormal at 5% Significance Level		
635				Lilliefors Test Statistic		0.193				**Lilliefors Lognormal GOF Test**		
636				5% Lilliefors Critical Value		0.274				Data appear Lognormal at 5% Significance Level		
637	**Data appear Lognormal at 5% Significance Level**											
638												
639	**Lognormal Statistics**											
640				Minimum of Logged Data		8.137				Mean of logged Data		8.385
641				Maximum of Logged Data		8.753				SD of logged Data		0.184
642												
643	**Assuming Lognormal Distribution**											
644				95% H-UCL		5044				90% Chebyshev (MVUE) UCL		5272
645				95% Chebyshev (MVUE) UCL		5644				97.5% Chebyshev (MVUE) UCL		6161
646				99% Chebyshev (MVUE) UCL		7177						
647												
648	**Nonparametric Distribution Free UCL Statistics**											
649	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
650												
651	**Nonparametric Distribution Free UCLs**											
652				95% CLT UCL		4934				95% Jackknife UCL		4997
653				95% Standard Bootstrap UCL		4905				95% Bootstrap-t UCL		5377
654				95% Hall's Bootstrap UCL		8035				95% Percentile Bootstrap UCL		4911
655				95% BCA Bootstrap UCL		5012						
656				90% Chebyshev(Mean, Sd) UCL		5330				95% Chebyshev(Mean, Sd) UCL		5728
657				97.5% Chebyshev(Mean, Sd) UCL		6280				99% Chebyshev(Mean, Sd) UCL		7365
658												
659	**Suggested UCL to Use**											
660				95% Student's-t UCL		4997						
661												
662	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
663	Recommendations are based upon data size, data distribution, and skewness.											
664	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
665	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
666												
667												
668	**Manganese (nfmw20)**											
669												
670	**General Statistics**											
671				Total Number of Observations		8				Number of Distinct Observations		5
672										Number of Missing Observations		0
673				Minimum		10300				Mean		12963
674				Maximum		15200				Median		13300
675				SD		2044				Std. Error of Mean		722.6
676				Coefficient of Variation		0.158				Skewness		-0.312

677												
678	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
679	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
680	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
681	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
682												
683	**Normal GOF Test**											
684						Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**				
685						5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level				
686						Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**				
687						5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level				
688	**Data appear Normal at 5% Significance Level**											
689												
690	**Assuming Normal Distribution**											
691	**95% Normal UCL**							**95% UCLs (Adjusted for Skewness)**				
692						95% Student's-t UCL	14331	95% Adjusted-CLT UCL (Chen-1995)	14066			
693								95% Modified-t UCL (Johnson-1978)	14318			
694												
695	**Gamma GOF Test**											
696						A-D Test Statistic	0.498	**Anderson-Darling Gamma GOF Test**				
697						5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level				
698						K-S Test Statistic	0.213	**Kolmogorov-Smirnov Gamma GOF Test**				
699						5% K-S Critical Value	0.293	Detected data appear Gamma Distributed at 5% Significance Level				
700	**Detected data appear Gamma Distributed at 5% Significance Level**											
701												
702	**Gamma Statistics**											
703						k hat (MLE)	44.26	k star (bias corrected MLE)	27.75			
704						Theta hat (MLE)	292.9	Theta star (bias corrected MLE)	467.2			
705						nu hat (MLE)	708.2	nu star (bias corrected)	444			
706						MLE Mean (bias corrected)	12963	MLE Sd (bias corrected)	2461			
707								Approximate Chi Square Value (0.05)	396.1			
708						Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	384.6			
709												
710	**Assuming Gamma Distribution**											
711						95% Approximate Gamma UCL (use when n>=50))	14528	95% Adjusted Gamma UCL (use when n<50)	14962			
712												
713	**Lognormal GOF Test**											
714						Shapiro Wilk Test Statistic	0.865	**Shapiro Wilk Lognormal GOF Test**				
715						5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level				
716						Lilliefors Test Statistic	0.215	**Lilliefors Lognormal GOF Test**				
717						5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level				
718	**Data appear Lognormal at 5% Significance Level**											
719												
720	**Lognormal Statistics**											
721						Minimum of Logged Data	9.24	Mean of logged Data	9.458			
722						Maximum of Logged Data	9.629	SD of logged Data	0.163			
723												
724	**Assuming Lognormal Distribution**											
725						95% H-UCL	14601	90% Chebyshev (MVUE) UCL	15205			
726						95% Chebyshev (MVUE) UCL	16220	97.5% Chebyshev (MVUE) UCL	17628			
727						99% Chebyshev (MVUE) UCL	20394					
728												

	A	B	C	D	E	F	G	H	I	J	K	L
729	**Nonparametric Distribution Free UCL Statistics**											
730	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
731												
732	**Nonparametric Distribution Free UCLs**											
733	95% CLT UCL					14151	95% Jackknife UCL					14331
734	95% Standard Bootstrap UCL					14104	95% Bootstrap-t UCL					14202
735	95% Hall's Bootstrap UCL					13898	95% Percentile Bootstrap UCL					14038
736	95% BCA Bootstrap UCL					13963						
737	90% Chebyshev(Mean, Sd) UCL					15130	95% Chebyshev(Mean, Sd) UCL					16112
738	97.5% Chebyshev(Mean, Sd) UCL					17475	99% Chebyshev(Mean, Sd) UCL					20152
739												
740	**Suggested UCL to Use**											
741	95% Student's-t UCL					14331						
742												
743	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
744	Recommendations are based upon data size, data distribution, and skewness.											
745	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
746	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
747												
748	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
749	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
750												
751												
752	**Manganese (nfmw22)**											
753												
754	**General Statistics**											
755	Total Number of Observations					4	Number of Distinct Observations					4
756							Number of Missing Observations					0
757	Minimum					2490	Mean					2735
758	Maximum					2960	Median					2745
759	SD					201.7	Std. Error of Mean					100.9
760	Coefficient of Variation					0.0738	Skewness					-0.242
761												
762	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
763	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
764	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
765	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
766												
767	**Normal GOF Test**											
768	Shapiro Wilk Test Statistic					0.993	**Shapiro Wilk GOF Test**					
769	5% Shapiro Wilk Critical Value					0.748	Data appear Normal at 5% Significance Level					
770	Lilliefors Test Statistic					0.163	**Lilliefors GOF Test**					
771	5% Lilliefors Critical Value					0.375	Data appear Normal at 5% Significance Level					
772	**Data appear Normal at 5% Significance Level**											
773												
774	**Assuming Normal Distribution**											
775	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
776	95% Student's-t UCL					2972	95% Adjusted-CLT UCL (Chen-1995)					2888
777							95% Modified-t UCL (Johnson-1978)					2970
778												
779	**Gamma GOF Test**											
780	A-D Test Statistic					0.206	**Anderson-Darling Gamma GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
781					5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level					
782					K-S Test Statistic	0.192	**Kolmogorov-Smirnov Gamma GOF Test**					
783					5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level					
784	**Detected data appear Gamma Distributed at 5% Significance Level**											
785												
786	**Gamma Statistics**											
787					k hat (MLE)	242.9			k star (bias corrected MLE)	60.9		
788					Theta hat (MLE)	11.26			Theta star (bias corrected MLE)	44.91		
789					nu hat (MLE)	1943			nu star (bias corrected)	487.2		
790					MLE Mean (bias corrected)	2735			MLE Sd (bias corrected)	350.5		
791									Approximate Chi Square Value (0.05)	437		
792					Adjusted Level of Significance	N/A			Adjusted Chi Square Value	N/A		
793												
794	**Assuming Gamma Distribution**											
795				95% Approximate Gamma UCL (use when n>=50))		3049			95% Adjusted Gamma UCL (use when n<50)	N/A		
796												
797	**Lognormal GOF Test**											
798					Shapiro Wilk Test Statistic	0.989	**Shapiro Wilk Lognormal GOF Test**					
799					5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level					
800					Lilliefors Test Statistic	0.17	**Lilliefors Lognormal GOF Test**					
801					5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level					
802	**Data appear Lognormal at 5% Significance Level**											
803												
804	**Lognormal Statistics**											
805					Minimum of Logged Data	7.82			Mean of logged Data	7.912		
806					Maximum of Logged Data	7.993			SD of logged Data	0.0743		
807												
808	**Assuming Lognormal Distribution**											
809					95% H-UCL	N/A			90% Chebyshev (MVUE) UCL	3040		
810					95% Chebyshev (MVUE) UCL	3178			97.5% Chebyshev (MVUE) UCL	3369		
811					99% Chebyshev (MVUE) UCL	3745						
812												
813	**Nonparametric Distribution Free UCL Statistics**											
814	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
815												
816	**Nonparametric Distribution Free UCLs**											
817					95% CLT UCL	2901			95% Jackknife UCL	2972		
818					95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL	N/A		
819					95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL	N/A		
820					95% BCA Bootstrap UCL	N/A						
821					90% Chebyshev(Mean, Sd) UCL	3038			95% Chebyshev(Mean, Sd) UCL	3175		
822					97.5% Chebyshev(Mean, Sd) UCL	3365			99% Chebyshev(Mean, Sd) UCL	3739		
823												
824	**Suggested UCL to Use**											
825					95% Student's-t UCL	2972						
826												
827	**Recommended UCL exceeds the maximum observation**											
828												
829	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
830	Recommendations are based upon data size, data distribution, and skewness.											
831	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
832	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

833												
834	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
835	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
836												
837												
838	**Manganese (nfmw23)**											
839												
840	**General Statistics**											
841					Total Number of Observations	4			Number of Distinct Observations	4		
842									Number of Missing Observations	0		
843					Minimum	3760			Mean	4340		
844					Maximum	4680			Median	4460		
845					SD	421.1			Std. Error of Mean	210.6		
846					Coefficient of Variation	0.097			Skewness	-1.196		
847												
848	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
849	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
850	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
851	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
852												
853	**Normal GOF Test**											
854					Shapiro Wilk Test Statistic	0.884			**Shapiro Wilk GOF Test**			
855					5% Shapiro Wilk Critical Value	0.748			Data appear Normal at 5% Significance Level			
856					Lilliefors Test Statistic	0.247			**Lilliefors GOF Test**			
857					5% Lilliefors Critical Value	0.375			Data appear Normal at 5% Significance Level			
858	**Data appear Normal at 5% Significance Level**											
859												
860	**Assuming Normal Distribution**											
861	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
862					95% Student's-t UCL	4836			95% Adjusted-CLT UCL (Chen-1995)	4552		
863									95% Modified-t UCL (Johnson-1978)	4815		
864												
865	**Gamma GOF Test**											
866					A-D Test Statistic	0.401			**Anderson-Darling Gamma GOF Test**			
867					5% A-D Critical Value	0.657			Detected data appear Gamma Distributed at 5% Significance Level			
868					K-S Test Statistic	0.278			**Kolmogorov-Smirnov Gamma GOF Test**			
869					5% K-S Critical Value	0.394			Detected data appear Gamma Distributed at 5% Significance Level			
870	**Detected data appear Gamma Distributed at 5% Significance Level**											
871												
872	**Gamma Statistics**											
873					k hat (MLE)	135.6			k star (bias corrected MLE)	34.06		
874					Theta hat (MLE)	32.01			Theta star (bias corrected MLE)	127.4		
875					nu hat (MLE)	1085			nu star (bias corrected)	272.5		
876					MLE Mean (bias corrected)	4340			MLE Sd (bias corrected)	743.7		
877									Approximate Chi Square Value (0.05)	235.2		
878					Adjusted Level of Significance	N/A			Adjusted Chi Square Value	N/A		
879												
880	**Assuming Gamma Distribution**											
881					95% Approximate Gamma UCL (use when n>=50))	5027			95% Adjusted Gamma UCL (use when n<50)	N/A		
882												
883	**Lognormal GOF Test**											
884					Shapiro Wilk Test Statistic	0.874			**Shapiro Wilk Lognormal GOF Test**			

885				5% Shapiro Wilk Critical Value		0.748		Data appear Lognormal at 5% Significance Level				
886				Lilliefors Test Statistic		0.245		**Lilliefors Lognormal GOF Test**				
887				5% Lilliefors Critical Value		0.375		Data appear Lognormal at 5% Significance Level				
888	**Data appear Lognormal at 5% Significance Level**											
889												
890	**Lognormal Statistics**											
891				Minimum of Logged Data		8.232		Mean of logged Data				8.372
892				Maximum of Logged Data		8.451		SD of logged Data				0.1
893												
894	**Assuming Lognormal Distribution**											
895				95% H-UCL		4943		90% Chebyshev (MVUE) UCL				4993
896				95% Chebyshev (MVUE) UCL		5289		97.5% Chebyshev (MVUE) UCL				5699
897				99% Chebyshev (MVUE) UCL		6505						
898												
899	**Nonparametric Distribution Free UCL Statistics**											
900	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
901												
902	**Nonparametric Distribution Free UCLs**											
903				95% CLT UCL		4686		95% Jackknife UCL				4836
904				95% Standard Bootstrap UCL		N/A		95% Bootstrap-t UCL				N/A
905				95% Hall's Bootstrap UCL		N/A		95% Percentile Bootstrap UCL				N/A
906				95% BCA Bootstrap UCL		N/A						
907				90% Chebyshev(Mean, Sd) UCL		4972		95% Chebyshev(Mean, Sd) UCL				5258
908				97.5% Chebyshev(Mean, Sd) UCL		5655		99% Chebyshev(Mean, Sd) UCL				6435
909												
910	**Suggested UCL to Use**											
911				95% Student's-t UCL		4836						
912												
913	**Recommended UCL exceeds the maximum observation**											
914												
915	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
916	Recommendations are based upon data size, data distribution, and skewness.											
917	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
918	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
919												
920	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
921	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
922												
923												
924	**Manganese (nfmw3)**											
925												
926	**General Statistics**											
927				Total Number of Observations		9		Number of Distinct Observations				9
928								Number of Missing Observations				0
929				Minimum		4380		Mean				6016
930				Maximum		7660		Median				5620
931				SD		1351		Std. Error of Mean				450.2
932				Coefficient of Variation		0.225		Skewness				-0.0258
933												
934	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
935	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
936	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											

	A	B	C	D	E	F	G	H	I	J	K	L
937	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
938												
939	**Normal GOF Test**											
940					Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk GOF Test**					
941					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
942					Lilliefors Test Statistic	0.227	**Lilliefors GOF Test**					
943					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
944	**Data appear Normal at 5% Significance Level**											
945												
946	**Assuming Normal Distribution**											
947	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
948					95% Student's-t UCL	6853				95% Adjusted-CLT UCL (Chen-1995)	6752	
949										95% Modified-t UCL (Johnson-1978)	6852	
950												
951	**Gamma GOF Test**											
952					A-D Test Statistic	0.58	**Anderson-Darling Gamma GOF Test**					
953					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
954					K-S Test Statistic	0.245	**Kolmogorov-Smirnov Gamma GOF Test**					
955					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
956	**Detected data appear Gamma Distributed at 5% Significance Level**											
957												
958	**Gamma Statistics**											
959					k hat (MLE)	21.73				k star (bias corrected MLE)	14.56	
960					Theta hat (MLE)	276.8				Theta star (bias corrected MLE)	413.1	
961					nu hat (MLE)	391.1				nu star (bias corrected)	262.1	
962					MLE Mean (bias corrected)	6016				MLE Sd (bias corrected)	1576	
963										Approximate Chi Square Value (0.05)	225.6	
964					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	218.5	
965												
966	**Assuming Gamma Distribution**											
967					95% Approximate Gamma UCL (use when n>=50))	6988				95% Adjusted Gamma UCL (use when n<50)	7217	
968												
969	**Lognormal GOF Test**											
970					Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk Lognormal GOF Test**					
971					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
972					Lilliefors Test Statistic	0.233	**Lilliefors Lognormal GOF Test**					
973					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
974	**Data appear Lognormal at 5% Significance Level**											
975												
976	**Lognormal Statistics**											
977					Minimum of Logged Data	8.385				Mean of logged Data	8.679	
978					Maximum of Logged Data	8.944				SD of logged Data	0.23	
979												
980	**Assuming Lognormal Distribution**											
981					95% H-UCL	7067				90% Chebyshev (MVUE) UCL	7408	
982					95% Chebyshev (MVUE) UCL	8037				97.5% Chebyshev (MVUE) UCL	8912	
983					99% Chebyshev (MVUE) UCL	10628						
984												
985	**Nonparametric Distribution Free UCL Statistics**											
986	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
987												
988	**Nonparametric Distribution Free UCLs**											

989	95% CLT UCL	6756	95% Jackknife UCL	6853
990	95% Standard Bootstrap UCL	6716	95% Bootstrap-t UCL	6780
991	95% Hall's Bootstrap UCL	6618	95% Percentile Bootstrap UCL	6732
992	95% BCA Bootstrap UCL	6728		
993	90% Chebyshev(Mean, Sd) UCL	7366	95% Chebyshev(Mean, Sd) UCL	7978
994	97.5% Chebyshev(Mean, Sd) UCL	8827	99% Chebyshev(Mean, Sd) UCL	10495
995				
996	**Suggested UCL to Use**			
997	95% Student's-t UCL	6853		
998				
999	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
1000	Recommendations are based upon data size, data distribution, and skewness.			
1001	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
1002	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
1003				
1004	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**			
1005	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**			
1006				
1007				
1008	**Manganese (nfmw4)**			
1009				
1010	**General Statistics**			
1011	Total Number of Observations	9	Number of Distinct Observations	9
1012			Number of Missing Observations	0
1013	Minimum	2520	Mean	5661
1014	Maximum	10900	Median	4370
1015	SD	2799	Std. Error of Mean	932.9
1016	Coefficient of Variation	0.494	Skewness	0.838
1017				
1018	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**			
1019	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**			
1020	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**			
1021	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**			
1022				
1023	**Normal GOF Test**			
1024	Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**	
1025	5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level	
1026	Lilliefors Test Statistic	0.233	**Lilliefors GOF Test**	
1027	5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level	
1028	**Data appear Normal at 5% Significance Level**			
1029				
1030	**Assuming Normal Distribution**			
1031	**95% Normal UCL**		**95% UCLs (Adjusted for Skewness)**	
1032	95% Student's-t UCL	7396	95% Adjusted-CLT UCL (Chen-1995)	7474
1033			95% Modified-t UCL (Johnson-1978)	7439
1034				
1035	**Gamma GOF Test**			
1036	A-D Test Statistic	0.346	**Anderson-Darling Gamma GOF Test**	
1037	5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level	
1038	K-S Test Statistic	0.209	**Kolmogorov-Smirnov Gamma GOF Test**	
1039	5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level	
1040	**Detected data appear Gamma Distributed at 5% Significance Level**			

1041												
1042	**Gamma Statistics**											
1043					k hat (MLE)	4.907			k star (bias corrected MLE)	3.346		
1044					Theta hat (MLE)	1154			Theta star (bias corrected MLE)	1692		
1045					nu hat (MLE)	88.33			nu star (bias corrected)	60.22		
1046					MLE Mean (bias corrected)	5661			MLE Sd (bias corrected)	3095		
1047									Approximate Chi Square Value (0.05)	43.37		
1048					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	40.38		
1049												
1050	**Assuming Gamma Distribution**											
1051					95% Approximate Gamma UCL (use when n>=50))	7860			95% Adjusted Gamma UCL (use when n<50)	8443		
1052												
1053	**Lognormal GOF Test**											
1054					Shapiro Wilk Test Statistic	0.952			**Shapiro Wilk Lognormal GOF Test**			
1055					5% Shapiro Wilk Critical Value	0.829			Data appear Lognormal at 5% Significance Level			
1056					Lilliefors Test Statistic	0.18			**Lilliefors Lognormal GOF Test**			
1057					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
1058	**Data appear Lognormal at 5% Significance Level**											
1059												
1060	**Lognormal Statistics**											
1061					Minimum of Logged Data	7.832			Mean of logged Data	8.536		
1062					Maximum of Logged Data	9.297			SD of logged Data	0.485		
1063												
1064	**Assuming Lognormal Distribution**											
1065					95% H-UCL	8378			90% Chebyshev (MVUE) UCL	8427		
1066					95% Chebyshev (MVUE) UCL	9685			97.5% Chebyshev (MVUE) UCL	11431		
1067					99% Chebyshev (MVUE) UCL	14861						
1068												
1069	**Nonparametric Distribution Free UCL Statistics**											
1070	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1071												
1072	**Nonparametric Distribution Free UCLs**											
1073					95% CLT UCL	7196			95% Jackknife UCL	7396		
1074					95% Standard Bootstrap UCL	7090			95% Bootstrap-t UCL	7919		
1075					95% Hall's Bootstrap UCL	7323			95% Percentile Bootstrap UCL	7152		
1076					95% BCA Bootstrap UCL	7322						
1077					90% Chebyshev(Mean, Sd) UCL	8460			95% Chebyshev(Mean, Sd) UCL	9728		
1078					97.5% Chebyshev(Mean, Sd) UCL	11487			99% Chebyshev(Mean, Sd) UCL	14943		
1079												
1080	**Suggested UCL to Use**											
1081					95% Student's-t UCL	7396						
1082												
1083	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1084	Recommendations are based upon data size, data distribution, and skewness.											
1085	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1086	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1087												
1088												
1089	**Manganese (nfmw7)**											
1090												
1091	**General Statistics**											
1092					Total Number of Observations	9			Number of Distinct Observations	8		

1093										Number of Missing Observations		0
1094					Minimum	131				Mean		271
1095					Maximum	539				Median		250
1096					SD	108.8				Std. Error of Mean		36.28
1097					Coefficient of Variation	0.402				Skewness		2.045
1098												
1099	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1100	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1101	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1102	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1103												
1104	**Normal GOF Test**											
1105					Shapiro Wilk Test Statistic	0.699	**Shapiro Wilk GOF Test**					
1106					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
1107					Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**					
1108					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
1109	**Data Not Normal at 5% Significance Level**											
1110												
1111	**Assuming Normal Distribution**											
1112	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1113					95% Student's-t UCL	338.5				95% Adjusted-CLT UCL (Chen-1995)		357.1
1114										95% Modified-t UCL (Johnson-1978)		342.6
1115												
1116	**Gamma GOF Test**											
1117					A-D Test Statistic	1.146	**Anderson-Darling Gamma GOF Test**					
1118					5% A-D Critical Value	0.722	Data Not Gamma Distributed at 5% Significance Level					
1119					K-S Test Statistic	0.339	**Kolmogorov-Smirnov Gamma GOF Test**					
1120					5% K-S Critical Value	0.279	Data Not Gamma Distributed at 5% Significance Level					
1121	**Data Not Gamma Distributed at 5% Significance Level**											
1122												
1123	**Gamma Statistics**											
1124					k hat (MLE)	8.555				k star (bias corrected MLE)		5.777
1125					Theta hat (MLE)	31.68				Theta star (bias corrected MLE)		46.91
1126					nu hat (MLE)	154				nu star (bias corrected)		104
1127					MLE Mean (bias corrected)	271				MLE Sd (bias corrected)		112.7
1128										Approximate Chi Square Value (0.05)		81.46
1129					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		77.26
1130												
1131	**Assuming Gamma Distribution**											
1132					95% Approximate Gamma UCL (use when n>=50))	346				95% Adjusted Gamma UCL (use when n<50)		364.8
1133												
1134	**Lognormal GOF Test**											
1135					Shapiro Wilk Test Statistic	0.795	**Shapiro Wilk Lognormal GOF Test**					
1136					5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level					
1137					Lilliefors Test Statistic	0.319	**Lilliefors Lognormal GOF Test**					
1138					5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level					
1139	**Data Not Lognormal at 5% Significance Level**											
1140												
1141	**Lognormal Statistics**											
1142					Minimum of Logged Data	4.875				Mean of logged Data		5.543
1143					Maximum of Logged Data	6.29				SD of logged Data		0.357
1144												

1145	**Assuming Lognormal Distribution**											
1146					95% H-UCL	353.8				90% Chebyshev (MVUE) UCL	367.4	
1147					95% Chebyshev (MVUE) UCL	411.4				97.5% Chebyshev (MVUE) UCL	472.5	
1148					99% Chebyshev (MVUE) UCL	592.6						
1149												
1150	**Nonparametric Distribution Free UCL Statistics**											
1151	**Data do not follow a Discernible Distribution (0.05)**											
1152												
1153	**Nonparametric Distribution Free UCLs**											
1154					95% CLT UCL	330.7				95% Jackknife UCL	338.5	
1155					95% Standard Bootstrap UCL	326.2				95% Bootstrap-t UCL	435.4	
1156					95% Hall's Bootstrap UCL	643.2				95% Percentile Bootstrap UCL	332.1	
1157					95% BCA Bootstrap UCL	351.6						
1158					90% Chebyshev(Mean, Sd) UCL	379.8				95% Chebyshev(Mean, Sd) UCL	429.2	
1159					97.5% Chebyshev(Mean, Sd) UCL	497.6				99% Chebyshev(Mean, Sd) UCL	632	
1160												
1161	**Suggested UCL to Use**											
1162					95% Student's-t UCL	338.5				or 95% Modified-t UCL	342.6	
1163												
1164	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1165	Recommendations are based upon data size, data distribution, and skewness.											
1166	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1167	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1168												
1169												
1170	**Manganese (nfmw8)**											
1171												
1172	**General Statistics**											
1173					Total Number of Observations	8				Number of Distinct Observations	8	
1174										Number of Missing Observations	0	
1175					Minimum	7070				Mean	8936	
1176					Maximum	11400				Median	8730	
1177					SD	1210				Std. Error of Mean	427.8	
1178					Coefficient of Variation	0.135				Skewness	0.898	
1179												
1180	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1181	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1182	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1183	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1184												
1185	**Normal GOF Test**											
1186					Shapiro Wilk Test Statistic	0.889				**Shapiro Wilk GOF Test**		
1187					5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level		
1188					Lilliefors Test Statistic	0.235				**Lilliefors GOF Test**		
1189					5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
1190	**Data appear Normal at 5% Significance Level**											
1191												
1192	**Assuming Normal Distribution**											
1193	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
1194					95% Student's-t UCL	9747				95% Adjusted-CLT UCL (Chen-1995)	9785	
1195										95% Modified-t UCL (Johnson-1978)	9769	
1196												

	A	B	C	D	E	F	G	H	I	J	K	L
1197	**Gamma GOF Test**											
1198	A-D Test Statistic					0.505	**Anderson-Darling Gamma GOF Test**					
1199	5% A-D Critical Value					0.715	Detected data appear Gamma Distributed at 5% Significance Level					
1200	K-S Test Statistic					0.21	**Kolmogorov-Smirnov Gamma GOF Test**					
1201	5% K-S Critical Value					0.293	Detected data appear Gamma Distributed at 5% Significance Level					
1202	**Detected data appear Gamma Distributed at 5% Significance Level**											
1203												
1204	**Gamma Statistics**											
1205	k hat (MLE)					64.65	k star (bias corrected MLE)					40.49
1206	Theta hat (MLE)					138.2	Theta star (bias corrected MLE)					220.7
1207	nu hat (MLE)					1034	nu star (bias corrected)					647.9
1208	MLE Mean (bias corrected)					8936	MLE Sd (bias corrected)					1404
1209							Approximate Chi Square Value (0.05)					589.8
1210	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					575.7
1211												
1212	**Assuming Gamma Distribution**											
1213	95% Approximate Gamma UCL (use when n>=50))					9816	95% Adjusted Gamma UCL (use when n<50)					10056
1214												
1215	**Lognormal GOF Test**											
1216	Shapiro Wilk Test Statistic					0.91	**Shapiro Wilk Lognormal GOF Test**					
1217	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1218	Lilliefors Test Statistic					0.216	**Lilliefors Lognormal GOF Test**					
1219	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
1220	**Data appear Lognormal at 5% Significance Level**											
1221												
1222	**Lognormal Statistics**											
1223	Minimum of Logged Data					8.864	Mean of logged Data					9.09
1224	Maximum of Logged Data					9.341	SD of logged Data					0.132
1225												
1226	**Assuming Lognormal Distribution**											
1227	95% H-UCL					9826	90% Chebyshev (MVUE) UCL					10190
1228	95% Chebyshev (MVUE) UCL					10759	97.5% Chebyshev (MVUE) UCL					11548
1229	99% Chebyshev (MVUE) UCL					13098						
1230												
1231	**Nonparametric Distribution Free UCL Statistics**											
1232	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1233												
1234	**Nonparametric Distribution Free UCLs**											
1235	95% CLT UCL					9640	95% Jackknife UCL					9747
1236	95% Standard Bootstrap UCL					9609	95% Bootstrap-t UCL					9946
1237	95% Hall's Bootstrap UCL					11174	95% Percentile Bootstrap UCL					9618
1238	95% BCA Bootstrap UCL					9778						
1239	90% Chebyshev(Mean, Sd) UCL					10220	95% Chebyshev(Mean, Sd) UCL					10801
1240	97.5% Chebyshev(Mean, Sd) UCL					11608	99% Chebyshev(Mean, Sd) UCL					13193
1241												
1242	**Suggested UCL to Use**											
1243	95% Student's-t UCL					9747						
1244												
1245	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1246	Recommendations are based upon data size, data distribution, and skewness.											
1247	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1248	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

	A	B	C	D	E	F	G	H	I	J	K	L
1249												
1250												
1251	**Manganese (nfmw9)**											
1252												
1253						**General Statistics**						
1254					Total Number of Observations	8			Number of Distinct Observations	8		
1255									Number of Missing Observations	0		
1256					Minimum	2670			Mean	6220		
1257					Maximum	14300			Median	4970		
1258					SD	3851			Std. Error of Mean	1362		
1259					Coefficient of Variation	0.619			Skewness	1.542		
1260												
1261					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1262					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1263					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1264					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1265												
1266						**Normal GOF Test**						
1267					Shapiro Wilk Test Statistic	0.841			**Shapiro Wilk GOF Test**			
1268					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
1269					Lilliefors Test Statistic	0.255			**Lilliefors GOF Test**			
1270					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
1271					**Data appear Normal at 5% Significance Level**							
1272												
1273						**Assuming Normal Distribution**						
1274					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
1275					95% Student's-t UCL	8800			95% Adjusted-CLT UCL (Chen-1995)	9253		
1276									95% Modified-t UCL (Johnson-1978)	8923		
1277												
1278						**Gamma GOF Test**						
1279					A-D Test Statistic	0.343			**Anderson-Darling Gamma GOF Test**			
1280					5% A-D Critical Value	0.72			Detected data appear Gamma Distributed at 5% Significance Level			
1281					K-S Test Statistic	0.186			**Kolmogorov-Smirnov Gamma GOF Test**			
1282					5% K-S Critical Value	0.296			Detected data appear Gamma Distributed at 5% Significance Level			
1283					**Detected data appear Gamma Distributed at 5% Significance Level**							
1284												
1285						**Gamma Statistics**						
1286					k hat (MLE)	3.621			k star (bias corrected MLE)	2.346		
1287					Theta hat (MLE)	1718			Theta star (bias corrected MLE)	2651		
1288					nu hat (MLE)	57.93			nu star (bias corrected)	37.54		
1289					MLE Mean (bias corrected)	6220			MLE Sd (bias corrected)	4061		
1290									Approximate Chi Square Value (0.05)	24.51		
1291					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	21.89		
1292												
1293						**Assuming Gamma Distribution**						
1294					95% Approximate Gamma UCL (use when n>=50))	9526			95% Adjusted Gamma UCL (use when n<50)	10669		
1295												
1296						**Lognormal GOF Test**						
1297					Shapiro Wilk Test Statistic	0.947			**Shapiro Wilk Lognormal GOF Test**			
1298					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
1299					Lilliefors Test Statistic	0.154			**Lilliefors Lognormal GOF Test**			
1300					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			

	A	B	C	D	E	F	G	H	I	J	K	L
1301	**Data appear Lognormal at 5% Significance Level**											
1302												
1303	**Lognormal Statistics**											
1304					Minimum of Logged Data	7.89				Mean of logged Data		8.591
1305					Maximum of Logged Data	9.568				SD of logged Data		0.56
1306												
1307	**Assuming Lognormal Distribution**											
1308					95% H-UCL	10595				90% Chebyshev (MVUE) UCL		9865
1309					95% Chebyshev (MVUE) UCL	11542				97.5% Chebyshev (MVUE) UCL		13870
1310					99% Chebyshev (MVUE) UCL	18443						
1311												
1312	**Nonparametric Distribution Free UCL Statistics**											
1313	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1314												
1315	**Nonparametric Distribution Free UCLs**											
1316					95% CLT UCL	8460				95% Jackknife UCL		8800
1317					95% Standard Bootstrap UCL	8324				95% Bootstrap-t UCL		11754
1318					95% Hall's Bootstrap UCL	22151				95% Percentile Bootstrap UCL		8399
1319					95% BCA Bootstrap UCL	9344						
1320					90% Chebyshev(Mean, Sd) UCL	10305				95% Chebyshev(Mean, Sd) UCL		12155
1321					97.5% Chebyshev(Mean, Sd) UCL	14723				99% Chebyshev(Mean, Sd) UCL		19768
1322												
1323	**Suggested UCL to Use**											
1324					95% Student's-t UCL	8800						
1325												
1326	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1327	Recommendations are based upon data size, data distribution, and skewness.											
1328	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1329	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1330												
1331												
1332	**Manganese (smw10)**											
1333												
1334	**General Statistics**											
1335					Total Number of Observations	8				Number of Distinct Observations		8
1336										Number of Missing Observations		0
1337					Minimum	1710				Mean		2240
1338					Maximum	3220				Median		2040
1339					SD	478.2				Std. Error of Mean		169.1
1340					Coefficient of Variation	0.213				Skewness		1.335
1341												
1342	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1343	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1344	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1345	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1346												
1347	**Normal GOF Test**											
1348					Shapiro Wilk Test Statistic	0.87				**Shapiro Wilk GOF Test**		
1349					5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level		
1350					Lilliefors Test Statistic	0.272				**Lilliefors GOF Test**		
1351					5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
1352	**Data appear Normal at 5% Significance Level**											

1353												
1354	**Assuming Normal Distribution**											
1355	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1356	95% Student's-t UCL				2560		95% Adjusted-CLT UCL (Chen-1995)					2603
1357							95% Modified-t UCL (Johnson-1978)					2574
1358												
1359	**Gamma GOF Test**											
1360	A-D Test Statistic				0.468		**Anderson-Darling Gamma GOF Test**					
1361	5% A-D Critical Value				0.716		Detected data appear Gamma Distributed at 5% Significance Level					
1362	K-S Test Statistic				0.27		**Kolmogorov-Smirnov Gamma GOF Test**					
1363	5% K-S Critical Value				0.294		Detected data appear Gamma Distributed at 5% Significance Level					
1364	**Detected data appear Gamma Distributed at 5% Significance Level**											
1365												
1366	**Gamma Statistics**											
1367	k hat (MLE)				27.79		k star (bias corrected MLE)					17.45
1368	Theta hat (MLE)				80.59		Theta star (bias corrected MLE)					128.3
1369	nu hat (MLE)				444.7		nu star (bias corrected)					279.3
1370	MLE Mean (bias corrected)				2240		MLE Sd (bias corrected)					536.2
1371							Approximate Chi Square Value (0.05)					241.6
1372	Adjusted Level of Significance				0.0195		Adjusted Chi Square Value					232.7
1373												
1374	**Assuming Gamma Distribution**											
1375	95% Approximate Gamma UCL (use when n>=50))				2590		95% Adjusted Gamma UCL (use when n<50)					2689
1376												
1377	**Lognormal GOF Test**											
1378	Shapiro Wilk Test Statistic				0.914		**Shapiro Wilk Lognormal GOF Test**					
1379	5% Shapiro Wilk Critical Value				0.818		Data appear Lognormal at 5% Significance Level					
1380	Lilliefors Test Statistic				0.254		**Lilliefors Lognormal GOF Test**					
1381	5% Lilliefors Critical Value				0.283		Data appear Lognormal at 5% Significance Level					
1382	**Data appear Lognormal at 5% Significance Level**											
1383												
1384	**Lognormal Statistics**											
1385	Minimum of Logged Data				7.444		Mean of logged Data					7.696
1386	Maximum of Logged Data				8.077		SD of logged Data					0.199
1387												
1388	**Assuming Lognormal Distribution**											
1389	95% H-UCL				2596		90% Chebyshev (MVUE) UCL					2711
1390	95% Chebyshev (MVUE) UCL				2925		97.5% Chebyshev (MVUE) UCL					3223
1391	99% Chebyshev (MVUE) UCL				3807							
1392												
1393	**Nonparametric Distribution Free UCL Statistics**											
1394	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1395												
1396	**Nonparametric Distribution Free UCLs**											
1397	95% CLT UCL				2518		95% Jackknife UCL					2560
1398	95% Standard Bootstrap UCL				2506		95% Bootstrap-t UCL					2756
1399	95% Hall's Bootstrap UCL				2828		95% Percentile Bootstrap UCL					2523
1400	95% BCA Bootstrap UCL				2563							
1401	90% Chebyshev(Mean, Sd) UCL				2747		95% Chebyshev(Mean, Sd) UCL					2977
1402	97.5% Chebyshev(Mean, Sd) UCL				3296		99% Chebyshev(Mean, Sd) UCL					3922
1403												
1404	**Suggested UCL to Use**											

1405				95% Student's-t UCL	2560							
1406												
1407	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1408	Recommendations are based upon data size, data distribution, and skewness.											
1409	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1410	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1411												
1412												
1413	**Manganese (smw11)**											
1414												
1415	**General Statistics**											
1416				Total Number of Observations	9			Number of Distinct Observations	9			
1417								Number of Missing Observations	0			
1418				Minimum	5090			Mean	7506			
1419				Maximum	18100			Median	6090			
1420				SD	4083			Std. Error of Mean	1361			
1421				Coefficient of Variation	0.544			Skewness	2.717			
1422												
1423	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1424	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1425	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1426	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1427												
1428	**Normal GOF Test**											
1429				Shapiro Wilk Test Statistic	0.587			**Shapiro Wilk GOF Test**				
1430				5% Shapiro Wilk Critical Value	0.829			Data Not Normal at 5% Significance Level				
1431				Lilliefors Test Statistic	0.343			**Lilliefors GOF Test**				
1432				5% Lilliefors Critical Value	0.274			Data Not Normal at 5% Significance Level				
1433	**Data Not Normal at 5% Significance Level**											
1434												
1435	**Assuming Normal Distribution**											
1436				**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**				
1437				95% Student's-t UCL	10036			95% Adjusted-CLT UCL (Chen-1995)	11061			
1438								95% Modified-t UCL (Johnson-1978)	10242			
1439												
1440	**Gamma GOF Test**											
1441				A-D Test Statistic	1.342			**Anderson-Darling Gamma GOF Test**				
1442				5% A-D Critical Value	0.723			Data Not Gamma Distributed at 5% Significance Level				
1443				K-S Test Statistic	0.315			**Kolmogorov-Smirnov Gamma GOF Test**				
1444				5% K-S Critical Value	0.28			Data Not Gamma Distributed at 5% Significance Level				
1445	**Data Not Gamma Distributed at 5% Significance Level**											
1446												
1447	**Gamma Statistics**											
1448				k hat (MLE)	6.106			k star (bias corrected MLE)	4.145			
1449				Theta hat (MLE)	1229			Theta star (bias corrected MLE)	1811			
1450				nu hat (MLE)	109.9			nu star (bias corrected)	74.61			
1451				MLE Mean (bias corrected)	7506			MLE Sd (bias corrected)	3687			
1452								Approximate Chi Square Value (0.05)	55.72			
1453				Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	52.29			
1454												
1455	**Assuming Gamma Distribution**											
1456				95% Approximate Gamma UCL (use when n>=50))	10051			95% Adjusted Gamma UCL (use when n<50)	10710			

1457												
1458	**Lognormal GOF Test**											
1459					Shapiro Wilk Test Statistic	0.709	**Shapiro Wilk Lognormal GOF Test**					
1460					5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level					
1461					Lilliefors Test Statistic	0.288	**Lilliefors Lognormal GOF Test**					
1462					5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level					
1463	**Data Not Lognormal at 5% Significance Level**											
1464												
1465	**Lognormal Statistics**											
1466					Minimum of Logged Data	8.535	Mean of logged Data	8.839				
1467					Maximum of Logged Data	9.804	SD of logged Data	0.389				
1468												
1469	**Assuming Lognormal Distribution**											
1470					95% H-UCL	9955	90% Chebyshev (MVUE) UCL	10267				
1471					95% Chebyshev (MVUE) UCL	11577	97.5% Chebyshev (MVUE) UCL	13396				
1472					99% Chebyshev (MVUE) UCL	16967						
1473												
1474	**Nonparametric Distribution Free UCL Statistics**											
1475	**Data do not follow a Discernible Distribution (0.05)**											
1476												
1477	**Nonparametric Distribution Free UCLs**											
1478					95% CLT UCL	9744	95% Jackknife UCL	10036				
1479					95% Standard Bootstrap UCL	9638	95% Bootstrap-t UCL	20852				
1480					95% Hall's Bootstrap UCL	19607	95% Percentile Bootstrap UCL	10061				
1481					95% BCA Bootstrap UCL	11290						
1482					90% Chebyshev(Mean, Sd) UCL	11588	95% Chebyshev(Mean, Sd) UCL	13437				
1483					97.5% Chebyshev(Mean, Sd) UCL	16004	99% Chebyshev(Mean, Sd) UCL	21046				
1484												
1485	**Suggested UCL to Use**											
1486					95% Student's-t UCL	10036	or 95% Modified-t UCL	10242				
1487												
1488	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1489	Recommendations are based upon data size, data distribution, and skewness.											
1490	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1491	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1492												
1493												
1494	**Manganese (smw12)**											
1495												
1496	**General Statistics**											
1497					Total Number of Observations	8	Number of Distinct Observations	8				
1498							Number of Missing Observations	0				
1499					Minimum	2570	Mean	3429				
1500					Maximum	4870	Median	3265				
1501					SD	787.4	Std. Error of Mean	278.4				
1502					Coefficient of Variation	0.23	Skewness	0.803				
1503												
1504	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1505	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1506	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1507	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1508												

	A	B	C	D	E	F	G	H	I	J	K	L
1509	**Normal GOF Test**											
1510					Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**					
1511					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1512					Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**					
1513					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1514	**Data appear Normal at 5% Significance Level**											
1515												
1516	**Assuming Normal Distribution**											
1517	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1518					95% Student's-t UCL	3956				95% Adjusted-CLT UCL (Chen-1995)	3971	
1519										95% Modified-t UCL (Johnson-1978)	3969	
1520												
1521	**Gamma GOF Test**											
1522					A-D Test Statistic	0.292	**Anderson-Darling Gamma GOF Test**					
1523					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1524					K-S Test Statistic	0.169	**Kolmogorov-Smirnov Gamma GOF Test**					
1525					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1526	**Detected data appear Gamma Distributed at 5% Significance Level**											
1527												
1528	**Gamma Statistics**											
1529					k hat (MLE)	22.91				k star (bias corrected MLE)	14.4	
1530					Theta hat (MLE)	149.6				Theta star (bias corrected MLE)	238	
1531					nu hat (MLE)	366.6				nu star (bias corrected)	230.5	
1532					MLE Mean (bias corrected)	3429				MLE Sd (bias corrected)	903.4	
1533										Approximate Chi Square Value (0.05)	196.3	
1534					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	188.3	
1535												
1536	**Assuming Gamma Distribution**											
1537					95% Approximate Gamma UCL (use when n>=50))	4025				95% Adjusted Gamma UCL (use when n<50)	4196	
1538												
1539	**Lognormal GOF Test**											
1540					Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**					
1541					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1542					Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**					
1543					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1544	**Data appear Lognormal at 5% Significance Level**											
1545												
1546	**Lognormal Statistics**											
1547					Minimum of Logged Data	7.852				Mean of logged Data	8.118	
1548					Maximum of Logged Data	8.491				SD of logged Data	0.222	
1549												
1550	**Assuming Lognormal Distribution**											
1551					95% H-UCL	4053				90% Chebyshev (MVUE) UCL	4235	
1552					95% Chebyshev (MVUE) UCL	4600				97.5% Chebyshev (MVUE) UCL	5108	
1553					99% Chebyshev (MVUE) UCL	6105						
1554												
1555	**Nonparametric Distribution Free UCL Statistics**											
1556	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1557												
1558	**Nonparametric Distribution Free UCLs**											
1559					95% CLT UCL	3887				95% Jackknife UCL	3956	
1560					95% Standard Bootstrap UCL	3864				95% Bootstrap-t UCL	4074	

1561				95% Hall's Bootstrap UCL	3969				95% Percentile Bootstrap UCL		3881	
1562				95% BCA Bootstrap UCL	3894							
1563				90% Chebyshev(Mean, Sd) UCL	4264				95% Chebyshev(Mean, Sd) UCL		4642	
1564				97.5% Chebyshev(Mean, Sd) UCL	5167				99% Chebyshev(Mean, Sd) UCL		6199	
1565												
1566					**Suggested UCL to Use**							
1567				95% Student's-t UCL	3956							
1568												
1569					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1570					Recommendations are based upon data size, data distribution, and skewness.							
1571					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1572					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1573												
1574												
1575	**Manganese (smw13)**											
1576												
1577					**General Statistics**							
1578				Total Number of Observations	8				Number of Distinct Observations		8	
1579									Number of Missing Observations		0	
1580				Minimum	1120				Mean		3533	
1581				Maximum	6690				Median		3385	
1582				SD	2015				Std. Error of Mean		712.4	
1583				Coefficient of Variation	0.57				Skewness		0.455	
1584												
1585					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1586					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1587					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1588					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1589												
1590					**Normal GOF Test**							
1591				Shapiro Wilk Test Statistic	0.942				**Shapiro Wilk GOF Test**			
1592				5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level			
1593				Lilliefors Test Statistic	0.141				**Lilliefors GOF Test**			
1594				5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level			
1595					**Data appear Normal at 5% Significance Level**							
1596												
1597					**Assuming Normal Distribution**							
1598					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
1599				95% Student's-t UCL	4882				95% Adjusted-CLT UCL (Chen-1995)		4827	
1600									95% Modified-t UCL (Johnson-1978)		4901	
1601												
1602					**Gamma GOF Test**							
1603				A-D Test Statistic	0.201				**Anderson-Darling Gamma GOF Test**			
1604				5% A-D Critical Value	0.721				Detected data appear Gamma Distributed at 5% Significance Level			
1605				K-S Test Statistic	0.132				**Kolmogorov-Smirnov Gamma GOF Test**			
1606				5% K-S Critical Value	0.296				Detected data appear Gamma Distributed at 5% Significance Level			
1607					**Detected data appear Gamma Distributed at 5% Significance Level**							
1608												
1609					**Gamma Statistics**							
1610				k hat (MLE)	3.221				k star (bias corrected MLE)		2.097	
1611				Theta hat (MLE)	1097				Theta star (bias corrected MLE)		1685	
1612				nu hat (MLE)	51.54				nu star (bias corrected)		33.55	

1613					MLE Mean (bias corrected)	3533					MLE Sd (bias corrected)	2440
1614											Approximate Chi Square Value (0.05)	21.3
1615					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	18.87
1616												
1617					**Assuming Gamma Distribution**							
1618					95% Approximate Gamma UCL (use when n>=50))	5563					95% Adjusted Gamma UCL (use when n<50)	6279
1619												
1620					**Lognormal GOF Test**							
1621					Shapiro Wilk Test Statistic	0.956					**Shapiro Wilk Lognormal GOF Test**	
1622					5% Shapiro Wilk Critical Value	0.818					Data appear Lognormal at 5% Significance Level	
1623					Lilliefors Test Statistic	0.146					**Lilliefors Lognormal GOF Test**	
1624					5% Lilliefors Critical Value	0.283					Data appear Lognormal at 5% Significance Level	
1625					**Data appear Lognormal at 5% Significance Level**							
1626												
1627					**Lognormal Statistics**							
1628					Minimum of Logged Data	7.021					Mean of logged Data	8.007
1629					Maximum of Logged Data	8.808					SD of logged Data	0.637
1630												
1631					**Assuming Lognormal Distribution**							
1632					95% H-UCL	6883					90% Chebyshev (MVUE) UCL	6019
1633					95% Chebyshev (MVUE) UCL	7128					97.5% Chebyshev (MVUE) UCL	8667
1634					99% Chebyshev (MVUE) UCL	11690						
1635												
1636					**Nonparametric Distribution Free UCL Statistics**							
1637					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
1638												
1639					**Nonparametric Distribution Free UCLs**							
1640					95% CLT UCL	4704					95% Jackknife UCL	4882
1641					95% Standard Bootstrap UCL	4629					95% Bootstrap-t UCL	5108
1642					95% Hall's Bootstrap UCL	5165					95% Percentile Bootstrap UCL	4681
1643					95% BCA Bootstrap UCL	4760						
1644					90% Chebyshev(Mean, Sd) UCL	5670					95% Chebyshev(Mean, Sd) UCL	6638
1645					97.5% Chebyshev(Mean, Sd) UCL	7981					99% Chebyshev(Mean, Sd) UCL	10621
1646												
1647					**Suggested UCL to Use**							
1648					95% Student's-t UCL	4882						
1649												
1650					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1651					Recommendations are based upon data size, data distribution, and skewness.							
1652					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1653					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1654												
1655												
1656	**Manganese (smw14)**											
1657												
1658					**General Statistics**							
1659					Total Number of Observations	8					Number of Distinct Observations	8
1660											Number of Missing Observations	0
1661					Minimum	509					Mean	2311
1662					Maximum	4240					Median	2315
1663					SD	1304					Std. Error of Mean	461.1
1664					Coefficient of Variation	0.564					Skewness	-0.0117

1665												
1666	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1667	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1668	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1669	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1670												
1671	**Normal GOF Test**											
1672					Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**					
1673					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1674					Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**					
1675					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1676	**Data appear Normal at 5% Significance Level**											
1677												
1678	**Assuming Normal Distribution**											
1679	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1680					95% Student's-t UCL	3184	95% Adjusted-CLT UCL (Chen-1995)	3067				
1681							95% Modified-t UCL (Johnson-1978)	3184				
1682												
1683	**Gamma GOF Test**											
1684					A-D Test Statistic	0.294	**Anderson-Darling Gamma GOF Test**					
1685					5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level					
1686					K-S Test Statistic	0.17	**Kolmogorov-Smirnov Gamma GOF Test**					
1687					5% K-S Critical Value	0.297	Detected data appear Gamma Distributed at 5% Significance Level					
1688	**Detected data appear Gamma Distributed at 5% Significance Level**											
1689												
1690	**Gamma Statistics**											
1691					k hat (MLE)	2.703	k star (bias corrected MLE)	1.773				
1692					Theta hat (MLE)	855	Theta star (bias corrected MLE)	1304				
1693					nu hat (MLE)	43.24	nu star (bias corrected)	28.36				
1694					MLE Mean (bias corrected)	2311	MLE Sd (bias corrected)	1736				
1695							Approximate Chi Square Value (0.05)	17.21				
1696					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	15.05				
1697												
1698	**Assuming Gamma Distribution**											
1699					95% Approximate Gamma UCL (use when n>=50))	3808	95% Adjusted Gamma UCL (use when n<50)	4353				
1700												
1701	**Lognormal GOF Test**											
1702					Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk Lognormal GOF Test**					
1703					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1704					Lilliefors Test Statistic	0.176	**Lilliefors Lognormal GOF Test**					
1705					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1706	**Data appear Lognormal at 5% Significance Level**											
1707												
1708	**Lognormal Statistics**											
1709					Minimum of Logged Data	6.232	Mean of logged Data	7.549				
1710					Maximum of Logged Data	8.352	SD of logged Data	0.74				
1711												
1712	**Assuming Lognormal Distribution**											
1713					95% H-UCL	5490	90% Chebyshev (MVUE) UCL	4312				
1714					95% Chebyshev (MVUE) UCL	5178	97.5% Chebyshev (MVUE) UCL	6381				
1715					99% Chebyshev (MVUE) UCL	8745						
1716												

	A	B	C	D	E	F	G	H	I	J	K	L
1717	**Nonparametric Distribution Free UCL Statistics**											
1718	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1719												
1720	**Nonparametric Distribution Free UCLs**											
1721					95% CLT UCL	3069				95% Jackknife UCL	3184	
1722					95% Standard Bootstrap UCL	3036				95% Bootstrap-t UCL	3160	
1723					95% Hall's Bootstrap UCL	3029				95% Percentile Bootstrap UCL	3044	
1724					95% BCA Bootstrap UCL	2991						
1725					90% Chebyshev(Mean, Sd) UCL	3694				95% Chebyshev(Mean, Sd) UCL	4321	
1726					97.5% Chebyshev(Mean, Sd) UCL	5190				99% Chebyshev(Mean, Sd) UCL	6898	
1727												
1728	**Suggested UCL to Use**											
1729					95% Student's-t UCL	3184						
1730												
1731	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1732	Recommendations are based upon data size, data distribution, and skewness.											
1733	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1734	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1735												
1736	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1737	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1738												
1739												
1740	**Manganese (smw15)**											
1741												
1742	**General Statistics**											
1743					Total Number of Observations	9				Number of Distinct Observations	9	
1744										Number of Missing Observations	0	
1745					Minimum	3280				Mean	8309	
1746					Maximum	15500				Median	7920	
1747					SD	4058				Std. Error of Mean	1353	
1748					Coefficient of Variation	0.488				Skewness	0.586	
1749												
1750	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1751	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1752	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1753	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1754												
1755	**Normal GOF Test**											
1756					Shapiro Wilk Test Statistic	0.939				**Shapiro Wilk GOF Test**		
1757					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
1758					Lilliefors Test Statistic	0.16				**Lilliefors GOF Test**		
1759					5% Lilliefors Critical Value	0.274				Data appear Normal at 5% Significance Level		
1760	**Data appear Normal at 5% Significance Level**											
1761												
1762	**Assuming Normal Distribution**											
1763	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
1764					95% Student's-t UCL	10824				95% Adjusted-CLT UCL (Chen-1995)	10816	
1765										95% Modified-t UCL (Johnson-1978)	10868	
1766												
1767	**Gamma GOF Test**											
1768					A-D Test Statistic	0.255				**Anderson-Darling Gamma GOF Test**		

1769				5% A-D Critical Value		0.724	Detected data appear Gamma Distributed at 5% Significance Level					
1770				K-S Test Statistic		0.174	**Kolmogorov-Smirnov Gamma GOF Test**					
1771				5% K-S Critical Value		0.28	Detected data appear Gamma Distributed at 5% Significance Level					
1772	**Detected data appear Gamma Distributed at 5% Significance Level**											
1773												
1774	**Gamma Statistics**											
1775				k hat (MLE)		4.577	k star (bias corrected MLE)					3.126
1776				Theta hat (MLE)		1815	Theta star (bias corrected MLE)					2658
1777				nu hat (MLE)		82.39	nu star (bias corrected)					56.26
1778				MLE Mean (bias corrected)		8309	MLE Sd (bias corrected)					4700
1779							Approximate Chi Square Value (0.05)					40.02
1780				Adjusted Level of Significance		0.0231	Adjusted Chi Square Value					37.15
1781												
1782	**Assuming Gamma Distribution**											
1783				95% Approximate Gamma UCL (use when n>=50))		11680	95% Adjusted Gamma UCL (use when n<50)					12583
1784												
1785	**Lognormal GOF Test**											
1786				Shapiro Wilk Test Statistic		0.953	**Shapiro Wilk Lognormal GOF Test**					
1787				5% Shapiro Wilk Critical Value		0.829	Data appear Lognormal at 5% Significance Level					
1788				Lilliefors Test Statistic		0.186	**Lilliefors Lognormal GOF Test**					
1789				5% Lilliefors Critical Value		0.274	Data appear Lognormal at 5% Significance Level					
1790	**Data appear Lognormal at 5% Significance Level**											
1791												
1792	**Lognormal Statistics**											
1793				Minimum of Logged Data		8.096	Mean of logged Data					8.912
1794				Maximum of Logged Data		9.649	SD of logged Data					0.518
1795												
1796	**Assuming Lognormal Distribution**											
1797				95% H-UCL		12816	90% Chebyshev (MVUE) UCL					12731
1798				95% Chebyshev (MVUE) UCL		14717	97.5% Chebyshev (MVUE) UCL					17473
1799				99% Chebyshev (MVUE) UCL		22888						
1800												
1801	**Nonparametric Distribution Free UCL Statistics**											
1802	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1803												
1804	**Nonparametric Distribution Free UCLs**											
1805				95% CLT UCL		10534	95% Jackknife UCL					10824
1806				95% Standard Bootstrap UCL		10442	95% Bootstrap-t UCL					11398
1807				95% Hall's Bootstrap UCL		12114	95% Percentile Bootstrap UCL					10458
1808				95% BCA Bootstrap UCL		10624						
1809				90% Chebyshev(Mean, Sd) UCL		12367	95% Chebyshev(Mean, Sd) UCL					14205
1810				97.5% Chebyshev(Mean, Sd) UCL		16756	99% Chebyshev(Mean, Sd) UCL					21768
1811												
1812	**Suggested UCL to Use**											
1813				95% Student's-t UCL		10824						
1814												
1815	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1816	Recommendations are based upon data size, data distribution, and skewness.											
1817	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1818	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1819												
1820												

1821	**Manganese (smw16)**											
1822												
1823	**General Statistics**											
1824					Total Number of Observations	9			Number of Distinct Observations	9		
1825									Number of Missing Observations	0		
1826					Minimum	3830			Mean	4479		
1827					Maximum	5410			Median	4520		
1828					SD	490.7			Std. Error of Mean	163.6		
1829					Coefficient of Variation	0.11			Skewness	0.482		
1830												
1831	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1832	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1833	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1834	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1835												
1836	**Normal GOF Test**											
1837					Shapiro Wilk Test Statistic	0.952			**Shapiro Wilk GOF Test**			
1838					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
1839					Lilliefors Test Statistic	0.143			**Lilliefors GOF Test**			
1840					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
1841	**Data appear Normal at 5% Significance Level**											
1842												
1843	**Assuming Normal Distribution**											
1844					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
1845					95% Student's-t UCL	4783			95% Adjusted-CLT UCL (Chen-1995)	4776		
1846									95% Modified-t UCL (Johnson-1978)	4787		
1847												
1848	**Gamma GOF Test**											
1849					A-D Test Statistic	0.247			**Anderson-Darling Gamma GOF Test**			
1850					5% A-D Critical Value	0.72			Detected data appear Gamma Distributed at 5% Significance Level			
1851					K-S Test Statistic	0.155			**Kolmogorov-Smirnov Gamma GOF Test**			
1852					5% K-S Critical Value	0.279			Detected data appear Gamma Distributed at 5% Significance Level			
1853	**Detected data appear Gamma Distributed at 5% Significance Level**											
1854												
1855	**Gamma Statistics**											
1856					k hat (MLE)	95.27			k star (bias corrected MLE)	63.59		
1857					Theta hat (MLE)	47.01			Theta star (bias corrected MLE)	70.44		
1858					nu hat (MLE)	1715			nu star (bias corrected)	1145		
1859					MLE Mean (bias corrected)	4479			MLE Sd (bias corrected)	561.7		
1860									Approximate Chi Square Value (0.05)	1067		
1861					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	1051		
1862												
1863	**Assuming Gamma Distribution**											
1864					95% Approximate Gamma UCL (use when n>=50))	4804			95% Adjusted Gamma UCL (use when n<50)	4877		
1865												
1866	**Lognormal GOF Test**											
1867					Shapiro Wilk Test Statistic	0.959			**Shapiro Wilk Lognormal GOF Test**			
1868					5% Shapiro Wilk Critical Value	0.829			Data appear Lognormal at 5% Significance Level			
1869					Lilliefors Test Statistic	0.162			**Lilliefors Lognormal GOF Test**			
1870					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
1871	**Data appear Lognormal at 5% Significance Level**											
1872												

1873	**Lognormal Statistics**											
1874					Minimum of Logged Data	8.251			Mean of logged Data	8.402		
1875					Maximum of Logged Data	8.596			SD of logged Data	0.108		
1876												
1877	**Assuming Lognormal Distribution**											
1878					95% H-UCL	4807			90% Chebyshev (MVUE) UCL	4965		
1879					95% Chebyshev (MVUE) UCL	5185			97.5% Chebyshev (MVUE) UCL	5491		
1880					99% Chebyshev (MVUE) UCL	6091						
1881												
1882	**Nonparametric Distribution Free UCL Statistics**											
1883	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1884												
1885	**Nonparametric Distribution Free UCLs**											
1886					95% CLT UCL	4748			95% Jackknife UCL	4783		
1887					95% Standard Bootstrap UCL	4729			95% Bootstrap-t UCL	4816		
1888					95% Hall's Bootstrap UCL	4827			95% Percentile Bootstrap UCL	4737		
1889					95% BCA Bootstrap UCL	4743						
1890					90% Chebyshev(Mean, Sd) UCL	4970			95% Chebyshev(Mean, Sd) UCL	5192		
1891					97.5% Chebyshev(Mean, Sd) UCL	5500			99% Chebyshev(Mean, Sd) UCL	6106		
1892												
1893	**Suggested UCL to Use**											
1894					95% Student's-t UCL	4783						
1895												
1896	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1897	Recommendations are based upon data size, data distribution, and skewness.											
1898	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1899	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1900												
1901												
1902	**Manganese (smw16d)**											
1903												
1904	**General Statistics**											
1905					Total Number of Observations	8			Number of Distinct Observations	8		
1906									Number of Missing Observations	0		
1907					Minimum	315			Mean	367.9		
1908					Maximum	417			Median	364.5		
1909					SD	33.95			Std. Error of Mean	12		
1910					Coefficient of Variation	0.0923			Skewness	0.18		
1911												
1912	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1913	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1914	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1915	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1916												
1917	**Normal GOF Test**											
1918					Shapiro Wilk Test Statistic	0.944			**Shapiro Wilk GOF Test**			
1919					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
1920					Lilliefors Test Statistic	0.202			**Lilliefors GOF Test**			
1921					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
1922	**Data appear Normal at 5% Significance Level**											
1923												
1924	**Assuming Normal Distribution**											

	A	B	C	D	E	F	G	H	I	J	K	L
1925	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1926					95% Student's-t UCL	390.6					95% Adjusted-CLT UCL (Chen-1995)	388.4
1927											95% Modified-t UCL (Johnson-1978)	390.7
1928												
1929	**Gamma GOF Test**											
1930					A-D Test Statistic	0.289	**Anderson-Darling Gamma GOF Test**					
1931					5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level					
1932					K-S Test Statistic	0.187	**Kolmogorov-Smirnov Gamma GOF Test**					
1933					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1934	**Detected data appear Gamma Distributed at 5% Significance Level**											
1935												
1936	**Gamma Statistics**											
1937					k hat (MLE)	134.4	k star (bias corrected MLE)					84.07
1938					Theta hat (MLE)	2.738	Theta star (bias corrected MLE)					4.376
1939					nu hat (MLE)	2150	nu star (bias corrected)					1345
1940					MLE Mean (bias corrected)	367.9	MLE Sd (bias corrected)					40.12
1941							Approximate Chi Square Value (0.05)					1261
1942					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value					1240
1943												
1944	**Assuming Gamma Distribution**											
1945			95% Approximate Gamma UCL (use when n>=50))			392.4	95% Adjusted Gamma UCL (use when n<50)					399
1946												
1947	**Lognormal GOF Test**											
1948					Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**					
1949					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1950					Lilliefors Test Statistic	0.186	**Lilliefors Lognormal GOF Test**					
1951					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1952	**Data appear Lognormal at 5% Significance Level**											
1953												
1954	**Lognormal Statistics**											
1955					Minimum of Logged Data	5.753	Mean of logged Data					5.904
1956					Maximum of Logged Data	6.033	SD of logged Data					0.0923
1957												
1958	**Assuming Lognormal Distribution**											
1959					95% H-UCL	N/A	90% Chebyshev (MVUE) UCL					403.9
1960					95% Chebyshev (MVUE) UCL	420.2	97.5% Chebyshev (MVUE) UCL					442.9
1961					99% Chebyshev (MVUE) UCL	487.4						
1962												
1963	**Nonparametric Distribution Free UCL Statistics**											
1964	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1965												
1966	**Nonparametric Distribution Free UCLs**											
1967					95% CLT UCL	387.6	95% Jackknife UCL					390.6
1968					95% Standard Bootstrap UCL	386.7	95% Bootstrap-t UCL					394.4
1969					95% Hall's Bootstrap UCL	403.3	95% Percentile Bootstrap UCL					385.8
1970					95% BCA Bootstrap UCL	386.5						
1971					90% Chebyshev(Mean, Sd) UCL	403.9	95% Chebyshev(Mean, Sd) UCL					420.2
1972					97.5% Chebyshev(Mean, Sd) UCL	442.8	99% Chebyshev(Mean, Sd) UCL					487.3
1973												
1974	**Suggested UCL to Use**											
1975					95% Student's-t UCL	390.6						
1976												

	A	B	C	D	E	F	G	H	I	J	K	L
1977	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1978	Recommendations are based upon data size, data distribution, and skewness.											
1979	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1980	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1981												
1982												
1983	**Manganese (smw17)**											
1984												
1985	**General Statistics**											
1986						Total Number of Observations	8			Number of Distinct Observations	8	
1987										Number of Missing Observations	0	
1988						Minimum	3800			Mean	5750	
1989						Maximum	16500			Median	4285	
1990						SD	4355			Std. Error of Mean	1540	
1991						Coefficient of Variation	0.757			Skewness	2.798	
1992												
1993	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1994	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1995	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1996	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1997												
1998	**Normal GOF Test**											
1999						Shapiro Wilk Test Statistic	0.487			**Shapiro Wilk GOF Test**		
2000						5% Shapiro Wilk Critical Value	0.818			Data Not Normal at 5% Significance Level		
2001						Lilliefors Test Statistic	0.46			**Lilliefors GOF Test**		
2002						5% Lilliefors Critical Value	0.283			Data Not Normal at 5% Significance Level		
2003	**Data Not Normal at 5% Significance Level**											
2004												
2005	**Assuming Normal Distribution**											
2006						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
2007						95% Student's-t UCL	8667			95% Adjusted-CLT UCL (Chen-1995)	9911	
2008										95% Modified-t UCL (Johnson-1978)	8921	
2009												
2010	**Gamma GOF Test**											
2011						A-D Test Statistic	1.877			**Anderson-Darling Gamma GOF Test**		
2012						5% A-D Critical Value	0.72			Data Not Gamma Distributed at 5% Significance Level		
2013						K-S Test Statistic	0.436			**Kolmogorov-Smirnov Gamma GOF Test**		
2014						5% K-S Critical Value	0.296			Data Not Gamma Distributed at 5% Significance Level		
2015	**Data Not Gamma Distributed at 5% Significance Level**											
2016												
2017	**Gamma Statistics**											
2018						k hat (MLE)	3.665			k star (bias corrected MLE)	2.374	
2019						Theta hat (MLE)	1569			Theta star (bias corrected MLE)	2422	
2020						nu hat (MLE)	58.64			nu star (bias corrected)	37.98	
2021						MLE Mean (bias corrected)	5750			MLE Sd (bias corrected)	3732	
2022										Approximate Chi Square Value (0.05)	24.87	
2023						Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	22.22	
2024												
2025	**Assuming Gamma Distribution**											
2026						95% Approximate Gamma UCL (use when n>=50))	8782			95% Adjusted Gamma UCL (use when n<50)	9828	
2027												
2028	**Lognormal GOF Test**											

2029				Shapiro Wilk Test Statistic		0.562	**Shapiro Wilk Lognormal GOF Test**					
2030				5% Shapiro Wilk Critical Value		0.818	Data Not Lognormal at 5% Significance Level					
2031				Lilliefors Test Statistic		0.404	**Lilliefors Lognormal GOF Test**					
2032				5% Lilliefors Critical Value		0.283	Data Not Lognormal at 5% Significance Level					
2033	**Data Not Lognormal at 5% Significance Level**											
2034												
2035	**Lognormal Statistics**											
2036				Minimum of Logged Data		8.243	Mean of logged Data					8.514
2037				Maximum of Logged Data		9.711	SD of logged Data					0.489
2038												
2039	**Assuming Lognormal Distribution**											
2040				95% H-UCL		8657	90% Chebyshev (MVUE) UCL					8428
2041				95% Chebyshev (MVUE) UCL		9741	97.5% Chebyshev (MVUE) UCL					11563
2042				99% Chebyshev (MVUE) UCL		15142						
2043												
2044	**Nonparametric Distribution Free UCL Statistics**											
2045	**Data do not follow a Discernible Distribution (0.05)**											
2046												
2047	**Nonparametric Distribution Free UCLs**											
2048				95% CLT UCL		8283	95% Jackknife UCL					8667
2049				95% Standard Bootstrap UCL		8068	95% Bootstrap-t UCL					37104
2050				95% Hall's Bootstrap UCL		27668	95% Percentile Bootstrap UCL					8764
2051				95% BCA Bootstrap UCL		10281						
2052				90% Chebyshev(Mean, Sd) UCL		10370	95% Chebyshev(Mean, Sd) UCL					12462
2053				97.5% Chebyshev(Mean, Sd) UCL		15366	99% Chebyshev(Mean, Sd) UCL					21071
2054												
2055	**Suggested UCL to Use**											
2056				95% Student's-t UCL		8667	or 95% Modified-t UCL					8921
2057												
2058	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2059	Recommendations are based upon data size, data distribution, and skewness.											
2060	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2061	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2062												
2063												
2064	**Manganese (smw17d)**											
2065												
2066	**General Statistics**											
2067				Total Number of Observations		8	Number of Distinct Observations					8
2068							Number of Missing Observations					0
2069				Minimum		525	Mean					638.3
2070				Maximum		788	Median					626
2071				SD		79.12	Std. Error of Mean					27.97
2072				Coefficient of Variation		0.124	Skewness					0.709
2073												
2074	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2075	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2076	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2077	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2078												
2079	**Normal GOF Test**											
2080				Shapiro Wilk Test Statistic		0.952	**Shapiro Wilk GOF Test**					

2081				5% Shapiro Wilk Critical Value		0.818		Data appear Normal at 5% Significance Level				
2082				Lilliefors Test Statistic		0.186		**Lilliefors GOF Test**				
2083				5% Lilliefors Critical Value		0.283		Data appear Normal at 5% Significance Level				
2084	**Data appear Normal at 5% Significance Level**											
2085												
2086	**Assuming Normal Distribution**											
2087	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2088				95% Student's-t UCL		691.2		95% Adjusted-CLT UCL (Chen-1995)				691.8
2089								95% Modified-t UCL (Johnson-1978)				692.4
2090												
2091	**Gamma GOF Test**											
2092				A-D Test Statistic		0.263		**Anderson-Darling Gamma GOF Test**				
2093				5% A-D Critical Value		0.715		Detected data appear Gamma Distributed at 5% Significance Level				
2094				K-S Test Statistic		0.172		**Kolmogorov-Smirnov Gamma GOF Test**				
2095				5% K-S Critical Value		0.294		Detected data appear Gamma Distributed at 5% Significance Level				
2096	**Detected data appear Gamma Distributed at 5% Significance Level**											
2097												
2098	**Gamma Statistics**											
2099				k hat (MLE)		76.5		k star (bias corrected MLE)				47.9
2100				Theta hat (MLE)		8.343		Theta star (bias corrected MLE)				13.33
2101				nu hat (MLE)		1224		nu star (bias corrected)				766.4
2102				MLE Mean (bias corrected)		638.3		MLE Sd (bias corrected)				92.22
2103								Approximate Chi Square Value (0.05)				703.1
2104				Adjusted Level of Significance		0.0195		Adjusted Chi Square Value				687.7
2105												
2106	**Assuming Gamma Distribution**											
2107	95% Approximate Gamma UCL (use when n>=50))					695.7		95% Adjusted Gamma UCL (use when n<50)				711.2
2108												
2109	**Lognormal GOF Test**											
2110				Shapiro Wilk Test Statistic		0.969		**Shapiro Wilk Lognormal GOF Test**				
2111				5% Shapiro Wilk Critical Value		0.818		Data appear Lognormal at 5% Significance Level				
2112				Lilliefors Test Statistic		0.166		**Lilliefors Lognormal GOF Test**				
2113				5% Lilliefors Critical Value		0.283		Data appear Lognormal at 5% Significance Level				
2114	**Data appear Lognormal at 5% Significance Level**											
2115												
2116	**Lognormal Statistics**											
2117				Minimum of Logged Data		6.263		Mean of logged Data				6.452
2118				Maximum of Logged Data		6.669		SD of logged Data				0.122
2119												
2120	**Assuming Lognormal Distribution**											
2121				95% H-UCL		696.1		90% Chebyshev (MVUE) UCL				720.6
2122				95% Chebyshev (MVUE) UCL		758		97.5% Chebyshev (MVUE) UCL				809.8
2123				99% Chebyshev (MVUE) UCL		911.6						
2124												
2125	**Nonparametric Distribution Free UCL Statistics**											
2126	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2127												
2128	**Nonparametric Distribution Free UCLs**											
2129				95% CLT UCL		684.3		95% Jackknife UCL				691.2
2130				95% Standard Bootstrap UCL		681.1		95% Bootstrap-t UCL				706.6
2131				95% Hall's Bootstrap UCL		777.4		95% Percentile Bootstrap UCL				681.4
2132				95% BCA Bootstrap UCL		692.1						

2133				90% Chebyshev(Mean, Sd) UCL		722.2				95% Chebyshev(Mean, Sd) UCL		760.2
2134				97.5% Chebyshev(Mean, Sd) UCL		812.9				99% Chebyshev(Mean, Sd) UCL		916.6
2135												
2136						**Suggested UCL to Use**							
2137				95% Student's-t UCL		691.2						
2138												
2139						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
2140						Recommendations are based upon data size, data distribution, and skewness.						
2141						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
2142						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
2143												
2144												
2145	**Manganese (smw18)**											
2146												
2147						**General Statistics**						
2148				Total Number of Observations		8				Number of Distinct Observations		7
2149										Number of Missing Observations		0
2150				Minimum		1910				Mean		3355
2151				Maximum		7060				Median		2395
2152				SD		1890				Std. Error of Mean		668.1
2153				Coefficient of Variation		0.563				Skewness		1.384
2154												
2155						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2156						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2157						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2158						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2159												
2160						**Normal GOF Test**						
2161				Shapiro Wilk Test Statistic		0.791				**Shapiro Wilk GOF Test**		
2162				5% Shapiro Wilk Critical Value		0.818				Data Not Normal at 5% Significance Level		
2163				Lilliefors Test Statistic		0.318				**Lilliefors GOF Test**		
2164				5% Lilliefors Critical Value		0.283				Data Not Normal at 5% Significance Level		
2165						**Data Not Normal at 5% Significance Level**						
2166												
2167						**Assuming Normal Distribution**						
2168				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
2169				95% Student's-t UCL		4621				95% Adjusted-CLT UCL (Chen-1995)		4803
2170										95% Modified-t UCL (Johnson-1978)		4675
2171												
2172						**Gamma GOF Test**						
2173				A-D Test Statistic		0.681				**Anderson-Darling Gamma GOF Test**		
2174				5% A-D Critical Value		0.719				Detected data appear Gamma Distributed at 5% Significance Level		
2175				K-S Test Statistic		0.319				**Kolmogorov-Smirnov Gamma GOF Test**		
2176				5% K-S Critical Value		0.295				Data Not Gamma Distributed at 5% Significance Level		
2177						**Detected data follow Appr. Gamma Distribution at 5% Significance Level**						
2178												
2179						**Gamma Statistics**						
2180				k hat (MLE)		4.449				k star (bias corrected MLE)		2.864
2181				Theta hat (MLE)		754.2				Theta star (bias corrected MLE)		1172
2182				nu hat (MLE)		71.18				nu star (bias corrected)		45.82
2183				MLE Mean (bias corrected)		3355				MLE Sd (bias corrected)		1983
2184										Approximate Chi Square Value (0.05)		31.29

2185					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		28.28
2186												
2187					**Assuming Gamma Distribution**							
2188					95% Approximate Gamma UCL (use when n>=50)	4913				95% Adjusted Gamma UCL (use when n<50)		5435
2189												
2190					**Lognormal GOF Test**							
2191					Shapiro Wilk Test Statistic	0.851				**Shapiro Wilk Lognormal GOF Test**		
2192					5% Shapiro Wilk Critical Value	0.818				Data appear Lognormal at 5% Significance Level		
2193					Lilliefors Test Statistic	0.296				**Lilliefors Lognormal GOF Test**		
2194					5% Lilliefors Critical Value	0.283				Data Not Lognormal at 5% Significance Level		
2195					**Data appear Approximate Lognormal at 5% Significance Level**							
2196												
2197					**Lognormal Statistics**							
2198					Minimum of Logged Data	7.555				Mean of logged Data		8.002
2199					Maximum of Logged Data	8.862				SD of logged Data		0.493
2200												
2201					**Assuming Lognormal Distribution**							
2202					95% H-UCL	5219				90% Chebyshev (MVUE) UCL		5070
2203					95% Chebyshev (MVUE) UCL	5863				97.5% Chebyshev (MVUE) UCL		6965
2204					99% Chebyshev (MVUE) UCL	9129						
2205												
2206					**Nonparametric Distribution Free UCL Statistics**							
2207					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
2208												
2209					**Nonparametric Distribution Free UCLs**							
2210					95% CLT UCL	4454				95% Jackknife UCL		4621
2211					95% Standard Bootstrap UCL	4370				95% Bootstrap-t UCL		6667
2212					95% Hall's Bootstrap UCL	5637				95% Percentile Bootstrap UCL		4449
2213					95% BCA Bootstrap UCL	4728						
2214					90% Chebyshev(Mean, Sd) UCL	5359				95% Chebyshev(Mean, Sd) UCL		6267
2215					97.5% Chebyshev(Mean, Sd) UCL	7527				99% Chebyshev(Mean, Sd) UCL		10002
2216												
2217					**Suggested UCL to Use**							
2218					95% Adjusted Gamma UCL	5435						
2219												
2220					When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test							
2221					When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL							
2222												
2223					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2224					Recommendations are based upon data size, data distribution, and skewness.							
2225					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2226					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2227												
2228												
2229	**Manganese (smw18d)**											
2230												
2231					**General Statistics**							
2232					Total Number of Observations	8				Number of Distinct Observations		8
2233										Number of Missing Observations		0
2234					Minimum	650				Mean		841.5
2235					Maximum	1420				Median		786
2236					SD	241.7				Std. Error of Mean		85.46

2237				Coefficient of Variation		0.287					Skewness	2.458
2238												
2239	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2240	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2241	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2242	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2243												
2244	**Normal GOF Test**											
2245				Shapiro Wilk Test Statistic		0.667	**Shapiro Wilk GOF Test**					
2246				5% Shapiro Wilk Critical Value		0.818	Data Not Normal at 5% Significance Level					
2247				Lilliefors Test Statistic		0.397	**Lilliefors GOF Test**					
2248				5% Lilliefors Critical Value		0.283	Data Not Normal at 5% Significance Level					
2249	**Data Not Normal at 5% Significance Level**											
2250												
2251	**Assuming Normal Distribution**											
2252	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2253				95% Student's-t UCL		1003	95% Adjusted-CLT UCL (Chen-1995)					1061
2254							95% Modified-t UCL (Johnson-1978)					1016
2255												
2256	**Gamma GOF Test**											
2257				A-D Test Statistic		1.024	**Anderson-Darling Gamma GOF Test**					
2258				5% A-D Critical Value		0.716	Data Not Gamma Distributed at 5% Significance Level					
2259				K-S Test Statistic		0.371	**Kolmogorov-Smirnov Gamma GOF Test**					
2260				5% K-S Critical Value		0.294	Data Not Gamma Distributed at 5% Significance Level					
2261	**Data Not Gamma Distributed at 5% Significance Level**											
2262												
2263	**Gamma Statistics**											
2264				k hat (MLE)		18.01	k star (bias corrected MLE)					11.34
2265				Theta hat (MLE)		46.73	Theta star (bias corrected MLE)					74.22
2266				nu hat (MLE)		288.1	nu star (bias corrected)					181.4
2267				MLE Mean (bias corrected)		841.5	MLE Sd (bias corrected)					249.9
2268							Approximate Chi Square Value (0.05)					151.3
2269				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					144.3
2270												
2271	**Assuming Gamma Distribution**											
2272				95% Approximate Gamma UCL (use when n>=50))		1009	95% Adjusted Gamma UCL (use when n<50)					1058
2273												
2274	**Lognormal GOF Test**											
2275				Shapiro Wilk Test Statistic		0.755	**Shapiro Wilk Lognormal GOF Test**					
2276				5% Shapiro Wilk Critical Value		0.818	Data Not Lognormal at 5% Significance Level					
2277				Lilliefors Test Statistic		0.355	**Lilliefors Lognormal GOF Test**					
2278				5% Lilliefors Critical Value		0.283	Data Not Lognormal at 5% Significance Level					
2279	**Data Not Lognormal at 5% Significance Level**											
2280												
2281	**Lognormal Statistics**											
2282				Minimum of Logged Data		6.477	Mean of logged Data					6.707
2283				Maximum of Logged Data		7.258	SD of logged Data					0.238
2284												
2285	**Assuming Lognormal Distribution**											
2286				95% H-UCL		1006	90% Chebyshev (MVUE) UCL					1051
2287				95% Chebyshev (MVUE) UCL		1147	97.5% Chebyshev (MVUE) UCL					1280
2288				99% Chebyshev (MVUE) UCL		1542						

	A	B	C	D	E	F	G	H	I	J	K	L
2289												
2290	**Nonparametric Distribution Free UCL Statistics**											
2291	**Data do not follow a Discernible Distribution (0.05)**											
2292												
2293	**Nonparametric Distribution Free UCLs**											
2294					95% CLT UCL	982.1			95% Jackknife UCL	1003		
2295					95% Standard Bootstrap UCL	971.3			95% Bootstrap-t UCL	1264		
2296					95% Hall's Bootstrap UCL	1612			95% Percentile Bootstrap UCL	995.5		
2297					95% BCA Bootstrap UCL	1078						
2298					90% Chebyshev(Mean, Sd) UCL	1098			95% Chebyshev(Mean, Sd) UCL	1214		
2299					97.5% Chebyshev(Mean, Sd) UCL	1375			99% Chebyshev(Mean, Sd) UCL	1692		
2300												
2301	**Suggested UCL to Use**											
2302					95% Student's-t UCL	1003			or 95% Modified-t UCL	1016		
2303												
2304	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2305	Recommendations are based upon data size, data distribution, and skewness.											
2306	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2307	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2308												
2309												
2310	**Manganese (smw19)**											
2311												
2312	**General Statistics**											
2313					Total Number of Observations	8			Number of Distinct Observations	8		
2314									Number of Missing Observations	0		
2315					Minimum	2860			Mean	5760		
2316					Maximum	8770			Median	5130		
2317					SD	2331			Std. Error of Mean	824.1		
2318					Coefficient of Variation	0.405			Skewness	0.234		
2319												
2320	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2321	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2322	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2323	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2324												
2325	**Normal GOF Test**											
2326					Shapiro Wilk Test Statistic	0.883			**Shapiro Wilk GOF Test**			
2327					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
2328					Lilliefors Test Statistic	0.229			**Lilliefors GOF Test**			
2329					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
2330	**Data appear Normal at 5% Significance Level**											
2331												
2332	**Assuming Normal Distribution**											
2333	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
2334					95% Student's-t UCL	7321			95% Adjusted-CLT UCL (Chen-1995)	7188		
2335									95% Modified-t UCL (Johnson-1978)	7333		
2336												
2337	**Gamma GOF Test**											
2338					A-D Test Statistic	0.445			**Anderson-Darling Gamma GOF Test**			
2339					5% A-D Critical Value	0.718			Detected data appear Gamma Distributed at 5% Significance Level			
2340					K-S Test Statistic	0.229			**Kolmogorov-Smirnov Gamma GOF Test**			

	A	B	C	D	E	F	G	H	I	J	K	L
2341				5% K-S Critical Value		0.295	Detected data appear Gamma Distributed at 5% Significance Level					
2342	**Detected data appear Gamma Distributed at 5% Significance Level**											
2343												
2344	**Gamma Statistics**											
2345				k hat (MLE)		6.751	k star (bias corrected MLE)					4.303
2346				Theta hat (MLE)		853.2	Theta star (bias corrected MLE)					1339
2347				nu hat (MLE)		108	nu star (bias corrected)					68.85
2348				MLE Mean (bias corrected)		5760	MLE Sd (bias corrected)					2777
2349							Approximate Chi Square Value (0.05)					50.75
2350				Adjusted Level of Significance		0.0195	Adjusted Chi Square Value					46.84
2351												
2352	**Assuming Gamma Distribution**											
2353			95% Approximate Gamma UCL (use when n>=50))			7814	95% Adjusted Gamma UCL (use when n<50)					8466
2354												
2355	**Lognormal GOF Test**											
2356				Shapiro Wilk Test Statistic		0.908	**Shapiro Wilk Lognormal GOF Test**					
2357				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
2358				Lilliefors Test Statistic		0.211	**Lilliefors Lognormal GOF Test**					
2359				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
2360	**Data appear Lognormal at 5% Significance Level**											
2361												
2362	**Lognormal Statistics**											
2363				Minimum of Logged Data		7.959	Mean of logged Data					8.583
2364				Maximum of Logged Data		9.079	SD of logged Data					0.422
2365												
2366	**Assuming Lognormal Distribution**											
2367				95% H-UCL		8332	90% Chebyshev (MVUE) UCL					8373
2368				95% Chebyshev (MVUE) UCL		9553	97.5% Chebyshev (MVUE) UCL					11190
2369				99% Chebyshev (MVUE) UCL		14406						
2370												
2371	**Nonparametric Distribution Free UCL Statistics**											
2372	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2373												
2374	**Nonparametric Distribution Free UCLs**											
2375				95% CLT UCL		7116	95% Jackknife UCL					7321
2376				95% Standard Bootstrap UCL		7045	95% Bootstrap-t UCL					7529
2377				95% Hall's Bootstrap UCL		6766	95% Percentile Bootstrap UCL					7093
2378				95% BCA Bootstrap UCL		6995						
2379				90% Chebyshev(Mean, Sd) UCL		8232	95% Chebyshev(Mean, Sd) UCL					9352
2380				97.5% Chebyshev(Mean, Sd) UCL		10907	99% Chebyshev(Mean, Sd) UCL					13960
2381												
2382	**Suggested UCL to Use**											
2383				95% Student's-t UCL		7321						
2384												
2385	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2386	Recommendations are based upon data size, data distribution, and skewness.											
2387	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2388	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2389												
2390												
2391	**Manganese (smw7)**											
2392												

2393	**General Statistics**											
2394				Total Number of Observations		8				Number of Distinct Observations		8
2395										Number of Missing Observations		0
2396				Minimum		137				Mean		667.5
2397				Maximum		1300				Median		517.5
2398				SD		431.5				Std. Error of Mean		152.6
2399				Coefficient of Variation		0.646				Skewness		0.659
2400												
2401	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2402	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2403	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2404	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2405												
2406	**Normal GOF Test**											
2407				Shapiro Wilk Test Statistic		0.882	**Shapiro Wilk GOF Test**					
2408				5% Shapiro Wilk Critical Value		0.818	Data appear Normal at 5% Significance Level					
2409				Lilliefors Test Statistic		0.259	**Lilliefors GOF Test**					
2410				5% Lilliefors Critical Value		0.283	Data appear Normal at 5% Significance Level					
2411	**Data appear Normal at 5% Significance Level**											
2412												
2413	**Assuming Normal Distribution**											
2414	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2415				95% Student's-t UCL		956.5				95% Adjusted-CLT UCL (Chen-1995)		956.4
2416										95% Modified-t UCL (Johnson-1978)		962.5
2417												
2418	**Gamma GOF Test**											
2419				A-D Test Statistic		0.327	**Anderson-Darling Gamma GOF Test**					
2420				5% A-D Critical Value		0.723	Detected data appear Gamma Distributed at 5% Significance Level					
2421				K-S Test Statistic		0.187	**Kolmogorov-Smirnov Gamma GOF Test**					
2422				5% K-S Critical Value		0.297	Detected data appear Gamma Distributed at 5% Significance Level					
2423	**Detected data appear Gamma Distributed at 5% Significance Level**											
2424												
2425	**Gamma Statistics**											
2426				k hat (MLE)		2.454				k star (bias corrected MLE)		1.617
2427				Theta hat (MLE)		272				Theta star (bias corrected MLE)		412.8
2428				nu hat (MLE)		39.26				nu star (bias corrected)		25.87
2429				MLE Mean (bias corrected)		667.5				MLE Sd (bias corrected)		524.9
2430										Approximate Chi Square Value (0.05)		15.28
2431				Adjusted Level of Significance		0.0195				Adjusted Chi Square Value		13.27
2432												
2433	**Assuming Gamma Distribution**											
2434				95% Approximate Gamma UCL (use when n>=50))		1130				95% Adjusted Gamma UCL (use when n<50)		1302
2435												
2436	**Lognormal GOF Test**											
2437				Shapiro Wilk Test Statistic		0.925	**Shapiro Wilk Lognormal GOF Test**					
2438				5% Shapiro Wilk Critical Value		0.818	Data appear Lognormal at 5% Significance Level					
2439				Lilliefors Test Statistic		0.223	**Lilliefors Lognormal GOF Test**					
2440				5% Lilliefors Critical Value		0.283	Data appear Lognormal at 5% Significance Level					
2441	**Data appear Lognormal at 5% Significance Level**											
2442												
2443	**Lognormal Statistics**											
2444				Minimum of Logged Data		4.92				Mean of logged Data		6.286

2445				Maximum of Logged Data	7.17					SD of logged Data	0.755	
2446												
2447				**Assuming Lognormal Distribution**								
2448				95% H-UCL	1613					90% Chebyshev (MVUE) UCL	1243	
2449				95% Chebyshev (MVUE) UCL	1496					97.5% Chebyshev (MVUE) UCL	1847	
2450				99% Chebyshev (MVUE) UCL	2536							
2451												
2452				**Nonparametric Distribution Free UCL Statistics**								
2453				**Data appear to follow a Discernible Distribution at 5% Significance Level**								
2454												
2455				**Nonparametric Distribution Free UCLs**								
2456				95% CLT UCL	918.4					95% Jackknife UCL	956.5	
2457				95% Standard Bootstrap UCL	899.3					95% Bootstrap-t UCL	1126	
2458				95% Hall's Bootstrap UCL	1326					95% Percentile Bootstrap UCL	906.8	
2459				95% BCA Bootstrap UCL	939.8							
2460				90% Chebyshev(Mean, Sd) UCL	1125					95% Chebyshev(Mean, Sd) UCL	1333	
2461				97.5% Chebyshev(Mean, Sd) UCL	1620					99% Chebyshev(Mean, Sd) UCL	2186	
2462												
2463				**Suggested UCL to Use**								
2464				95% Student's-t UCL	956.5							
2465												
2466				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
2467				Recommendations are based upon data size, data distribution, and skewness.								
2468				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
2469				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
2470												
2471												
2472	**Manganese (smw8)**											
2473												
2474				**General Statistics**								
2475				Total Number of Observations	8					Number of Distinct Observations	8	
2476										Number of Missing Observations	0	
2477				Minimum	737					Mean	968.8	
2478				Maximum	1230					Median	947	
2479				SD	159.6					Std. Error of Mean	56.42	
2480				Coefficient of Variation	0.165					Skewness	0.471	
2481												
2482				**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**								
2483				**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**								
2484				**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**								
2485				**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**								
2486												
2487				**Normal GOF Test**								
2488				Shapiro Wilk Test Statistic	0.927					**Shapiro Wilk GOF Test**		
2489				5% Shapiro Wilk Critical Value	0.818					Data appear Normal at 5% Significance Level		
2490				Lilliefors Test Statistic	0.264					**Lilliefors GOF Test**		
2491				5% Lilliefors Critical Value	0.283					Data appear Normal at 5% Significance Level		
2492				**Data appear Normal at 5% Significance Level**								
2493												
2494				**Assuming Normal Distribution**								
2495				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
2496				95% Student's-t UCL	1076					95% Adjusted-CLT UCL (Chen-1995)	1072	

2497											95% Modified-t UCL (Johnson-1978)	1077
2498												
2499	**Gamma GOF Test**											
2500					A-D Test Statistic	0.382	**Anderson-Darling Gamma GOF Test**					
2501					5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level					
2502					K-S Test Statistic	0.245	**Kolmogorov-Smirnov Gamma GOF Test**					
2503					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
2504	**Detected data appear Gamma Distributed at 5% Significance Level**											
2505												
2506	**Gamma Statistics**											
2507					k hat (MLE)	42.8	k star (bias corrected MLE)	26.83				
2508					Theta hat (MLE)	22.63	Theta star (bias corrected MLE)	36.1				
2509					nu hat (MLE)	684.8	nu star (bias corrected)	429.3				
2510					MLE Mean (bias corrected)	968.8	MLE Sd (bias corrected)	187				
2511							Approximate Chi Square Value (0.05)	382.3				
2512					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	371				
2513												
2514	**Assuming Gamma Distribution**											
2515				95% Approximate Gamma UCL (use when n>=50))		1088	95% Adjusted Gamma UCL (use when n<50)	1121				
2516												
2517	**Lognormal GOF Test**											
2518					Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk Lognormal GOF Test**					
2519					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
2520					Lilliefors Test Statistic	0.236	**Lilliefors Lognormal GOF Test**					
2521					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
2522	**Data appear Lognormal at 5% Significance Level**											
2523												
2524	**Lognormal Statistics**											
2525					Minimum of Logged Data	6.603	Mean of logged Data	6.864				
2526					Maximum of Logged Data	7.115	SD of logged Data	0.163				
2527												
2528	**Assuming Lognormal Distribution**											
2529					95% H-UCL	1092	90% Chebyshev (MVUE) UCL	1137				
2530					95% Chebyshev (MVUE) UCL	1213	97.5% Chebyshev (MVUE) UCL	1319				
2531					99% Chebyshev (MVUE) UCL	1526						
2532												
2533	**Nonparametric Distribution Free UCL Statistics**											
2534	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2535												
2536	**Nonparametric Distribution Free UCLs**											
2537					95% CLT UCL	1062	95% Jackknife UCL	1076				
2538					95% Standard Bootstrap UCL	1053	95% Bootstrap-t UCL	1114				
2539					95% Hall's Bootstrap UCL	1236	95% Percentile Bootstrap UCL	1060				
2540					95% BCA Bootstrap UCL	1064						
2541					90% Chebyshev(Mean, Sd) UCL	1138	95% Chebyshev(Mean, Sd) UCL	1215				
2542					97.5% Chebyshev(Mean, Sd) UCL	1321	99% Chebyshev(Mean, Sd) UCL	1530				
2543												
2544	**Suggested UCL to Use**											
2545					95% Student's-t UCL	1076						
2546												
2547	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2548	Recommendations are based upon data size, data distribution, and skewness.											

	A	B	C	D	E	F	G	H	I	J	K	L
2549	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2550	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2551												
2552	**Manganese (smw9)**											
2553												
2554	**General Statistics**											
2555						Total Number of Observations	9			Number of Distinct Observations	9	
2556						Number of Detects	8			Number of Non-Detects	1	
2557						Number of Distinct Detects	8			Number of Distinct Non-Detects	1	
2558						Minimum Detect	2.5			Minimum Non-Detect	0.32	
2559						Maximum Detect	504			Maximum Non-Detect	0.32	
2560						Variance Detects	28084			Percent Non-Detects	11.11%	
2561						Mean Detects	121.4			SD Detects	167.6	
2562						Median Detects	59.6			CV Detects	1.38	
2563						Skewness Detects	2.072			Kurtosis Detects	4.654	
2564						Mean of Logged Detects	3.702			SD of Logged Detects	1.881	
2565												
2566	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2567	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2568	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2569	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2570												
2571	**Normal GOF Test on Detects Only**											
2572						Shapiro Wilk Test Statistic	0.742			**Shapiro Wilk GOF Test**		
2573						5% Shapiro Wilk Critical Value	0.818			Detected Data Not Normal at 5% Significance Level		
2574						Lilliefors Test Statistic	0.254			**Lilliefors GOF Test**		
2575						5% Lilliefors Critical Value	0.283			Detected Data appear Normal at 5% Significance Level		
2576	**Detected Data appear Approximate Normal at 5% Significance Level**											
2577												
2578	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2579						KM Mean	108			KM Standard Error of Mean	54.38	
2580						KM SD	152.6			95% KM (BCA) UCL	193.3	
2581						95% KM (t) UCL	209.1			95% KM (Percentile Bootstrap) UCL	197.7	
2582						95% KM (z) UCL	197.4			95% KM Bootstrap t UCL	327	
2583						90% KM Chebyshev UCL	271.1			95% KM Chebyshev UCL	345	
2584						97.5% KM Chebyshev UCL	447.6			99% KM Chebyshev UCL	649.1	
2585												
2586	**Gamma GOF Tests on Detected Observations Only**											
2587						A-D Test Statistic	0.199			**Anderson-Darling GOF Test**		
2588						5% A-D Critical Value	0.758			Detected data appear Gamma Distributed at 5% Significance Level		
2589						K-S Test Statistic	0.14			**Kolmogorov-Smirnov GOF**		
2590						5% K-S Critical Value	0.308			Detected data appear Gamma Distributed at 5% Significance Level		
2591	**Detected data appear Gamma Distributed at 5% Significance Level**											
2592												
2593	**Gamma Statistics on Detected Data Only**											
2594						k hat (MLE)	0.568			k star (bias corrected MLE)	0.438	
2595						Theta hat (MLE)	213.8			Theta star (bias corrected MLE)	277	
2596						nu hat (MLE)	9.086			nu star (bias corrected)	7.012	
2597						Mean (detects)	121.4					
2598												
2599	**Gamma ROS Statistics using Imputed Non-Detects**											
2600	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											

	A	B	C	D	E	F	G	H	I	J	K	L
2601	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2602	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2603	This is especially true when the sample size is small.											
2604	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2605					Minimum	0.01				Mean	107.9	
2606					Maximum	504				Median	42.5	
2607					SD	161.9				CV	1.5	
2608					k hat (MLE)	0.353				k star (bias corrected MLE)	0.309	
2609					Theta hat (MLE)	305.7				Theta star (bias corrected MLE)	348.8	
2610					nu hat (MLE)	6.354				nu star (bias corrected)	5.569	
2611					Adjusted Level of Significance (β)	0.0231						
2612					Approximate Chi Square Value (5.57, α)	1.424				Adjusted Chi Square Value (5.57, β)	1.031	
2613					95% Gamma Approximate UCL (use when n>=50)	422.1				95% Gamma Adjusted UCL (use when n<50)	583.2	
2614												
2615	**Estimates of Gamma Parameters using KM Estimates**											
2616					Mean (KM)	108				SD (KM)	152.6	
2617					Variance (KM)	23291				SE of Mean (KM)	54.38	
2618					k hat (KM)	0.5				k star (KM)	0.408	
2619					nu hat (KM)	9.007				nu star (KM)	7.338	
2620					theta hat (KM)	215.7				theta star (KM)	264.8	
2621					80% gamma percentile (KM)	174.6				90% gamma percentile (KM)	303.9	
2622					95% gamma percentile (KM)	445.6				99% gamma percentile (KM)	801.3	
2623												
2624	**Gamma Kaplan-Meier (KM) Statistics**											
2625					Approximate Chi Square Value (7.34, α)	2.358				Adjusted Chi Square Value (7.34, β)	1.808	
2626					95% Gamma Approximate KM-UCL (use when n>=50)	336				95% Gamma Adjusted KM-UCL (use when n<50)	438.2	
2627												
2628	**Lognormal GOF Test on Detected Observations Only**											
2629					Shapiro Wilk Test Statistic	0.941				**Shapiro Wilk GOF Test**		
2630					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Lognormal at 5% Significance Level		
2631					Lilliefors Test Statistic	0.151				**Lilliefors GOF Test**		
2632					5% Lilliefors Critical Value	0.283				Detected Data appear Lognormal at 5% Significance Level		
2633	**Detected Data appear Lognormal at 5% Significance Level**											
2634												
2635	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2636					Mean in Original Scale	108				Mean in Log Scale	3.189	
2637					SD in Original Scale	161.9				SD in Log Scale	2.338	
2638					95% t UCL (assumes normality of ROS data)	208.3				95% Percentile Bootstrap UCL	203.4	
2639					95% BCA Bootstrap UCL	231.2				95% Bootstrap t UCL	342.5	
2640					95% H-UCL (Log ROS)	86682						
2641												
2642	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2643					KM Mean (logged)	3.164				KM Geo Mean	23.67	
2644					KM SD (logged)	2.251				95% Critical H Value (KM-Log)	6.365	
2645					KM Standard Error of Mean (logged)	0.802				95% H-UCL (KM -Log)	47323	
2646					KM SD (logged)	2.251				95% Critical H Value (KM-Log)	6.365	
2647					KM Standard Error of Mean (logged)	0.802						
2648												
2649	**DL/2 Statistics**											
2650				**DL/2 Normal**						**DL/2 Log-Transformed**		
2651					Mean in Original Scale	107.9				Mean in Log Scale	3.087	
2652					SD in Original Scale	161.9				SD in Log Scale	2.55	

2653			95% t UCL (Assumes normality)			208.3					95% H-Stat UCL	356833
2654	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2655												
2656	**Nonparametric Distribution Free UCL Statistics**											
2657	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
2658												
2659	**Suggested UCL to Use**											
2660			95% KM (t) UCL			209.1						
2661												
2662	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2663	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2664												
2665	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2666	Recommendations are based upon data size, data distribution, and skewness.											
2667	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2668	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2669												
2670												
2671	**Manganese (tw2r)**											
2672												
2673	**General Statistics**											
2674			Total Number of Observations			9					Number of Distinct Observations	9
2675											Number of Missing Observations	0
2676			Minimum			306					Mean	1209
2677			Maximum			2110					Median	1290
2678			SD			634.1					Std. Error of Mean	211.4
2679			Coefficient of Variation			0.524					Skewness	-0.123
2680												
2681	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2682	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2683	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2684	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2685												
2686	**Normal GOF Test**											
2687			Shapiro Wilk Test Statistic			0.956			**Shapiro Wilk GOF Test**			
2688			5% Shapiro Wilk Critical Value			0.829			Data appear Normal at 5% Significance Level			
2689			Lilliefors Test Statistic			0.128			**Lilliefors GOF Test**			
2690			5% Lilliefors Critical Value			0.274			Data appear Normal at 5% Significance Level			
2691	**Data appear Normal at 5% Significance Level**											
2692												
2693	**Assuming Normal Distribution**											
2694	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
2695			95% Student's-t UCL			1602					95% Adjusted-CLT UCL (Chen-1995)	1548
2696											95% Modified-t UCL (Johnson-1978)	1601
2697												
2698	**Gamma GOF Test**											
2699			A-D Test Statistic			0.332			**Anderson-Darling Gamma GOF Test**			
2700			5% A-D Critical Value			0.727			Detected data appear Gamma Distributed at 5% Significance Level			
2701			K-S Test Statistic			0.175			**Kolmogorov-Smirnov Gamma GOF Test**			
2702			5% K-S Critical Value			0.281			Detected data appear Gamma Distributed at 5% Significance Level			
2703	**Detected data appear Gamma Distributed at 5% Significance Level**											
2704												

	A	B	C	D	E	F	G	H	I	J	K	L
2705	**Gamma Statistics**											
2706					k hat (MLE)	3.139			k star (bias corrected MLE)			2.167
2707					Theta hat (MLE)	385.2			Theta star (bias corrected MLE)			558
2708					nu hat (MLE)	56.51			nu star (bias corrected)			39.01
2709					MLE Mean (bias corrected)	1209			MLE Sd (bias corrected)			821.4
2710									Approximate Chi Square Value (0.05)			25.7
2711					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value			23.45
2712												
2713	**Assuming Gamma Distribution**											
2714			95% Approximate Gamma UCL (use when n>=50))			1835			95% Adjusted Gamma UCL (use when n<50)			2012
2715												
2716	**Lognormal GOF Test**											
2717					Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk Lognormal GOF Test**					
2718					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
2719					Lilliefors Test Statistic	0.191	**Lilliefors Lognormal GOF Test**					
2720					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
2721	**Data appear Lognormal at 5% Significance Level**											
2722												
2723	**Lognormal Statistics**											
2724					Minimum of Logged Data	5.724			Mean of logged Data			6.93
2725					Maximum of Logged Data	7.654			SD of logged Data			0.671
2726												
2727	**Assuming Lognormal Distribution**											
2728					95% H-UCL	2354			90% Chebyshev (MVUE) UCL			2097
2729					95% Chebyshev (MVUE) UCL	2484			97.5% Chebyshev (MVUE) UCL			3020
2730					99% Chebyshev (MVUE) UCL	4074						
2731												
2732	**Nonparametric Distribution Free UCL Statistics**											
2733	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2734												
2735	**Nonparametric Distribution Free UCLs**											
2736					95% CLT UCL	1557			95% Jackknife UCL			1602
2737					95% Standard Bootstrap UCL	1535			95% Bootstrap-t UCL			1600
2738					95% Hall's Bootstrap UCL	1522			95% Percentile Bootstrap UCL			1543
2739					95% BCA Bootstrap UCL	1528						
2740					90% Chebyshev(Mean, Sd) UCL	1843			95% Chebyshev(Mean, Sd) UCL			2130
2741					97.5% Chebyshev(Mean, Sd) UCL	2529			99% Chebyshev(Mean, Sd) UCL			3312
2742												
2743	**Suggested UCL to Use**											
2744					95% Student's-t UCL	1602						
2745												
2746	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2747	Recommendations are based upon data size, data distribution, and skewness.											
2748	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2749	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2750												
2751	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
2752	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
2753												
2754												
2755	**Manganese (tw5r)**											
2756												

	A	B	C	D	E	F	G	H	I	J	K	L
2757	**General Statistics**											
2758					Total Number of Observations	8				Number of Distinct Observations		8
2759										Number of Missing Observations		0
2760					Minimum	204				Mean		471.6
2761					Maximum	1220				Median		375.5
2762					SD	325.5				Std. Error of Mean		115.1
2763					Coefficient of Variation	0.69				Skewness		2.123
2764												
2765	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2766	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2767	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2768	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2769												
2770	**Normal GOF Test**											
2771					Shapiro Wilk Test Statistic	0.755	**Shapiro Wilk GOF Test**					
2772					5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level					
2773					Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**					
2774					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
2775	**Data appear Approximate Normal at 5% Significance Level**											
2776												
2777	**Assuming Normal Distribution**											
2778	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2779					95% Student's-t UCL	689.7				95% Adjusted-CLT UCL (Chen-1995)		753.2
2780										95% Modified-t UCL (Johnson-1978)		704.1
2781												
2782	**Gamma GOF Test**											
2783					A-D Test Statistic	0.461	**Anderson-Darling Gamma GOF Test**					
2784					5% A-D Critical Value	0.72	Detected data appear Gamma Distributed at 5% Significance Level					
2785					K-S Test Statistic	0.197	**Kolmogorov-Smirnov Gamma GOF Test**					
2786					5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level					
2787	**Detected data appear Gamma Distributed at 5% Significance Level**											
2788												
2789	**Gamma Statistics**											
2790					k hat (MLE)	3.414				k star (bias corrected MLE)		2.217
2791					Theta hat (MLE)	138.2				Theta star (bias corrected MLE)		212.7
2792					nu hat (MLE)	54.62				nu star (bias corrected)		35.47
2793					MLE Mean (bias corrected)	471.6				MLE Sd (bias corrected)		316.8
2794										Approximate Chi Square Value (0.05)		22.84
2795					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		20.32
2796												
2797	**Assuming Gamma Distribution**											
2798					95% Approximate Gamma UCL (use when n>=50))	732.3				95% Adjusted Gamma UCL (use when n<50)		823.4
2799												
2800	**Lognormal GOF Test**											
2801					Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk Lognormal GOF Test**					
2802					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
2803					Lilliefors Test Statistic	0.16	**Lilliefors Lognormal GOF Test**					
2804					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
2805	**Data appear Lognormal at 5% Significance Level**											
2806												
2807	**Lognormal Statistics**											
2808					Minimum of Logged Data	5.318				Mean of logged Data		6.003

2809	Maximum of Logged Data					7.107	SD of logged Data					0.555
2810												
2811	**Assuming Lognormal Distribution**											
2812	95% H-UCL					789	90% Chebyshev (MVUE) UCL					737.1
2813	95% Chebyshev (MVUE) UCL					861.7	97.5% Chebyshev (MVUE) UCL					1035
2814	99% Chebyshev (MVUE) UCL					1375						
2815												
2816	**Nonparametric Distribution Free UCL Statistics**											
2817	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2818												
2819	**Nonparametric Distribution Free UCLs**											
2820	95% CLT UCL					660.9	95% Jackknife UCL					689.7
2821	95% Standard Bootstrap UCL					649.3	95% Bootstrap-t UCL					1052
2822	95% Hall's Bootstrap UCL					1538	95% Percentile Bootstrap UCL					664
2823	95% BCA Bootstrap UCL					761.8						
2824	90% Chebyshev(Mean, Sd) UCL					816.9	95% Chebyshev(Mean, Sd) UCL					973.3
2825	97.5% Chebyshev(Mean, Sd) UCL					1190	99% Chebyshev(Mean, Sd) UCL					1617
2826												
2827	**Suggested UCL to Use**											
2828	95% Student's-t UCL					689.7						
2829												
2830	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2831	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2832												
2833	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2834	Recommendations are based upon data size, data distribution, and skewness.											
2835	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2836	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2837												
2838												
2839	**Manganese (waste water clarifier well)**											
2840												
2841	**General Statistics**											
2842	Total Number of Observations					1	Number of Distinct Observations					1
2843							Number of Missing Observations					0
2844	Minimum					1980	Mean					1980
2845	Maximum					1980	Median					1980
2846												
2847	**Warning: This data set only has 1 observations!**											
2848	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
2849	**The data set for variable Manganese (waste water clarifier well) was not processed!**											
2850												
2851	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
2852	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
2853												
2854												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:04:46 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Nickel (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	0.5	Mean	1.018
Maximum	1.5	Median	1.1
SD	0.318	Std. Error of Mean	0.106
Coefficient of Variation	0.312	Skewness	-0.293

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.215	95% Adjusted-CLT UCL (Chen-1995)	1.181
		95% Modified-t UCL (Johnson-1978)	1.213

Gamma GOF Test

A-D Test Statistic	0.303	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.194	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	10.04	k star (bias corrected MLE)	6.766
Theta hat (MLE)	0.101	Theta star (bias corrected MLE)	0.15
nu hat (MLE)	180.7	nu star (bias corrected)	121.8
MLE Mean (bias corrected)	1.018	MLE Sd (bias corrected)	0.391
		Approximate Chi Square Value (0.05)	97.31
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	92.7

53	**Assuming Gamma Distribution**											
54	95% Approximate Gamma UCL (use when n>=50))					1.274	95% Adjusted Gamma UCL (use when n<50)					1.337
55												
56	**Lognormal GOF Test**											
57	Shapiro Wilk Test Statistic					0.929	**Shapiro Wilk Lognormal GOF Test**					
58	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
59	Lilliefors Test Statistic					0.204	**Lilliefors Lognormal GOF Test**					
60	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64	Minimum of Logged Data					-0.693	Mean of logged Data					-0.033
65	Maximum of Logged Data					0.405	SD of logged Data					0.352
66												
67	**Assuming Lognormal Distribution**											
68	95% H-UCL					1.333	90% Chebyshev (MVUE) UCL					1.385
69	95% Chebyshev (MVUE) UCL					1.55	97.5% Chebyshev (MVUE) UCL					1.778
70	99% Chebyshev (MVUE) UCL					2.226						
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
74												
75	**Nonparametric Distribution Free UCLs**											
76	95% CLT UCL					1.192	95% Jackknife UCL					1.215
77	95% Standard Bootstrap UCL					1.181	95% Bootstrap-t UCL					1.205
78	95% Hall's Bootstrap UCL					1.191	95% Percentile Bootstrap UCL					1.182
79	95% BCA Bootstrap UCL					1.171						
80	90% Chebyshev(Mean, Sd) UCL					1.336	95% Chebyshev(Mean, Sd) UCL					1.48
81	97.5% Chebyshev(Mean, Sd) UCL					1.68	99% Chebyshev(Mean, Sd) UCL					2.073
82												
83	**Suggested UCL to Use**											
84	95% Student's-t UCL					1.215						
85												
86	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
87	Recommendations are based upon data size, data distribution, and skewness.											
88	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
89	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
90												
91	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
92	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
93												
94												
95	**Nickel (nfmw10)**											
96												
97	**General Statistics**											
98	Total Number of Observations					8	Number of Distinct Observations					8
99							Number of Missing Observations					0
100	Minimum					3.3	Mean					4.875
101	Maximum					6.5	Median					4.95
102	SD					1.126	Std. Error of Mean					0.398
103	Coefficient of Variation					0.231	Skewness					-0.146
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
106	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
107	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
108	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
109												
110	Normal GOF Test											
111					Shapiro Wilk Test Statistic	0.956	Shapiro Wilk GOF Test					
112					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
113					Lilliefors Test Statistic	0.147	Lilliefors GOF Test					
114					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
115	Data appear Normal at 5% Significance Level											
116												
117	Assuming Normal Distribution											
118	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
119					95% Student's-t UCL	5.629	95% Adjusted-CLT UCL (Chen-1995)					5.508
120							95% Modified-t UCL (Johnson-1978)					5.626
121												
122	Gamma GOF Test											
123					A-D Test Statistic	0.277	Anderson-Darling Gamma GOF Test					
124					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
125					K-S Test Statistic	0.176	Kolmogorov-Smirnov Gamma GOF Test					
126					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
127	Detected data appear Gamma Distributed at 5% Significance Level											
128												
129	Gamma Statistics											
130					k hat (MLE)	20.32	k star (bias corrected MLE)					12.78
131					Theta hat (MLE)	0.24	Theta star (bias corrected MLE)					0.381
132					nu hat (MLE)	325.1	nu star (bias corrected)					204.5
133					MLE Mean (bias corrected)	4.875	MLE Sd (bias corrected)					1.364
134							Approximate Chi Square Value (0.05)					172.4
135					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value					165
136												
137	Assuming Gamma Distribution											
138					95% Approximate Gamma UCL (use when n>=50))	5.782	95% Adjusted Gamma UCL (use when n<50)					6.044
139												
140	Lognormal GOF Test											
141					Shapiro Wilk Test Statistic	0.937	Shapiro Wilk Lognormal GOF Test					
142					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
143					Lilliefors Test Statistic	0.173	Lilliefors Lognormal GOF Test					
144					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
145	Data appear Lognormal at 5% Significance Level											
146												
147	Lognormal Statistics											
148					Minimum of Logged Data	1.194	Mean of logged Data					1.559
149					Maximum of Logged Data	1.872	SD of logged Data					0.242
150												
151	Assuming Lognormal Distribution											
152					95% H-UCL	5.874	90% Chebyshev (MVUE) UCL					6.135
153					95% Chebyshev (MVUE) UCL	6.704	97.5% Chebyshev (MVUE) UCL					7.493
154					99% Chebyshev (MVUE) UCL	9.044						
155												
156	Nonparametric Distribution Free UCL Statistics											

157	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
158												
159	**Nonparametric Distribution Free UCLs**											
160					95% CLT UCL	5.53			95% Jackknife UCL	5.629		
161					95% Standard Bootstrap UCL	5.482			95% Bootstrap-t UCL	5.573		
162					95% Hall's Bootstrap UCL	5.484			95% Percentile Bootstrap UCL	5.488		
163					95% BCA Bootstrap UCL	5.463						
164					90% Chebyshev(Mean, Sd) UCL	6.069			95% Chebyshev(Mean, Sd) UCL	6.61		
165					97.5% Chebyshev(Mean, Sd) UCL	7.361			99% Chebyshev(Mean, Sd) UCL	8.836		
166												
167	**Suggested UCL to Use**											
168					95% Student's-t UCL	5.629						
169												
170	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
171	Recommendations are based upon data size, data distribution, and skewness.											
172	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
173	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
174												
175	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
176	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
177												
178												
179	**Nickel (nfmw11)**											
180												
181	**General Statistics**											
182					Total Number of Observations	8			Number of Distinct Observations	8		
183									Number of Missing Observations	0		
184					Minimum	1			Mean	1.838		
185					Maximum	3.5			Median	1.6		
186					SD	0.818			Std. Error of Mean	0.289		
187					Coefficient of Variation	0.445			Skewness	1.265		
188												
189	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
190	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
191	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
192	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
193												
194	**Normal GOF Test**											
195					Shapiro Wilk Test Statistic	0.892			**Shapiro Wilk GOF Test**			
196					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
197					Lilliefors Test Statistic	0.192			**Lilliefors GOF Test**			
198					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
199	**Data appear Normal at 5% Significance Level**											
200												
201	**Assuming Normal Distribution**											
202	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
203					95% Student's-t UCL	2.385			95% Adjusted-CLT UCL (Chen-1995)	2.451		
204									95% Modified-t UCL (Johnson-1978)	2.407		
205												
206	**Gamma GOF Test**											
207					A-D Test Statistic	0.25			**Anderson-Darling Gamma GOF Test**			
208					5% A-D Critical Value	0.718			Detected data appear Gamma Distributed at 5% Significance Level			

	A	B	C	D	E	F	G	H	I	J	K	L
209					K-S Test Statistic	0.151	**Kolmogorov-Smirnov Gamma GOF Test**					
210					5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level					
211	**Detected data appear Gamma Distributed at 5% Significance Level**											
212												
213	**Gamma Statistics**											
214					k hat (MLE)	6.56				k star (bias corrected MLE)		4.183
215					Theta hat (MLE)	0.28				Theta star (bias corrected MLE)		0.439
216					nu hat (MLE)	105				nu star (bias corrected)		66.93
217					MLE Mean (bias corrected)	1.838				MLE Sd (bias corrected)		0.898
218										Approximate Chi Square Value (0.05)		49.1
219					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		45.26
220												
221	**Assuming Gamma Distribution**											
222				95% Approximate Gamma UCL (use when n>=50))		2.505				95% Adjusted Gamma UCL (use when n<50)		2.717
223												
224	**Lognormal GOF Test**											
225					Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**					
226					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
227					Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**					
228					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
229	**Data appear Lognormal at 5% Significance Level**											
230												
231	**Lognormal Statistics**											
232					Minimum of Logged Data	0				Mean of logged Data		0.53
233					Maximum of Logged Data	1.253				SD of logged Data		0.415
234												
235	**Assuming Lognormal Distribution**											
236					95% H-UCL	2.621				90% Chebyshev (MVUE) UCL		2.642
237					95% Chebyshev (MVUE) UCL	3.01				97.5% Chebyshev (MVUE) UCL		3.52
238					99% Chebyshev (MVUE) UCL	4.522						
239												
240	**Nonparametric Distribution Free UCL Statistics**											
241	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
242												
243	**Nonparametric Distribution Free UCLs**											
244					95% CLT UCL	2.313				95% Jackknife UCL		2.385
245					95% Standard Bootstrap UCL	2.291				95% Bootstrap-t UCL		2.643
246					95% Hall's Bootstrap UCL	2.798				95% Percentile Bootstrap UCL		2.288
247					95% BCA Bootstrap UCL	2.413						
248					90% Chebyshev(Mean, Sd) UCL	2.705				95% Chebyshev(Mean, Sd) UCL		3.097
249					97.5% Chebyshev(Mean, Sd) UCL	3.643				99% Chebyshev(Mean, Sd) UCL		4.713
250												
251	**Suggested UCL to Use**											
252					95% Student's-t UCL	2.385						
253												
254	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
255	Recommendations are based upon data size, data distribution, and skewness.											
256	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
257	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
258												
259	**Nickel (nfmw12)**											
260												

261	**General Statistics**											
262					Total Number of Observations	8				Number of Distinct Observations		8
263					Number of Detects	4				Number of Non-Detects		4
264					Number of Distinct Detects	4				Number of Distinct Non-Detects		4
265					Minimum Detect	0.24				Minimum Non-Detect		0.15
266					Maximum Detect	8.1				Maximum Non-Detect		0.54
267					Variance Detects	15.1				Percent Non-Detects		50%
268					Mean Detects	2.273				SD Detects		3.886
269					Median Detects	0.375				CV Detects		1.71
270					Skewness Detects	1.997				Kurtosis Detects		3.99
271					Mean of Logged Detects	-0.334				SD of Logged Detects		1.638
272												
273	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
274	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
275	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
276	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
277												
278	**Normal GOF Test on Detects Only**											
279					Shapiro Wilk Test Statistic	0.65				**Shapiro Wilk GOF Test**		
280					5% Shapiro Wilk Critical Value	0.748				Detected Data Not Normal at 5% Significance Level		
281					Lilliefors Test Statistic	0.43				**Lilliefors GOF Test**		
282					5% Lilliefors Critical Value	0.375				Detected Data Not Normal at 5% Significance Level		
283	**Detected Data Not Normal at 5% Significance Level**											
284												
285	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
286					KM Mean	1.238				KM Standard Error of Mean		1.06
287					KM SD	2.596				95% KM (BCA) UCL		N/A
288					95% KM (t) UCL	3.246				95% KM (Percentile Bootstrap) UCL		N/A
289					95% KM (z) UCL	2.982				95% KM Bootstrap t UCL		N/A
290					90% KM Chebyshev UCL	4.418				95% KM Chebyshev UCL		5.859
291					97.5% KM Chebyshev UCL	7.858				99% KM Chebyshev UCL		11.79
292												
293	**Gamma GOF Tests on Detected Observations Only**											
294					A-D Test Statistic	0.74				**Anderson-Darling GOF Test**		
295					5% A-D Critical Value	0.679				Detected Data Not Gamma Distributed at 5% Significance Level		
296					K-S Test Statistic	0.427				**Kolmogorov-Smirnov GOF**		
297					5% K-S Critical Value	0.409				Detected Data Not Gamma Distributed at 5% Significance Level		
298	**Detected Data Not Gamma Distributed at 5% Significance Level**											
299												
300	**Gamma Statistics on Detected Data Only**											
301					k hat (MLE)	0.543				k star (bias corrected MLE)		0.302
302					Theta hat (MLE)	4.186				Theta star (bias corrected MLE)		7.515
303					nu hat (MLE)	4.343				nu star (bias corrected)		2.419
304					Mean (detects)	2.273						
305												
306	**Gamma ROS Statistics using Imputed Non-Detects**											
307	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
308	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
309	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
310	This is especially true when the sample size is small.											
311	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
312					Minimum	0.01				Mean		1.141

313					Maximum	8.1				Median		0.125
314					SD	2.817				CV		2.468
315					k hat (MLE)	0.27				k star (bias corrected MLE)		0.252
316					Theta hat (MLE)	4.232				Theta star (bias corrected MLE)		4.531
317					nu hat (MLE)	4.315				nu star (bias corrected)		4.03
318					Adjusted Level of Significance (β)	0.0195						
319					Approximate Chi Square Value (4.03, α)	0.734				Adjusted Chi Square Value (4.03, β)		0.45
320					95% Gamma Approximate UCL (use when n>=50)	6.27				95% Gamma Adjusted UCL (use when n<50)		N/A
321												
322					**Estimates of Gamma Parameters using KM Estimates**							
323					Mean (KM)	1.238				SD (KM)		2.596
324					Variance (KM)	6.737				SE of Mean (KM)		1.06
325					k hat (KM)	0.228				k star (KM)		0.226
326					nu hat (KM)	3.641				nu star (KM)		3.609
327					theta hat (KM)	5.441				theta star (KM)		5.489
328					80% gamma percentile (KM)	1.728				90% gamma percentile (KM)		3.738
329					95% gamma percentile (KM)	6.175				99% gamma percentile (KM)		12.76
330												
331					**Gamma Kaplan-Meier (KM) Statistics**							
332					Approximate Chi Square Value (3.61, α)	0.574				Adjusted Chi Square Value (3.61, β)		0.341
333					95% Gamma Approximate KM-UCL (use when n>=50)	7.79				95% Gamma Adjusted KM-UCL (use when n<50)		13.09
334												
335					**Lognormal GOF Test on Detected Observations Only**							
336					Shapiro Wilk Test Statistic	0.768				**Shapiro Wilk GOF Test**		
337					5% Shapiro Wilk Critical Value	0.748				Detected Data appear Lognormal at 5% Significance Level		
338					Lilliefors Test Statistic	0.362				**Lilliefors GOF Test**		
339					5% Lilliefors Critical Value	0.375				Detected Data appear Lognormal at 5% Significance Level		
340					**Detected Data appear Lognormal at 5% Significance Level**							
341												
342					**Lognormal ROS Statistics Using Imputed Non-Detects**							
343					Mean in Original Scale	1.172				Mean in Log Scale		-1.668
344					SD in Original Scale	2.803				SD in Log Scale		1.909
345					95% t UCL (assumes normality of ROS data)	3.05				95% Percentile Bootstrap UCL		3.098
346					95% BCA Bootstrap UCL	4.114				95% Bootstrap t UCL		28.63
347					95% H-UCL (Log ROS)	80.97						
348												
349					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
350					KM Mean (logged)	-1.003				KM Geo Mean		0.367
351					KM SD (logged)	1.234				95% Critical H Value (KM-Log)		4.026
352					KM Standard Error of Mean (logged)	0.514				95% H-UCL (KM -Log)		5.137
353					KM SD (logged)	1.234				95% Critical H Value (KM-Log)		4.026
354					KM Standard Error of Mean (logged)	0.514						
355												
356					**DL/2 Statistics**							
357					**DL/2 Normal**					**DL/2 Log-Transformed**		
358					Mean in Original Scale	1.223				Mean in Log Scale		-1.116
359					SD in Original Scale	2.781				SD in Log Scale		1.424
360					95% t UCL (Assumes normality)	3.086				95% H-Stat UCL		10.34
361					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
362												
363					**Nonparametric Distribution Free UCL Statistics**							
364					**Detected Data appear Lognormal Distributed at 5% Significance Level**							

365												
366	**Suggested UCL to Use**											
367			97.5% KM (Chebyshev) UCL			7.858			99% KM (Chebyshev) UCL			11.79
368	**Warning: Recommended UCL exceeds the maximum observation**											
369												
370	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
371	Recommendations are based upon data size, data distribution, and skewness.											
372	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
373	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
374												
375												
376	**Nickel (nfmw19)**											
377												
378	**General Statistics**											
379			Total Number of Observations			8			Number of Distinct Observations			8
380									Number of Missing Observations			0
381			Minimum			3.1			Mean			23.48
382			Maximum			90.6			Median			12.8
383			SD			29.27			Std. Error of Mean			10.35
384			Coefficient of Variation			1.247			Skewness			2.109
385												
386	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
387	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
388	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
389	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
390												
391	**Normal GOF Test**											
392			Shapiro Wilk Test Statistic			0.73			**Shapiro Wilk GOF Test**			
393			5% Shapiro Wilk Critical Value			0.818			Data Not Normal at 5% Significance Level			
394			Lilliefors Test Statistic			0.25			**Lilliefors GOF Test**			
395			5% Lilliefors Critical Value			0.283			Data appear Normal at 5% Significance Level			
396	**Data appear Approximate Normal at 5% Significance Level**											
397												
398	**Assuming Normal Distribution**											
399			**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**			
400			95% Student's-t UCL			43.08			95% Adjusted-CLT UCL (Chen-1995)			48.74
401									95% Modified-t UCL (Johnson-1978)			44.37
402												
403	**Gamma GOF Test**											
404			A-D Test Statistic			0.391			**Anderson-Darling Gamma GOF Test**			
405			5% A-D Critical Value			0.737			Detected data appear Gamma Distributed at 5% Significance Level			
406			K-S Test Statistic			0.212			**Kolmogorov-Smirnov Gamma GOF Test**			
407			5% K-S Critical Value			0.302			Detected data appear Gamma Distributed at 5% Significance Level			
408	**Detected data appear Gamma Distributed at 5% Significance Level**											
409												
410	**Gamma Statistics**											
411			k hat (MLE)			0.964			k star (bias corrected MLE)			0.686
412			Theta hat (MLE)			24.36			Theta star (bias corrected MLE)			34.23
413			nu hat (MLE)			15.42			nu star (bias corrected)			10.97
414			MLE Mean (bias corrected)			23.48			MLE Sd (bias corrected)			28.35
415									Approximate Chi Square Value (0.05)			4.558
416			Adjusted Level of Significance			0.0195			Adjusted Chi Square Value			3.571

417												
418	**Assuming Gamma Distribution**											
419	95% Approximate Gamma UCL (use when n>=50))					56.51	95% Adjusted Gamma UCL (use when n<50)					72.13
420												
421	**Lognormal GOF Test**											
422	Shapiro Wilk Test Statistic					0.942	**Shapiro Wilk Lognormal GOF Test**					
423	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
424	Lilliefors Test Statistic					0.17	**Lilliefors Lognormal GOF Test**					
425	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
426	**Data appear Lognormal at 5% Significance Level**											
427												
428	**Lognormal Statistics**											
429	Minimum of Logged Data					1.131	Mean of logged Data					2.554
430	Maximum of Logged Data					4.506	SD of logged Data					1.17
431												
432	**Assuming Lognormal Distribution**											
433	95% H-UCL					140.3	90% Chebyshev (MVUE) UCL					51.21
434	95% Chebyshev (MVUE) UCL					64.17	97.5% Chebyshev (MVUE) UCL					82.15
435	99% Chebyshev (MVUE) UCL					117.5						
436												
437	**Nonparametric Distribution Free UCL Statistics**											
438	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
439												
440	**Nonparametric Distribution Free UCLs**											
441	95% CLT UCL					40.5	95% Jackknife UCL					43.08
442	95% Standard Bootstrap UCL					39.76	95% Bootstrap-t UCL					67.33
443	95% Hall's Bootstrap UCL					103.9	95% Percentile Bootstrap UCL					41.64
444	95% BCA Bootstrap UCL					47.44						
445	90% Chebyshev(Mean, Sd) UCL					54.52	95% Chebyshev(Mean, Sd) UCL					68.58
446	97.5% Chebyshev(Mean, Sd) UCL					88.1	99% Chebyshev(Mean, Sd) UCL					126.4
447												
448	**Suggested UCL to Use**											
449	95% Student's-t UCL					43.08						
450												
451	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
452	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
453												
454	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
455	Recommendations are based upon data size, data distribution, and skewness.											
456	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
457	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
458												
459												
460	**Nickel (nfmw1d)**											
461												
462	**General Statistics**											
463	Total Number of Observations					9	Number of Distinct Observations					9
464							Number of Missing Observations					0
465	Minimum					6.4	Mean					9.644
466	Maximum					13.6	Median					9.6
467	SD					2.292	Std. Error of Mean					0.764
468	Coefficient of Variation					0.238	Skewness					0.321

469												
470	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
471	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
472	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
473	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
474												
475	**Normal GOF Test**											
476					Shapiro Wilk Test Statistic	0.985	**Shapiro Wilk GOF Test**					
477					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
478					Lilliefors Test Statistic	0.104	**Lilliefors GOF Test**					
479					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
480	**Data appear Normal at 5% Significance Level**											
481												
482	**Assuming Normal Distribution**											
483	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
484					95% Student's-t UCL	11.07	95% Adjusted-CLT UCL (Chen-1995)	10.99				
485							95% Modified-t UCL (Johnson-1978)	11.08				
486												
487	**Gamma GOF Test**											
488					A-D Test Statistic	0.115	**Anderson-Darling Gamma GOF Test**					
489					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
490					K-S Test Statistic	0.0909	**Kolmogorov-Smirnov Gamma GOF Test**					
491					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
492	**Detected data appear Gamma Distributed at 5% Significance Level**											
493												
494	**Gamma Statistics**											
495					k hat (MLE)	19.83	k star (bias corrected MLE)	13.3				
496					Theta hat (MLE)	0.486	Theta star (bias corrected MLE)	0.725				
497					nu hat (MLE)	357	nu star (bias corrected)	239.3				
498					MLE Mean (bias corrected)	9.644	MLE Sd (bias corrected)	2.645				
499							Approximate Chi Square Value (0.05)	204.5				
500					Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	197.7				
501												
502	**Assuming Gamma Distribution**											
503					95% Approximate Gamma UCL (use when n>=50))	11.29	95% Adjusted Gamma UCL (use when n<50)	11.67				
504												
505	**Lognormal GOF Test**											
506					Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk Lognormal GOF Test**					
507					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
508					Lilliefors Test Statistic	0.0922	**Lilliefors Lognormal GOF Test**					
509					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
510	**Data appear Lognormal at 5% Significance Level**											
511												
512	**Lognormal Statistics**											
513					Minimum of Logged Data	1.856	Mean of logged Data	2.241				
514					Maximum of Logged Data	2.61	SD of logged Data	0.24				
515												
516	**Assuming Lognormal Distribution**											
517					95% H-UCL	11.42	90% Chebyshev (MVUE) UCL	11.97				
518					95% Chebyshev (MVUE) UCL	13.03	97.5% Chebyshev (MVUE) UCL	14.49				
519					99% Chebyshev (MVUE) UCL	17.37						
520												

521	**Nonparametric Distribution Free UCL Statistics**											
522	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
523												
524	**Nonparametric Distribution Free UCLs**											
525					95% CLT UCL	10.9			95% Jackknife UCL	11.07		
526					95% Standard Bootstrap UCL	10.86			95% Bootstrap-t UCL	11.09		
527					95% Hall's Bootstrap UCL	11.15			95% Percentile Bootstrap UCL	10.83		
528					95% BCA Bootstrap UCL	10.89						
529					90% Chebyshev(Mean, Sd) UCL	11.94			95% Chebyshev(Mean, Sd) UCL	12.98		
530					97.5% Chebyshev(Mean, Sd) UCL	14.42			99% Chebyshev(Mean, Sd) UCL	17.25		
531												
532	**Suggested UCL to Use**											
533					95% Student's-t UCL	11.07						
534												
535	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
536	Recommendations are based upon data size, data distribution, and skewness.											
537	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
538	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
539												
540												
541	**Nickel (nfmw1s)**											
542												
543	**General Statistics**											
544					Total Number of Observations	7			Number of Distinct Observations	7		
545									Number of Missing Observations	0		
546					Minimum	19.4			Mean	31.81		
547					Maximum	66.8			Median	26.2		
548					SD	16.36			Std. Error of Mean	6.182		
549					Coefficient of Variation	0.514			Skewness	2.072		
550												
551	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
552	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
553	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
554	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
555												
556	**Normal GOF Test**											
557					Shapiro Wilk Test Statistic	0.748			**Shapiro Wilk GOF Test**			
558					5% Shapiro Wilk Critical Value	0.803			Data Not Normal at 5% Significance Level			
559					Lilliefors Test Statistic	0.311			**Lilliefors GOF Test**			
560					5% Lilliefors Critical Value	0.304			Data Not Normal at 5% Significance Level			
561	**Data Not Normal at 5% Significance Level**											
562												
563	**Assuming Normal Distribution**											
564	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
565					95% Student's-t UCL	43.83			95% Adjusted-CLT UCL (Chen-1995)	47.16		
566									95% Modified-t UCL (Johnson-1978)	44.63		
567												
568	**Gamma GOF Test**											
569					A-D Test Statistic	0.571			**Anderson-Darling Gamma GOF Test**			
570					5% A-D Critical Value	0.71			Detected data appear Gamma Distributed at 5% Significance Level			
571					K-S Test Statistic	0.248			**Kolmogorov-Smirnov Gamma GOF Test**			
572					5% K-S Critical Value	0.313			Detected data appear Gamma Distributed at 5% Significance Level			

573	**Detected data appear Gamma Distributed at 5% Significance Level**											
574												
575	**Gamma Statistics**											
576					k hat (MLE)	5.974			k star (bias corrected MLE)	3.509		
577					Theta hat (MLE)	5.326			Theta star (bias corrected MLE)	9.067		
578					nu hat (MLE)	83.64			nu star (bias corrected)	49.12		
579					MLE Mean (bias corrected)	31.81			MLE Sd (bias corrected)	16.98		
580									Approximate Chi Square Value (0.05)	34.03		
581					Adjusted Level of Significance	0.0158			Adjusted Chi Square Value	30.29		
582												
583	**Assuming Gamma Distribution**											
584				95% Approximate Gamma UCL (use when n>=50)		45.92			95% Adjusted Gamma UCL (use when n<50)	51.6		
585												
586	**Lognormal GOF Test**											
587					Shapiro Wilk Test Statistic	0.87			**Shapiro Wilk Lognormal GOF Test**			
588					5% Shapiro Wilk Critical Value	0.803			Data appear Lognormal at 5% Significance Level			
589					Lilliefors Test Statistic	0.223			**Lilliefors Lognormal GOF Test**			
590					5% Lilliefors Critical Value	0.304			Data appear Lognormal at 5% Significance Level			
591	**Data appear Lognormal at 5% Significance Level**											
592												
593	**Lognormal Statistics**											
594					Minimum of Logged Data	2.965			Mean of logged Data	3.374		
595					Maximum of Logged Data	4.202			SD of logged Data	0.419		
596												
597	**Assuming Lognormal Distribution**											
598					95% H-UCL	47.33			90% Chebyshev (MVUE) UCL	46.48		
599					95% Chebyshev (MVUE) UCL	53.28			97.5% Chebyshev (MVUE) UCL	62.72		
600					99% Chebyshev (MVUE) UCL	81.27						
601												
602	**Nonparametric Distribution Free UCL Statistics**											
603	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
604												
605	**Nonparametric Distribution Free UCLs**											
606					95% CLT UCL	41.98			95% Jackknife UCL	43.83		
607					95% Standard Bootstrap UCL	41.28			95% Bootstrap-t UCL	59.71		
608					95% Hall's Bootstrap UCL	79.33			95% Percentile Bootstrap UCL	42.63		
609					95% BCA Bootstrap UCL	45.57						
610					90% Chebyshev(Mean, Sd) UCL	50.36			95% Chebyshev(Mean, Sd) UCL	58.76		
611					97.5% Chebyshev(Mean, Sd) UCL	70.42			99% Chebyshev(Mean, Sd) UCL	93.33		
612												
613	**Suggested UCL to Use**											
614					95% Adjusted Gamma UCL	51.6						
615												
616	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
617	Recommendations are based upon data size, data distribution, and skewness.											
618	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
619	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
620												
621	**Nickel (nfmw2)**											
622												
623	**General Statistics**											
624					Total Number of Observations	9			Number of Distinct Observations	8		

625				Number of Detects	8					Number of Non-Detects	1	
626				Number of Distinct Detects	8					Number of Distinct Non-Detects	1	
627				Minimum Detect	0.73					Minimum Non-Detect	2.1	
628				Maximum Detect	2.8					Maximum Non-Detect	2.1	
629				Variance Detects	0.722					Percent Non-Detects	11.11%	
630				Mean Detects	1.601					SD Detects	0.85	
631				Median Detects	1.45					CV Detects	0.531	
632				Skewness Detects	0.342					Kurtosis Detects	-1.929	
633				Mean of Logged Detects	0.338					SD of Logged Detects	0.559	
634												
635					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
636					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
637					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
638					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
639												
640					**Normal GOF Test on Detects Only**							
641				Shapiro Wilk Test Statistic	0.86	**Shapiro Wilk GOF Test**						
642				5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level						
643				Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**						
644				5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level						
645					**Detected Data appear Normal at 5% Significance Level**							
646												
647					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
648				KM Mean	1.541					KM Standard Error of Mean	0.284	
649				KM SD	0.782					95% KM (BCA) UCL	1.964	
650				95% KM (t) UCL	2.07					95% KM (Percentile Bootstrap) UCL	1.997	
651				95% KM (z) UCL	2.009					95% KM Bootstrap t UCL	2.171	
652				90% KM Chebyshev UCL	2.393					95% KM Chebyshev UCL	2.779	
653				97.5% KM Chebyshev UCL	3.315					99% KM Chebyshev UCL	4.367	
654												
655					**Gamma GOF Tests on Detected Observations Only**							
656				A-D Test Statistic	0.573	**Anderson-Darling GOF Test**						
657				5% A-D Critical Value	0.719	Detected data appear Gamma Distributed at 5% Significance Level						
658				K-S Test Statistic	0.255	**Kolmogorov-Smirnov GOF**						
659				5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level						
660					**Detected data appear Gamma Distributed at 5% Significance Level**							
661												
662					**Gamma Statistics on Detected Data Only**							
663				k hat (MLE)	3.922					k star (bias corrected MLE)	2.534	
664				Theta hat (MLE)	0.408					Theta star (bias corrected MLE)	0.632	
665				nu hat (MLE)	62.75					nu star (bias corrected)	40.55	
666				Mean (detects)	1.601							
667												
668					**Gamma ROS Statistics using Imputed Non-Detects**							
669					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
670					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
671					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
672					This is especially true when the sample size is small.							
673					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
674				Minimum	0.73					Mean	1.543	
675				Maximum	2.8					Median	1.077	
676				SD	0.814					CV	0.527	

677					k hat (MLE)	4.155				k star (bias corrected MLE)		2.844
678					Theta hat (MLE)	0.371				Theta star (bias corrected MLE)		0.543
679					nu hat (MLE)	74.79				nu star (bias corrected)		51.2
680					Adjusted Level of Significance (β)	0.0231						
681					Approximate Chi Square Value (51.20, α)	35.76				Adjusted Chi Square Value (51.20, β)		33.06
682					95% Gamma Approximate UCL (use when n>=50)	2.209				95% Gamma Adjusted UCL (use when n<50)		2.389
683												
684	**Estimates of Gamma Parameters using KM Estimates**											
685					Mean (KM)	1.541				SD (KM)		0.782
686					Variance (KM)	0.611				SE of Mean (KM)		0.284
687					k hat (KM)	3.889				k star (KM)		2.667
688					nu hat (KM)	70.01				nu star (KM)		48.01
689					theta hat (KM)	0.396				theta star (KM)		0.578
690					80% gamma percentile (KM)	2.23				90% gamma percentile (KM)		2.806
691					95% gamma percentile (KM)	3.347				99% gamma percentile (KM)		4.528
692												
693	**Gamma Kaplan-Meier (KM) Statistics**											
694					Approximate Chi Square Value (48.01, α)	33.1				Adjusted Chi Square Value (48.01, β)		30.51
695					95% Gamma Approximate KM-UCL (use when n>=50)	2.235				95% Gamma Adjusted KM-UCL (use when n<50)		2.425
696												
697	**Lognormal GOF Test on Detected Observations Only**											
698					Shapiro Wilk Test Statistic	0.863				**Shapiro Wilk GOF Test**		
699					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Lognormal at 5% Significance Level		
700					Lilliefors Test Statistic	0.227				**Lilliefors GOF Test**		
701					5% Lilliefors Critical Value	0.283				Detected Data appear Lognormal at 5% Significance Level		
702	**Detected Data appear Lognormal at 5% Significance Level**											
703												
704	**Lognormal ROS Statistics Using Imputed Non-Detects**											
705					Mean in Original Scale	1.538				Mean in Log Scale		0.304
706					SD in Original Scale	0.817				SD in Log Scale		0.533
707					95% t UCL (assumes normality of ROS data)	2.045				95% Percentile Bootstrap UCL		1.974
708					95% BCA Bootstrap UCL	2.003				95% Bootstrap t UCL		2.151
709					95% H-UCL (Log ROS)	2.401						
710												
711	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
712					KM Mean (logged)	0.3				KM Geo Mean		1.35
713					KM SD (logged)	0.517				95% Critical H Value (KM-Log)		2.255
714					KM Standard Error of Mean (logged)	0.19				95% H-UCL (KM -Log)		2.33
715					KM SD (logged)	0.517				95% Critical H Value (KM-Log)		2.255
716					KM Standard Error of Mean (logged)	0.19						
717												
718	**DL/2 Statistics**											
719	**DL/2 Normal**									**DL/2 Log-Transformed**		
720					Mean in Original Scale	1.54				Mean in Log Scale		0.306
721					SD in Original Scale	0.816				SD in Log Scale		0.532
722					95% t UCL (Assumes normality)	2.046				95% H-Stat UCL		2.401
723	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
724												
725	**Nonparametric Distribution Free UCL Statistics**											
726	**Detected Data appear Normal Distributed at 5% Significance Level**											
727												
728	**Suggested UCL to Use**											

	A	B	C	D	E	F	G	H	I	J	K	L
729					95% KM (t) UCL	2.07						
730												
731	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
732	Recommendations are based upon data size, data distribution, and skewness.											
733	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
734	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
735												
736												
737	**Nickel (nfmw20)**											
738												
739	**General Statistics**											
740					Total Number of Observations	8				Number of Distinct Observations		7
741										Number of Missing Observations		0
742					Minimum	2.4				Mean		3.225
743					Maximum	4.4				Median		3.2
744					SD	0.597				Std. Error of Mean		0.211
745					Coefficient of Variation	0.185				Skewness		0.898
746												
747	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
748	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
749	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
750	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
751												
752	**Normal GOF Test**											
753					Shapiro Wilk Test Statistic	0.942				**Shapiro Wilk GOF Test**		
754					5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level		
755					Lilliefors Test Statistic	0.2				**Lilliefors GOF Test**		
756					5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
757	**Data appear Normal at 5% Significance Level**											
758												
759	**Assuming Normal Distribution**											
760	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
761					95% Student's-t UCL	3.625				95% Adjusted-CLT UCL (Chen-1995)		3.644
762										95% Modified-t UCL (Johnson-1978)		3.636
763												
764	**Gamma GOF Test**											
765					A-D Test Statistic	0.248				**Anderson-Darling Gamma GOF Test**		
766					5% A-D Critical Value	0.715				Detected data appear Gamma Distributed at 5% Significance Level		
767					K-S Test Statistic	0.174				**Kolmogorov-Smirnov Gamma GOF Test**		
768					5% K-S Critical Value	0.294				Detected data appear Gamma Distributed at 5% Significance Level		
769	**Detected data appear Gamma Distributed at 5% Significance Level**											
770												
771	**Gamma Statistics**											
772					k hat (MLE)	34.98				k star (bias corrected MLE)		21.94
773					Theta hat (MLE)	0.0922				Theta star (bias corrected MLE)		0.147
774					nu hat (MLE)	559.6				nu star (bias corrected)		351.1
775					MLE Mean (bias corrected)	3.225				MLE Sd (bias corrected)		0.688
776										Approximate Chi Square Value (0.05)		308.7
777					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		298.6
778												
779	**Assuming Gamma Distribution**											
780					95% Approximate Gamma UCL (use when n>=50))	3.668				95% Adjusted Gamma UCL (use when n<50)		3.792

781												
782	**Lognormal GOF Test**											
783					Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk Lognormal GOF Test**					
784					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
785					Lilliefors Test Statistic	0.168	**Lilliefors Lognormal GOF Test**					
786					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
787	**Data appear Lognormal at 5% Significance Level**											
788												
789	**Lognormal Statistics**											
790					Minimum of Logged Data	0.875	Mean of logged Data	1.157				
791					Maximum of Logged Data	1.482	SD of logged Data	0.18				
792												
793	**Assuming Lognormal Distribution**											
794					95% H-UCL	3.682	90% Chebyshev (MVUE) UCL	3.84				
795					95% Chebyshev (MVUE) UCL	4.119	97.5% Chebyshev (MVUE) UCL	4.506				
796					99% Chebyshev (MVUE) UCL	5.266						
797												
798	**Nonparametric Distribution Free UCL Statistics**											
799	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
800												
801	**Nonparametric Distribution Free UCLs**											
802					95% CLT UCL	3.572	95% Jackknife UCL	3.625				
803					95% Standard Bootstrap UCL	3.557	95% Bootstrap-t UCL	3.715				
804					95% Hall's Bootstrap UCL	4.149	95% Percentile Bootstrap UCL	3.563				
805					95% BCA Bootstrap UCL	3.625						
806					90% Chebyshev(Mean, Sd) UCL	3.858	95% Chebyshev(Mean, Sd) UCL	4.145				
807					97.5% Chebyshev(Mean, Sd) UCL	4.543	99% Chebyshev(Mean, Sd) UCL	5.325				
808												
809	**Suggested UCL to Use**											
810					95% Student's-t UCL	3.625						
811												
812	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
813	Recommendations are based upon data size, data distribution, and skewness.											
814	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
815	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
816												
817												
818	**Nickel (nfmw22)**											
819												
820	**General Statistics**											
821					Total Number of Observations	4	Number of Distinct Observations	4				
822							Number of Missing Observations	0				
823					Minimum	6.2	Mean	6.55				
824					Maximum	6.9	Median	6.55				
825					SD	0.311	Std. Error of Mean	0.155				
826					Coefficient of Variation	0.0475	Skewness	-8.56E-15				
827												
828	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
829	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
830	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
831	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
832												

	A	B	C	D	E	F	G	H	I	J	K	L
833	**Normal GOF Test**											
834					Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk GOF Test**					
835					5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level					
836					Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**					
837					5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level					
838	**Data appear Normal at 5% Significance Level**											
839												
840	**Assuming Normal Distribution**											
841	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
842					95% Student's-t UCL	6.916	95% Adjusted-CLT UCL (Chen-1995)					6.806
843							95% Modified-t UCL (Johnson-1978)					6.916
844												
845	**Gamma GOF Test**											
846					A-D Test Statistic	0.239	**Anderson-Darling Gamma GOF Test**					
847					5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level					
848					K-S Test Statistic	0.214	**Kolmogorov-Smirnov Gamma GOF Test**					
849					5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level					
850	**Detected data appear Gamma Distributed at 5% Significance Level**											
851												
852	**Gamma Statistics**											
853					k hat (MLE)	591.2	k star (bias corrected MLE)					148
854					Theta hat (MLE)	0.0111	Theta star (bias corrected MLE)					0.0443
855					nu hat (MLE)	4729	nu star (bias corrected)					1184
856					MLE Mean (bias corrected)	6.55	MLE Sd (bias corrected)					0.538
857							Approximate Chi Square Value (0.05)					1105
858					Adjusted Level of Significance	N/A	Adjusted Chi Square Value					N/A
859												
860	**Assuming Gamma Distribution**											
861					95% Approximate Gamma UCL (use when n>=50))	7.018	95% Adjusted Gamma UCL (use when n<50)					N/A
862												
863	**Lognormal GOF Test**											
864					Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk Lognormal GOF Test**					
865					5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level					
866					Lilliefors Test Statistic	0.189	**Lilliefors Lognormal GOF Test**					
867					5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level					
868	**Data appear Lognormal at 5% Significance Level**											
869												
870	**Lognormal Statistics**											
871					Minimum of Logged Data	1.825	Mean of logged Data					1.879
872					Maximum of Logged Data	1.932	SD of logged Data					0.0475
873												
874	**Assuming Lognormal Distribution**											
875					95% H-UCL	N/A	90% Chebyshev (MVUE) UCL					7.017
876					95% Chebyshev (MVUE) UCL	7.228	97.5% Chebyshev (MVUE) UCL					7.522
877					99% Chebyshev (MVUE) UCL	8.098						
878												
879	**Nonparametric Distribution Free UCL Statistics**											
880	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
881												
882	**Nonparametric Distribution Free UCLs**											
883					95% CLT UCL	6.806	95% Jackknife UCL					6.916
884					95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL					N/A

885				95% Hall's Bootstrap UCL		N/A				95% Percentile Bootstrap UCL		N/A
886				95% BCA Bootstrap UCL		N/A						
887				90% Chebyshev(Mean, Sd) UCL		7.016				95% Chebyshev(Mean, Sd) UCL		7.228
888				97.5% Chebyshev(Mean, Sd) UCL		7.521				99% Chebyshev(Mean, Sd) UCL		8.097
889												
890					**Suggested UCL to Use**							
891				95% Student's-t UCL		6.916						
892												
893					**Recommended UCL exceeds the maximum observation**							
894												
895					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
896					Recommendations are based upon data size, data distribution, and skewness.							
897					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
898					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
899												
900					**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**							
901					**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**							
902												
903												
904	**Nickel (nfmw23)**											
905												
906					**General Statistics**							
907				Total Number of Observations		4				Number of Distinct Observations		3
908										Number of Missing Observations		0
909				Minimum		5.7				Mean		6.375
910				Maximum		6.8				Median		6.5
911				SD		0.472				Std. Error of Mean		0.236
912				Coefficient of Variation		0.074				Skewness		-1.441
913												
914					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
915					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
916					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
917					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
918												
919					**Normal GOF Test**							
920				Shapiro Wilk Test Statistic		0.856				**Shapiro Wilk GOF Test**		
921				5% Shapiro Wilk Critical Value		0.748				Data appear Normal at 5% Significance Level		
922				Lilliefors Test Statistic		0.354				**Lilliefors GOF Test**		
923				5% Lilliefors Critical Value		0.375				Data appear Normal at 5% Significance Level		
924					**Data appear Normal at 5% Significance Level**							
925												
926					**Assuming Normal Distribution**							
927					**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**	
928				95% Student's-t UCL		6.93				95% Adjusted-CLT UCL (Chen-1995)		6.581
929										95% Modified-t UCL (Johnson-1978)		6.902
930												
931					**Gamma GOF Test**							
932				A-D Test Statistic		0.507				**Anderson-Darling Gamma GOF Test**		
933				5% A-D Critical Value		0.657				Detected data appear Gamma Distributed at 5% Significance Level		
934				K-S Test Statistic		0.375				**Kolmogorov-Smirnov Gamma GOF Test**		
935				5% K-S Critical Value		0.394				Detected data appear Gamma Distributed at 5% Significance Level		
936					**Detected data appear Gamma Distributed at 5% Significance Level**							

937												
938	**Gamma Statistics**											
939					k hat (MLE)	234.3			k star (bias corrected MLE)	58.73		
940					Theta hat (MLE)	0.0272			Theta star (bias corrected MLE)	0.109		
941					nu hat (MLE)	1874			nu star (bias corrected)	469.9		
942					MLE Mean (bias corrected)	6.375			MLE Sd (bias corrected)	0.832		
943									Approximate Chi Square Value (0.05)	420.6		
944					Adjusted Level of Significance	N/A			Adjusted Chi Square Value	N/A		
945												
946	**Assuming Gamma Distribution**											
947					95% Approximate Gamma UCL (use when n>=50))	7.122			95% Adjusted Gamma UCL (use when n<50)	N/A		
948												
949	**Lognormal GOF Test**											
950					Shapiro Wilk Test Statistic	0.844			**Shapiro Wilk Lognormal GOF Test**			
951					5% Shapiro Wilk Critical Value	0.748			Data appear Lognormal at 5% Significance Level			
952					Lilliefors Test Statistic	0.361			**Lilliefors Lognormal GOF Test**			
953					5% Lilliefors Critical Value	0.375			Data appear Lognormal at 5% Significance Level			
954	**Data appear Lognormal at 5% Significance Level**											
955												
956	**Lognormal Statistics**											
957					Minimum of Logged Data	1.74			Mean of logged Data	1.85		
958					Maximum of Logged Data	1.917			SD of logged Data	0.0762		
959												
960	**Assuming Lognormal Distribution**											
961					95% H-UCL	N/A			90% Chebyshev (MVUE) UCL	7.104		
962					95% Chebyshev (MVUE) UCL	7.434			97.5% Chebyshev (MVUE) UCL	7.892		
963					99% Chebyshev (MVUE) UCL	8.792						
964												
965	**Nonparametric Distribution Free UCL Statistics**											
966	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
967												
968	**Nonparametric Distribution Free UCLs**											
969					95% CLT UCL	6.763			95% Jackknife UCL	6.93		
970					95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL	N/A		
971					95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL	N/A		
972					95% BCA Bootstrap UCL	N/A						
973					90% Chebyshev(Mean, Sd) UCL	7.083			95% Chebyshev(Mean, Sd) UCL	7.403		
974					97.5% Chebyshev(Mean, Sd) UCL	7.848			99% Chebyshev(Mean, Sd) UCL	8.722		
975												
976	**Suggested UCL to Use**											
977					95% Student's-t UCL	6.93						
978												
979	**Recommended UCL exceeds the maximum observation**											
980												
981	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
982	Recommendations are based upon data size, data distribution, and skewness.											
983	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
984	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
985												
986	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
987	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
988												

	A	B	C	D	E	F	G	H	I	J	K	L
989												
990	**Nickel (nfmw3)**											
991												
992	**General Statistics**											
993	Total Number of Observations					9	Number of Distinct Observations					9
994							Number of Missing Observations					0
995	Minimum					2.9	Mean					4.489
996	Maximum					6.5	Median					4.1
997	SD					1.288	Std. Error of Mean					0.429
998	Coefficient of Variation					0.287	Skewness					0.476
999												
1000	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1001	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1002	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1003	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1004												
1005	**Normal GOF Test**											
1006	Shapiro Wilk Test Statistic					0.929	**Shapiro Wilk GOF Test**					
1007	5% Shapiro Wilk Critical Value					0.829	Data appear Normal at 5% Significance Level					
1008	Lilliefors Test Statistic					0.174	**Lilliefors GOF Test**					
1009	5% Lilliefors Critical Value					0.274	Data appear Normal at 5% Significance Level					
1010	**Data appear Normal at 5% Significance Level**											
1011												
1012	**Assuming Normal Distribution**											
1013	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1014	95% Student's-t UCL					5.287	95% Adjusted-CLT UCL (Chen-1995)					5.268
1015							95% Modified-t UCL (Johnson-1978)					5.299
1016												
1017	**Gamma GOF Test**											
1018	A-D Test Statistic					0.273	**Anderson-Darling Gamma GOF Test**					
1019	5% A-D Critical Value					0.721	Detected data appear Gamma Distributed at 5% Significance Level					
1020	K-S Test Statistic					0.152	**Kolmogorov-Smirnov Gamma GOF Test**					
1021	5% K-S Critical Value					0.279	Detected data appear Gamma Distributed at 5% Significance Level					
1022	**Detected data appear Gamma Distributed at 5% Significance Level**											
1023												
1024	**Gamma Statistics**											
1025	k hat (MLE)					13.98	k star (bias corrected MLE)					9.391
1026	Theta hat (MLE)					0.321	Theta star (bias corrected MLE)					0.478
1027	nu hat (MLE)					251.6	nu star (bias corrected)					169
1028	MLE Mean (bias corrected)					4.489	MLE Sd (bias corrected)					1.465
1029							Approximate Chi Square Value (0.05)					140
1030	Adjusted Level of Significance					0.0231	Adjusted Chi Square Value					134.4
1031												
1032	**Assuming Gamma Distribution**											
1033	95% Approximate Gamma UCL (use when n>=50))					5.421	95% Adjusted Gamma UCL (use when n<50)					5.646
1034												
1035	**Lognormal GOF Test**											
1036	Shapiro Wilk Test Statistic					0.95	**Shapiro Wilk Lognormal GOF Test**					
1037	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
1038	Lilliefors Test Statistic					0.135	**Lilliefors Lognormal GOF Test**					
1039	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
1040	**Data appear Lognormal at 5% Significance Level**											

	A	B	C	D	E	F	G	H	I	J	K	L
1041												
1042	**Lognormal Statistics**											
1043	Minimum of Logged Data					1.065	Mean of logged Data					1.465
1044	Maximum of Logged Data					1.872	SD of logged Data					0.285
1045												
1046	**Assuming Lognormal Distribution**											
1047	95% H-UCL					5.512	90% Chebyshev (MVUE) UCL					5.773
1048	95% Chebyshev (MVUE) UCL					6.355	97.5% Chebyshev (MVUE) UCL					7.164
1049	99% Chebyshev (MVUE) UCL					8.751						
1050												
1051	**Nonparametric Distribution Free UCL Statistics**											
1052	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1053												
1054	**Nonparametric Distribution Free UCLs**											
1055	95% CLT UCL					5.195	95% Jackknife UCL					5.287
1056	95% Standard Bootstrap UCL					5.159	95% Bootstrap-t UCL					5.445
1057	95% Hall's Bootstrap UCL					5.315	95% Percentile Bootstrap UCL					5.167
1058	95% BCA Bootstrap UCL					5.233						
1059	90% Chebyshev(Mean, Sd) UCL					5.777	95% Chebyshev(Mean, Sd) UCL					6.36
1060	97.5% Chebyshev(Mean, Sd) UCL					7.17	99% Chebyshev(Mean, Sd) UCL					8.76
1061												
1062	**Suggested UCL to Use**											
1063	95% Student's-t UCL					5.287						
1064												
1065	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1066	Recommendations are based upon data size, data distribution, and skewness.											
1067	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1068	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1069												
1070	**Nickel (nfmw4)**											
1071												
1072	**General Statistics**											
1073	Total Number of Observations					9	Number of Distinct Observations					9
1074	Number of Detects					7	Number of Non-Detects					2
1075	Number of Distinct Detects					7	Number of Distinct Non-Detects					2
1076	Minimum Detect					0.29	Minimum Non-Detect					0.23
1077	Maximum Detect					0.84	Maximum Non-Detect					2.1
1078	Variance Detects					0.0344	Percent Non-Detects					22.22%
1079	Mean Detects					0.503	SD Detects					0.185
1080	Median Detects					0.44	CV Detects					0.369
1081	Skewness Detects					1.011	Kurtosis Detects					0.764
1082	Mean of Logged Detects					-0.742	SD of Logged Detects					0.354
1083												
1084	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1085	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1086	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1087	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1088												
1089	**Normal GOF Test on Detects Only**											
1090	Shapiro Wilk Test Statistic					0.932	**Shapiro Wilk GOF Test**					
1091	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Normal at 5% Significance Level					
1092	Lilliefors Test Statistic					0.204	**Lilliefors GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
1093	5% Lilliefors Critical Value					0.304	Detected Data appear Normal at 5% Significance Level					
1094	**Detected Data appear Normal at 5% Significance Level**											
1095												
1096	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1097	KM Mean					0.469	KM Standard Error of Mean					0.0703
1098	KM SD					0.184	95% KM (BCA) UCL					0.583
1099	95% KM (t) UCL					0.6	95% KM (Percentile Bootstrap) UCL					0.578
1100	95% KM (z) UCL					0.584	95% KM Bootstrap t UCL					0.651
1101	90% KM Chebyshev UCL					0.68	95% KM Chebyshev UCL					0.775
1102	97.5% KM Chebyshev UCL					0.908	99% KM Chebyshev UCL					1.168
1103												
1104	**Gamma GOF Tests on Detected Observations Only**											
1105	A-D Test Statistic					0.213	**Anderson-Darling GOF Test**					
1106	5% A-D Critical Value					0.709	Detected data appear Gamma Distributed at 5% Significance Level					
1107	K-S Test Statistic					0.185	**Kolmogorov-Smirnov GOF**					
1108	5% K-S Critical Value					0.312	Detected data appear Gamma Distributed at 5% Significance Level					
1109	**Detected data appear Gamma Distributed at 5% Significance Level**											
1110												
1111	**Gamma Statistics on Detected Data Only**											
1112	k hat (MLE)					9.298	k star (bias corrected MLE)					5.408
1113	Theta hat (MLE)					0.0541	Theta star (bias corrected MLE)					0.093
1114	nu hat (MLE)					130.2	nu star (bias corrected)					75.72
1115	Mean (detects)					0.503						
1116												
1117	**Gamma ROS Statistics using Imputed Non-Detects**											
1118	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1119	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1120	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1121	This is especially true when the sample size is small.											
1122	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1123	Minimum					0.116	Mean					0.453
1124	Maximum					0.84	Median					0.44
1125	SD					0.205	CV					0.453
1126	k hat (MLE)					4.483	k star (bias corrected MLE)					3.063
1127	Theta hat (MLE)					0.101	Theta star (bias corrected MLE)					0.148
1128	nu hat (MLE)					80.7	nu star (bias corrected)					55.13
1129	Adjusted Level of Significance (β)					0.0231						
1130	Approximate Chi Square Value (55.13, α)					39.07	Adjusted Chi Square Value (55.13, β)					36.24
1131	95% Gamma Approximate UCL (use when n>=50)					0.639	95% Gamma Adjusted UCL (use when n<50)					0.689
1132												
1133	**Estimates of Gamma Parameters using KM Estimates**											
1134	Mean (KM)					0.469	SD (KM)					0.184
1135	Variance (KM)					0.0339	SE of Mean (KM)					0.0703
1136	k hat (KM)					6.48	k star (KM)					4.394
1137	nu hat (KM)					116.6	nu star (KM)					79.09
1138	theta hat (KM)					0.0723	theta star (KM)					0.107
1139	80% gamma percentile (KM)					0.639	90% gamma percentile (KM)					0.768
1140	95% gamma percentile (KM)					0.887	99% gamma percentile (KM)					1.138
1141												
1142	**Gamma Kaplan-Meier (KM) Statistics**											
1143	Approximate Chi Square Value (79.09, α)					59.6	Adjusted Chi Square Value (79.09, β)					56.04
1144	95% Gamma Approximate KM-UCL (use when n>=50)					0.622	95% Gamma Adjusted KM-UCL (use when n<50)					0.661

	A	B	C	D	E	F	G	H	I	J	K	L
1145												
1146	**Lognormal GOF Test on Detected Observations Only**											
1147					Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk GOF Test**					
1148					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
1149					Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**					
1150					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
1151	**Detected Data appear Lognormal at 5% Significance Level**											
1152												
1153	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1154					Mean in Original Scale	0.461	Mean in Log Scale	-0.852				
1155					SD in Original Scale	0.19	SD in Log Scale	0.425				
1156					95% t UCL (assumes normality of ROS data)	0.579	95% Percentile Bootstrap UCL	0.569				
1157					95% BCA Bootstrap UCL	0.575	95% Bootstrap t UCL	0.617				
1158					95% H-UCL (Log ROS)	0.646						
1159												
1160	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1161					KM Mean (logged)	-0.833	KM Geo Mean	0.435				
1162					KM SD (logged)	0.389	95% Critical H Value (KM-Log)	2.12				
1163					KM Standard Error of Mean (logged)	0.149	95% H-UCL (KM -Log)	0.628				
1164					KM SD (logged)	0.389	95% Critical H Value (KM-Log)	2.12				
1165					KM Standard Error of Mean (logged)	0.149						
1166												
1167	**DL/2 Statistics**											
1168					**DL/2 Normal**		**DL/2 Log-Transformed**					
1169					Mean in Original Scale	0.521	Mean in Log Scale	-0.812				
1170					SD in Original Scale	0.286	SD in Log Scale	0.647				
1171					95% t UCL (Assumes normality)	0.698	95% H-Stat UCL	0.976				
1172	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1173												
1174	**Nonparametric Distribution Free UCL Statistics**											
1175	**Detected Data appear Normal Distributed at 5% Significance Level**											
1176												
1177	**Suggested UCL to Use**											
1178					95% KM (t) UCL	0.6						
1179												
1180	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1181	Recommendations are based upon data size, data distribution, and skewness.											
1182	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1183	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1184												
1185												
1186	**Nickel (nfmw7)**											
1187												
1188	**General Statistics**											
1189					Total Number of Observations	9	Number of Distinct Observations	6				
1190							Number of Missing Observations	0				
1191					Minimum	1.8	Mean	2.767				
1192					Maximum	4	Median	2.8				
1193					SD	0.68	Std. Error of Mean	0.227				
1194					Coefficient of Variation	0.246	Skewness	0.0957				
1195												
1196	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											

	A	B	C	D	E	F	G	H	I	J	K	L
1197	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1198	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1199	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1200												
1201	Normal GOF Test											
1202					Shapiro Wilk Test Statistic	0.913	Shapiro Wilk GOF Test					
1203					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
1204					Lilliefors Test Statistic	0.239	Lilliefors GOF Test					
1205					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
1206	Data appear Normal at 5% Significance Level											
1207												
1208	Assuming Normal Distribution											
1209	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
1210					95% Student's-t UCL	3.188				95% Adjusted-CLT UCL (Chen-1995)		3.147
1211										95% Modified-t UCL (Johnson-1978)		3.189
1212												
1213	Gamma GOF Test											
1214					A-D Test Statistic	0.54	Anderson-Darling Gamma GOF Test					
1215					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
1216					K-S Test Statistic	0.269	Kolmogorov-Smirnov Gamma GOF Test					
1217					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
1218	Detected data appear Gamma Distributed at 5% Significance Level											
1219												
1220	Gamma Statistics											
1221					k hat (MLE)	17.7				k star (bias corrected MLE)		11.87
1222					Theta hat (MLE)	0.156				Theta star (bias corrected MLE)		0.233
1223					nu hat (MLE)	318.6				nu star (bias corrected)		213.7
1224					MLE Mean (bias corrected)	2.767				MLE Sd (bias corrected)		0.803
1225										Approximate Chi Square Value (0.05)		180.9
1226					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		174.5
1227												
1228	Assuming Gamma Distribution											
1229					95% Approximate Gamma UCL (use when n>=50))	3.269				95% Adjusted Gamma UCL (use when n<50)		3.388
1230												
1231	Lognormal GOF Test											
1232					Shapiro Wilk Test Statistic	0.886	Shapiro Wilk Lognormal GOF Test					
1233					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1234					Lilliefors Test Statistic	0.284	Lilliefors Lognormal GOF Test					
1235					5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level					
1236	Data appear Approximate Lognormal at 5% Significance Level											
1237												
1238	Lognormal Statistics											
1239					Minimum of Logged Data	0.588				Mean of logged Data		0.989
1240					Maximum of Logged Data	1.386				SD of logged Data		0.258
1241												
1242	Assuming Lognormal Distribution											
1243					95% H-UCL	3.327				90% Chebyshev (MVUE) UCL		3.488
1244					95% Chebyshev (MVUE) UCL	3.813				97.5% Chebyshev (MVUE) UCL		4.265
1245					99% Chebyshev (MVUE) UCL	5.152						
1246												
1247	Nonparametric Distribution Free UCL Statistics											
1248	Data appear to follow a Discernible Distribution at 5% Significance Level											

1249												
1250	**Nonparametric Distribution Free UCLs**											
1251					95% CLT UCL	3.14			95% Jackknife UCL	3.188		
1252					95% Standard Bootstrap UCL	3.119			95% Bootstrap-t UCL	3.173		
1253					95% Hall's Bootstrap UCL	3.209			95% Percentile Bootstrap UCL	3.133		
1254					95% BCA Bootstrap UCL	3.111						
1255					90% Chebyshev(Mean, Sd) UCL	3.447			95% Chebyshev(Mean, Sd) UCL	3.755		
1256					97.5% Chebyshev(Mean, Sd) UCL	4.182			99% Chebyshev(Mean, Sd) UCL	5.022		
1257												
1258	**Suggested UCL to Use**											
1259					95% Student's-t UCL	3.188						
1260												
1261	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1262	Recommendations are based upon data size, data distribution, and skewness.											
1263	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1264	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1265												
1266												
1267	**Nickel (nfmw8)**											
1268												
1269	**General Statistics**											
1270					Total Number of Observations	8			Number of Distinct Observations	8		
1271									Number of Missing Observations	0		
1272					Minimum	2.3			Mean	4.038		
1273					Maximum	5.9			Median	4.05		
1274					SD	1.329			Std. Error of Mean	0.47		
1275					Coefficient of Variation	0.329			Skewness	0.191		
1276												
1277	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1278	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1279	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1280	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1281												
1282	**Normal GOF Test**											
1283					Shapiro Wilk Test Statistic	0.943			**Shapiro Wilk GOF Test**			
1284					5% Shapiro Wilk Critical Value	0.818			Data appear Normal at 5% Significance Level			
1285					Lilliefors Test Statistic	0.145			**Lilliefors GOF Test**			
1286					5% Lilliefors Critical Value	0.283			Data appear Normal at 5% Significance Level			
1287	**Data appear Normal at 5% Significance Level**											
1288												
1289	**Assuming Normal Distribution**											
1290	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
1291					95% Student's-t UCL	4.928			95% Adjusted-CLT UCL (Chen-1995)	4.844		
1292									95% Modified-t UCL (Johnson-1978)	4.933		
1293												
1294	**Gamma GOF Test**											
1295					A-D Test Statistic	0.231			**Anderson-Darling Gamma GOF Test**			
1296					5% A-D Critical Value	0.715			Detected data appear Gamma Distributed at 5% Significance Level			
1297					K-S Test Statistic	0.148			**Kolmogorov-Smirnov Gamma GOF Test**			
1298					5% K-S Critical Value	0.294			Detected data appear Gamma Distributed at 5% Significance Level			
1299	**Detected data appear Gamma Distributed at 5% Significance Level**											
1300												

	A	B	C	D	E	F	G	H	I	J	K	L
1301	**Gamma Statistics**											
1302					k hat (MLE)	10.16			k star (bias corrected MLE)			6.431
1303					Theta hat (MLE)	0.398			Theta star (bias corrected MLE)			0.628
1304					nu hat (MLE)	162.5			nu star (bias corrected)			102.9
1305					MLE Mean (bias corrected)	4.038			MLE Sd (bias corrected)			1.592
1306									Approximate Chi Square Value (0.05)			80.49
1307					Adjusted Level of Significance	0.0195			Adjusted Chi Square Value			75.48
1308												
1309	**Assuming Gamma Distribution**											
1310			95% Approximate Gamma UCL (use when n>=50))			5.161			95% Adjusted Gamma UCL (use when n<50)			5.503
1311												
1312	**Lognormal GOF Test**											
1313					Shapiro Wilk Test Statistic	0.947			**Shapiro Wilk Lognormal GOF Test**			
1314					5% Shapiro Wilk Critical Value	0.818			Data appear Lognormal at 5% Significance Level			
1315					Lilliefors Test Statistic	0.129			**Lilliefors Lognormal GOF Test**			
1316					5% Lilliefors Critical Value	0.283			Data appear Lognormal at 5% Significance Level			
1317	**Data appear Lognormal at 5% Significance Level**											
1318												
1319	**Lognormal Statistics**											
1320					Minimum of Logged Data	0.833			Mean of logged Data			1.346
1321					Maximum of Logged Data	1.775			SD of logged Data			0.344
1322												
1323	**Assuming Lognormal Distribution**											
1324					95% H-UCL	5.362			90% Chebyshev (MVUE) UCL			5.524
1325					95% Chebyshev (MVUE) UCL	6.195			97.5% Chebyshev (MVUE) UCL			7.126
1326					99% Chebyshev (MVUE) UCL	8.956						
1327												
1328	**Nonparametric Distribution Free UCL Statistics**											
1329	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1330												
1331	**Nonparametric Distribution Free UCLs**											
1332					95% CLT UCL	4.81			95% Jackknife UCL			4.928
1333					95% Standard Bootstrap UCL	4.775			95% Bootstrap-t UCL			5.019
1334					95% Hall's Bootstrap UCL	4.987			95% Percentile Bootstrap UCL			4.788
1335					95% BCA Bootstrap UCL	4.8						
1336					90% Chebyshev(Mean, Sd) UCL	5.447			95% Chebyshev(Mean, Sd) UCL			6.085
1337					97.5% Chebyshev(Mean, Sd) UCL	6.971			99% Chebyshev(Mean, Sd) UCL			8.712
1338												
1339	**Suggested UCL to Use**											
1340					95% Student's-t UCL	4.928						
1341												
1342	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1343	Recommendations are based upon data size, data distribution, and skewness.											
1344	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1345	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1346												
1347												
1348	**Nickel (nfmw9)**											
1349												
1350	**General Statistics**											
1351					Total Number of Observations	8			Number of Distinct Observations			8
1352									Number of Missing Observations			0

1353					Minimum	6					Mean	12.74
1354					Maximum	21.6					Median	11.45
1355					SD	5.493					Std. Error of Mean	1.942
1356					Coefficient of Variation	0.431					Skewness	0.846
1357												
1358	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1359	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1360	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1361	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1362												
1363	**Normal GOF Test**											
1364					Shapiro Wilk Test Statistic	0.876	**Shapiro Wilk GOF Test**					
1365					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1366					Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**					
1367					5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level					
1368	**Data appear Approximate Normal at 5% Significance Level**											
1369												
1370	**Assuming Normal Distribution**											
1371	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1372					95% Student's-t UCL	16.42					95% Adjusted-CLT UCL (Chen-1995)	16.55
1373											95% Modified-t UCL (Johnson-1978)	16.51
1374												
1375	**Gamma GOF Test**											
1376					A-D Test Statistic	0.395	**Anderson-Darling Gamma GOF Test**					
1377					5% A-D Critical Value	0.718	Detected data appear Gamma Distributed at 5% Significance Level					
1378					K-S Test Statistic	0.241	**Kolmogorov-Smirnov Gamma GOF Test**					
1379					5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level					
1380	**Detected data appear Gamma Distributed at 5% Significance Level**											
1381												
1382	**Gamma Statistics**											
1383					k hat (MLE)	6.488					k star (bias corrected MLE)	4.138
1384					Theta hat (MLE)	1.963					Theta star (bias corrected MLE)	3.078
1385					nu hat (MLE)	103.8					nu star (bias corrected)	66.22
1386					MLE Mean (bias corrected)	12.74					MLE Sd (bias corrected)	6.261
1387											Approximate Chi Square Value (0.05)	48.49
1388					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	44.68
1389												
1390	**Assuming Gamma Distribution**											
1391					95% Approximate Gamma UCL (use when n>=50))	17.39					95% Adjusted Gamma UCL (use when n<50)	18.88
1392												
1393	**Lognormal GOF Test**											
1394					Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**					
1395					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1396					Lilliefors Test Statistic	0.216	**Lilliefors Lognormal GOF Test**					
1397					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1398	**Data appear Lognormal at 5% Significance Level**											
1399												
1400	**Lognormal Statistics**											
1401					Minimum of Logged Data	1.792					Mean of logged Data	2.466
1402					Maximum of Logged Data	3.073					SD of logged Data	0.425
1403												
1404	**Assuming Lognormal Distribution**											

1405					95% H-UCL	18.44				90% Chebyshev (MVUE) UCL		18.51
1406					95% Chebyshev (MVUE) UCL	21.13				97.5% Chebyshev (MVUE) UCL		24.77
1407					99% Chebyshev (MVUE) UCL	31.91						
1408												
1409					**Nonparametric Distribution Free UCL Statistics**							
1410					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
1411												
1412					**Nonparametric Distribution Free UCLs**							
1413					95% CLT UCL	15.93				95% Jackknife UCL		16.42
1414					95% Standard Bootstrap UCL	15.67				95% Bootstrap-t UCL		19.86
1415					95% Hall's Bootstrap UCL	47.38				95% Percentile Bootstrap UCL		15.88
1416					95% BCA Bootstrap UCL	16.11						
1417					90% Chebyshev(Mean, Sd) UCL	18.56				95% Chebyshev(Mean, Sd) UCL		21.2
1418					97.5% Chebyshev(Mean, Sd) UCL	24.87				99% Chebyshev(Mean, Sd) UCL		32.06
1419												
1420					**Suggested UCL to Use**							
1421					95% Student's-t UCL	16.42						
1422												
1423					When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test							
1424					When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL							
1425												
1426					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1427					Recommendations are based upon data size, data distribution, and skewness.							
1428					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1429					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1430												
1431	**Nickel (smw10)**											
1432												
1433					**General Statistics**							
1434					Total Number of Observations	8				Number of Distinct Observations		7
1435					Number of Detects	7				Number of Non-Detects		1
1436					Number of Distinct Detects	7				Number of Distinct Non-Detects		1
1437					Minimum Detect	3.7				Minimum Non-Detect		5.3
1438					Maximum Detect	5.6				Maximum Non-Detect		5.3
1439					Variance Detects	0.597				Percent Non-Detects		12.5%
1440					Mean Detects	4.7				SD Detects		0.772
1441					Median Detects	4.5				CV Detects		0.164
1442					Skewness Detects	-0.0456				Kurtosis Detects		-1.973
1443					Mean of Logged Detects	1.536				SD of Logged Detects		0.167
1444												
1445					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1446					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1447					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1448					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1449												
1450					**Normal GOF Test on Detects Only**							
1451					Shapiro Wilk Test Statistic	0.9				**Shapiro Wilk GOF Test**		
1452					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Normal at 5% Significance Level		
1453					Lilliefors Test Statistic	0.21				**Lilliefors GOF Test**		
1454					5% Lilliefors Critical Value	0.304				Detected Data appear Normal at 5% Significance Level		
1455					**Detected Data appear Normal at 5% Significance Level**							
1456												

	A	B	C	D	E	F	G	H	I	J	K	L
1457	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1458					KM Mean	4.628				KM Standard Error of Mean		0.274
1459					KM SD	0.705				95% KM (BCA) UCL		5.05
1460					95% KM (t) UCL	5.147				95% KM (Percentile Bootstrap) UCL		5.069
1461					95% KM (z) UCL	5.079				95% KM Bootstrap t UCL		5.152
1462					90% KM Chebyshev UCL	5.45				95% KM Chebyshev UCL		5.823
1463					97.5% KM Chebyshev UCL	6.34				99% KM Chebyshev UCL		7.355
1464												
1465	**Gamma GOF Tests on Detected Observations Only**											
1466					A-D Test Statistic	0.39	**Anderson-Darling GOF Test**					
1467					5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level					
1468					K-S Test Statistic	0.231	**Kolmogorov-Smirnov GOF**					
1469					5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level					
1470	**Detected data appear Gamma Distributed at 5% Significance Level**											
1471												
1472	**Gamma Statistics on Detected Data Only**											
1473					k hat (MLE)	42.47				k star (bias corrected MLE)		24.37
1474					Theta hat (MLE)	0.111				Theta star (bias corrected MLE)		0.193
1475					nu hat (MLE)	594.6				nu star (bias corrected)		341.1
1476					Mean (detects)	4.7						
1477												
1478	**Gamma ROS Statistics using Imputed Non-Detects**											
1479	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1480	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1481	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1482	This is especially true when the sample size is small.											
1483	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1484					Minimum	3.7				Mean		4.636
1485					Maximum	5.6				Median		4.45
1486					SD	0.738				CV		0.159
1487					k hat (MLE)	45.42				k star (bias corrected MLE)		28.47
1488					Theta hat (MLE)	0.102				Theta star (bias corrected MLE)		0.163
1489					nu hat (MLE)	726.7				nu star (bias corrected)		455.5
1490					Adjusted Level of Significance (β)	0.0195						
1491					Approximate Chi Square Value (455.54, α)	407.1				Adjusted Chi Square Value (455.54, β)		395.4
1492					95% Gamma Approximate UCL (use when n>=50)	5.188				95% Gamma Adjusted UCL (use when n<50)		5.341
1493												
1494	**Estimates of Gamma Parameters using KM Estimates**											
1495					Mean (KM)	4.628				SD (KM)		0.705
1496					Variance (KM)	0.498				SE of Mean (KM)		0.274
1497					k hat (KM)	43.04				k star (KM)		26.98
1498					nu hat (KM)	688.7				nu star (KM)		431.8
1499					theta hat (KM)	0.108				theta star (KM)		0.172
1500					80% gamma percentile (KM)	5.356				90% gamma percentile (KM)		5.8
1501					95% gamma percentile (KM)	6.184				99% gamma percentile (KM)		6.949
1502												
1503	**Gamma Kaplan-Meier (KM) Statistics**											
1504					Approximate Chi Square Value (431.75, α)	384.6				Adjusted Chi Square Value (431.75, β)		373.3
1505					95% Gamma Approximate KM-UCL (use when n>=50)	5.196				95% Gamma Adjusted KM-UCL (use when n<50)		5.353
1506												
1507	**Lognormal GOF Test on Detected Observations Only**											
1508					Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**					

1509				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Lognormal at 5% Significance Level					
1510				Lilliefors Test Statistic		0.214	**Lilliefors GOF Test**					
1511				5% Lilliefors Critical Value		0.304	Detected Data appear Lognormal at 5% Significance Level					
1512	**Detected Data appear Lognormal at 5% Significance Level**											
1513												
1514	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1515				Mean in Original Scale		4.634	Mean in Log Scale					1.522
1516				SD in Original Scale		0.739	SD in Log Scale					0.159
1517				95% t UCL (assumes normality of ROS data)		5.129	95% Percentile Bootstrap UCL					5.034
1518				95% BCA Bootstrap UCL		5.063	95% Bootstrap t UCL					5.138
1519				95% H-UCL (Log ROS)		5.204						
1520												
1521	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1522				KM Mean (logged)		1.52	KM Geo Mean					4.574
1523				KM SD (logged)		0.153	95% Critical H Value (KM-Log)					1.896
1524				KM Standard Error of Mean (logged)		0.0596	95% H-UCL (KM -Log)					5.164
1525				KM SD (logged)		0.153	95% Critical H Value (KM-Log)					1.896
1526				KM Standard Error of Mean (logged)		0.0596						
1527												
1528	**DL/2 Statistics**											
1529	**DL/2 Normal**						**DL/2 Log-Transformed**					
1530				Mean in Original Scale		4.444	Mean in Log Scale					1.466
1531				SD in Original Scale		1.018	SD in Log Scale					0.251
1532				95% t UCL (Assumes normality)		5.126	95% H-Stat UCL					5.405
1533	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1534												
1535	**Nonparametric Distribution Free UCL Statistics**											
1536	**Detected Data appear Normal Distributed at 5% Significance Level**											
1537												
1538	**Suggested UCL to Use**											
1539				95% KM (t) UCL		5.147						
1540												
1541	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1542	Recommendations are based upon data size, data distribution, and skewness.											
1543	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1544	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1545												
1546												
1547	**Nickel (smw11)**											
1548												
1549	**General Statistics**											
1550				Total Number of Observations		9	Number of Distinct Observations					9
1551							Number of Missing Observations					0
1552				Minimum		2.2	Mean					5.589
1553				Maximum		10	Median					5.8
1554				SD		2.229	Std. Error of Mean					0.743
1555				Coefficient of Variation		0.399	Skewness					0.415
1556												
1557	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1558	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1559	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1560	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											

1561												
1562	**Normal GOF Test**											
1563					Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk GOF Test**					
1564					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
1565					Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**					
1566					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
1567	**Data appear Normal at 5% Significance Level**											
1568												
1569	**Assuming Normal Distribution**											
1570				**95% Normal UCL**			**95% UCLs (Adjusted for Skewness)**					
1571					95% Student's-t UCL	6.971	95% Adjusted-CLT UCL (Chen-1995)	6.921				
1572							95% Modified-t UCL (Johnson-1978)	6.988				
1573												
1574	**Gamma GOF Test**											
1575					A-D Test Statistic	0.596	**Anderson-Darling Gamma GOF Test**					
1576					5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level					
1577					K-S Test Statistic	0.26	**Kolmogorov-Smirnov Gamma GOF Test**					
1578					5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level					
1579	**Detected data appear Gamma Distributed at 5% Significance Level**											
1580												
1581	**Gamma Statistics**											
1582					k hat (MLE)	6.312	k star (bias corrected MLE)	4.282				
1583					Theta hat (MLE)	0.885	Theta star (bias corrected MLE)	1.305				
1584					nu hat (MLE)	113.6	nu star (bias corrected)	77.08				
1585					MLE Mean (bias corrected)	5.589	MLE Sd (bias corrected)	2.701				
1586							Approximate Chi Square Value (0.05)	57.86				
1587					Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	54.36				
1588												
1589	**Assuming Gamma Distribution**											
1590					95% Approximate Gamma UCL (use when n>=50))	7.446	95% Adjusted Gamma UCL (use when n<50)	7.925				
1591												
1592	**Lognormal GOF Test**											
1593					Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk Lognormal GOF Test**					
1594					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1595					Lilliefors Test Statistic	0.286	**Lilliefors Lognormal GOF Test**					
1596					5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level					
1597	**Data appear Approximate Lognormal at 5% Significance Level**											
1598												
1599	**Lognormal Statistics**											
1600					Minimum of Logged Data	0.788	Mean of logged Data	1.639				
1601					Maximum of Logged Data	2.303	SD of logged Data	0.45				
1602												
1603	**Assuming Lognormal Distribution**											
1604					95% H-UCL	8.076	90% Chebyshev (MVUE) UCL	8.203				
1605					95% Chebyshev (MVUE) UCL	9.366	97.5% Chebyshev (MVUE) UCL	10.98				
1606					99% Chebyshev (MVUE) UCL	14.15						
1607												
1608	**Nonparametric Distribution Free UCL Statistics**											
1609	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1610												
1611	**Nonparametric Distribution Free UCLs**											
1612					95% CLT UCL	6.811	95% Jackknife UCL	6.971				

1613				95% Standard Bootstrap UCL		6.753				95% Bootstrap-t UCL		7.006
1614				95% Hall's Bootstrap UCL		7.354				95% Percentile Bootstrap UCL		6.756
1615				95% BCA Bootstrap UCL		6.867						
1616				90% Chebyshev(Mean, Sd) UCL		7.818				95% Chebyshev(Mean, Sd) UCL		8.828
1617				97.5% Chebyshev(Mean, Sd) UCL		10.23				99% Chebyshev(Mean, Sd) UCL		12.98
1618												
1619					**Suggested UCL to Use**							
1620				95% Student's-t UCL		6.971						
1621												
1622					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1623					Recommendations are based upon data size, data distribution, and skewness.							
1624					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1625					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1626												
1627	**Nickel (smw12)**											
1628												
1629					**General Statistics**							
1630				Total Number of Observations		8				Number of Distinct Observations		8
1631				Number of Detects		7				Number of Non-Detects		1
1632				Number of Distinct Detects		7				Number of Distinct Non-Detects		1
1633				Minimum Detect		2				Minimum Non-Detect		5.3
1634				Maximum Detect		14.3				Maximum Non-Detect		5.3
1635				Variance Detects		18.06				Percent Non-Detects		12.5%
1636				Mean Detects		4.871				SD Detects		4.25
1637				Median Detects		3.4				CV Detects		0.872
1638				Skewness Detects		2.411				Kurtosis Detects		6.062
1639				Mean of Logged Detects		1.371				SD of Logged Detects		0.633
1640												
1641					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1642					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1643					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1644					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1645												
1646					**Normal GOF Test on Detects Only**							
1647				Shapiro Wilk Test Statistic		0.652				**Shapiro Wilk GOF Test**		
1648				5% Shapiro Wilk Critical Value		0.803				Detected Data Not Normal at 5% Significance Level		
1649				Lilliefors Test Statistic		0.392				**Lilliefors GOF Test**		
1650				5% Lilliefors Critical Value		0.304				Detected Data Not Normal at 5% Significance Level		
1651					**Detected Data Not Normal at 5% Significance Level**							
1652												
1653					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
1654				KM Mean		4.675				KM Standard Error of Mean		1.43
1655				KM SD		3.73				95% KM (BCA) UCL		7.363
1656				95% KM (t) UCL		7.385				95% KM (Percentile Bootstrap) UCL		7.188
1657				95% KM (z) UCL		7.028				95% KM Bootstrap t UCL		13.05
1658				90% KM Chebyshev UCL		8.966				95% KM Chebyshev UCL		10.91
1659				97.5% KM Chebyshev UCL		13.61				99% KM Chebyshev UCL		18.91
1660												
1661					**Gamma GOF Tests on Detected Observations Only**							
1662				A-D Test Statistic		0.751				**Anderson-Darling GOF Test**		
1663				5% A-D Critical Value		0.714				Detected Data Not Gamma Distributed at 5% Significance Level		
1664				K-S Test Statistic		0.322				**Kolmogorov-Smirnov GOF**		

1665				5% K-S Critical Value		0.314	Detected Data Not Gamma Distributed at 5% Significance Level					
1666	**Detected Data Not Gamma Distributed at 5% Significance Level**											
1667												
1668	**Gamma Statistics on Detected Data Only**											
1669				k hat (MLE)		2.51	k star (bias corrected MLE)					1.529
1670				Theta hat (MLE)		1.941	Theta star (bias corrected MLE)					3.185
1671				nu hat (MLE)		35.13	nu star (bias corrected)					21.41
1672				Mean (detects)		4.871						
1673												
1674	**Gamma ROS Statistics using Imputed Non-Detects**											
1675	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1676	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1677	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1678	This is especially true when the sample size is small.											
1679	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1680				Minimum		2	Mean					4.693
1681				Maximum		14.3	Median					3.421
1682				SD		3.967	CV					0.845
1683				k hat (MLE)		2.762	k star (bias corrected MLE)					1.81
1684				Theta hat (MLE)		1.699	Theta star (bias corrected MLE)					2.593
1685				nu hat (MLE)		44.2	nu star (bias corrected)					28.96
1686				Adjusted Level of Significance (β)		0.0195						
1687				Approximate Chi Square Value (28.96, α)		17.68	Adjusted Chi Square Value (28.96, β)					15.49
1688				95% Gamma Approximate UCL (use when n>=50)		7.688	95% Gamma Adjusted UCL (use when n<50)					8.774
1689												
1690	**Estimates of Gamma Parameters using KM Estimates**											
1691				Mean (KM)		4.675	SD (KM)					3.73
1692				Variance (KM)		13.91	SE of Mean (KM)					1.43
1693				k hat (KM)		1.571	k star (KM)					1.065
1694				nu hat (KM)		25.13	nu star (KM)					17.04
1695				theta hat (KM)		2.976	theta star (KM)					4.389
1696				80% gamma percentile (KM)		7.484	90% gamma percentile (KM)					10.6
1697				95% gamma percentile (KM)		13.7	99% gamma percentile (KM)					20.86
1698												
1699	**Gamma Kaplan-Meier (KM) Statistics**											
1700				Approximate Chi Square Value (17.04, α)		8.702	Adjusted Chi Square Value (17.04, β)					7.246
1701				95% Gamma Approximate KM-UCL (use when n>=50)		9.155	95% Gamma Adjusted KM-UCL (use when n<50)					10.99
1702												
1703	**Lognormal GOF Test on Detected Observations Only**											
1704				Shapiro Wilk Test Statistic		0.857	**Shapiro Wilk GOF Test**					
1705				5% Shapiro Wilk Critical Value		0.803	Detected Data appear Lognormal at 5% Significance Level					
1706				Lilliefors Test Statistic		0.274	**Lilliefors GOF Test**					
1707				5% Lilliefors Critical Value		0.304	Detected Data appear Lognormal at 5% Significance Level					
1708	**Detected Data appear Lognormal at 5% Significance Level**											
1709												
1710	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1711				Mean in Original Scale		4.689	Mean in Log Scale					1.353
1712				SD in Original Scale		3.968	SD in Log Scale					0.588
1713				95% t UCL (assumes normality of ROS data)		7.347	95% Percentile Bootstrap UCL					7.363
1714				95% BCA Bootstrap UCL		7.813	95% Bootstrap t UCL					13.93
1715				95% H-UCL (Log ROS)		8.044						
1716												

1717	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1718					KM Mean (logged)	1.344				KM Geo Mean	3.835	
1719					KM SD (logged)	0.562				95% Critical H Value (KM-Log)	2.462	
1720					KM Standard Error of Mean (logged)	0.218				95% H-UCL (KM -Log)	7.574	
1721					KM SD (logged)	0.562				95% Critical H Value (KM-Log)	2.462	
1722					KM Standard Error of Mean (logged)	0.218						
1723												
1724	**DL/2 Statistics**											
1725	**DL/2 Normal**						**DL/2 Log-Transformed**					
1726					Mean in Original Scale	4.594				Mean in Log Scale	1.322	
1727					SD in Original Scale	4.012				SD in Log Scale	0.603	
1728					95% t UCL (Assumes normality)	7.281				95% H-Stat UCL	8.017	
1729	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1730												
1731	**Nonparametric Distribution Free UCL Statistics**											
1732	**Detected Data appear Lognormal Distributed at 5% Significance Level**											
1733												
1734	**Suggested UCL to Use**											
1735					KM H-UCL	7.574						
1736												
1737	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1738	Recommendations are based upon data size, data distribution, and skewness.											
1739	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1740	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1741												
1742												
1743	**Nickel (smw13)**											
1744												
1745	**General Statistics**											
1746					Total Number of Observations	8				Number of Distinct Observations	8	
1747										Number of Missing Observations	0	
1748					Minimum	1.7				Mean	4.325	
1749					Maximum	8.5				Median	3.9	
1750					SD	2.073				Std. Error of Mean	0.733	
1751					Coefficient of Variation	0.479				Skewness	1.109	
1752												
1753	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1754	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1755	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1756	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1757												
1758	**Normal GOF Test**											
1759					Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**					
1760					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1761					Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**					
1762					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1763	**Data appear Normal at 5% Significance Level**											
1764												
1765	**Assuming Normal Distribution**											
1766	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1767					95% Student's-t UCL	5.714				95% Adjusted-CLT UCL (Chen-1995)	5.838	
1768										95% Modified-t UCL (Johnson-1978)	5.762	

	A	B	C	D	E	F	G	H	I	J	K	L
1769												
1770	**Gamma GOF Test**											
1771	A-D Test Statistic					0.19	**Anderson-Darling Gamma GOF Test**					
1772	5% A-D Critical Value					0.719	Detected data appear Gamma Distributed at 5% Significance Level					
1773	K-S Test Statistic					0.137	**Kolmogorov-Smirnov Gamma GOF Test**					
1774	5% K-S Critical Value					0.295	Detected data appear Gamma Distributed at 5% Significance Level					
1775	**Detected data appear Gamma Distributed at 5% Significance Level**											
1776												
1777	**Gamma Statistics**											
1778	k hat (MLE)					5.231	k star (bias corrected MLE)					3.352
1779	Theta hat (MLE)					0.827	Theta star (bias corrected MLE)					1.29
1780	nu hat (MLE)					83.69	nu star (bias corrected)					53.64
1781	MLE Mean (bias corrected)					4.325	MLE Sd (bias corrected)					2.362
1782							Approximate Chi Square Value (0.05)					37.81
1783	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					34.48
1784												
1785	**Assuming Gamma Distribution**											
1786	95% Approximate Gamma UCL (use when n>=50))					6.135	95% Adjusted Gamma UCL (use when n<50)					6.728
1787												
1788	**Lognormal GOF Test**											
1789	Shapiro Wilk Test Statistic					0.982	**Shapiro Wilk Lognormal GOF Test**					
1790	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1791	Lilliefors Test Statistic					0.164	**Lilliefors Lognormal GOF Test**					
1792	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
1793	**Data appear Lognormal at 5% Significance Level**											
1794												
1795	**Lognormal Statistics**											
1796	Minimum of Logged Data					0.531	Mean of logged Data					1.366
1797	Maximum of Logged Data					2.14	SD of logged Data					0.481
1798												
1799	**Assuming Lognormal Distribution**											
1800	95% H-UCL					6.709	90% Chebyshev (MVUE) UCL					6.561
1801	95% Chebyshev (MVUE) UCL					7.572	97.5% Chebyshev (MVUE) UCL					8.974
1802	99% Chebyshev (MVUE) UCL					11.73						
1803												
1804	**Nonparametric Distribution Free UCL Statistics**											
1805	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1806												
1807	**Nonparametric Distribution Free UCLs**											
1808	95% CLT UCL					5.531	95% Jackknife UCL					5.714
1809	95% Standard Bootstrap UCL					5.462	95% Bootstrap-t UCL					6.314
1810	95% Hall's Bootstrap UCL					6.943	95% Percentile Bootstrap UCL					5.563
1811	95% BCA Bootstrap UCL					5.738						
1812	90% Chebyshev(Mean, Sd) UCL					6.524	95% Chebyshev(Mean, Sd) UCL					7.52
1813	97.5% Chebyshev(Mean, Sd) UCL					8.903	99% Chebyshev(Mean, Sd) UCL					11.62
1814												
1815	**Suggested UCL to Use**											
1816	95% Student's-t UCL					5.714						
1817												
1818	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1819	Recommendations are based upon data size, data distribution, and skewness.											
1820	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

	A	B	C	D	E	F	G	H	I	J	K	L
1821	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1822												
1823												
1824	**Nickel (smw14)**											
1825												
1826	**General Statistics**											
1827	Total Number of Observations					8	Number of Distinct Observations					8
1828							Number of Missing Observations					0
1829	Minimum					2.2	Mean					3.488
1830	Maximum					4.8	Median					3.5
1831	SD					0.813	Std. Error of Mean					0.288
1832	Coefficient of Variation					0.233	Skewness					0.0484
1833												
1834	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1835	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1836	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1837	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1838												
1839	**Normal GOF Test**											
1840	Shapiro Wilk Test Statistic					0.998	**Shapiro Wilk GOF Test**					
1841	5% Shapiro Wilk Critical Value					0.818	Data appear Normal at 5% Significance Level					
1842	Lilliefors Test Statistic					0.1	**Lilliefors GOF Test**					
1843	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
1844	**Data appear Normal at 5% Significance Level**											
1845												
1846	**Assuming Normal Distribution**											
1847	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1848	95% Student's-t UCL					4.032	95% Adjusted-CLT UCL (Chen-1995)					3.966
1849							95% Modified-t UCL (Johnson-1978)					4.033
1850												
1851	**Gamma GOF Test**											
1852	A-D Test Statistic					0.128	**Anderson-Darling Gamma GOF Test**					
1853	5% A-D Critical Value					0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1854	K-S Test Statistic					0.109	**Kolmogorov-Smirnov Gamma GOF Test**					
1855	5% K-S Critical Value					0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1856	**Detected data appear Gamma Distributed at 5% Significance Level**											
1857												
1858	**Gamma Statistics**											
1859	k hat (MLE)					20.11	k star (bias corrected MLE)					12.65
1860	Theta hat (MLE)					0.173	Theta star (bias corrected MLE)					0.276
1861	nu hat (MLE)					321.7	nu star (bias corrected)					202.4
1862	MLE Mean (bias corrected)					3.488	MLE Sd (bias corrected)					0.981
1863							Approximate Chi Square Value (0.05)					170.5
1864	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					163.1
1865												
1866	**Assuming Gamma Distribution**											
1867	95% Approximate Gamma UCL (use when n>=50))					4.14	95% Adjusted Gamma UCL (use when n<50)					4.329
1868												
1869	**Lognormal GOF Test**											
1870	Shapiro Wilk Test Statistic					0.984	**Shapiro Wilk Lognormal GOF Test**					
1871	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1872	Lilliefors Test Statistic					0.124	**Lilliefors Lognormal GOF Test**					

1873				5% Lilliefors Critical Value		0.283		Data appear Lognormal at 5% Significance Level				
1874	**Data appear Lognormal at 5% Significance Level**											
1875												
1876	**Lognormal Statistics**											
1877				Minimum of Logged Data		0.788		Mean of logged Data				1.224
1878				Maximum of Logged Data		1.569		SD of logged Data				0.243
1879												
1880	**Assuming Lognormal Distribution**											
1881				95% H-UCL		4.208		90% Chebyshev (MVUE) UCL				4.394
1882				95% Chebyshev (MVUE) UCL		4.803		97.5% Chebyshev (MVUE) UCL				5.372
1883				99% Chebyshev (MVUE) UCL		6.488						
1884												
1885	**Nonparametric Distribution Free UCL Statistics**											
1886	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1887												
1888	**Nonparametric Distribution Free UCLs**											
1889				95% CLT UCL		3.96		95% Jackknife UCL				4.032
1890				95% Standard Bootstrap UCL		3.921		95% Bootstrap-t UCL				4.01
1891				95% Hall's Bootstrap UCL		4.044		95% Percentile Bootstrap UCL				3.95
1892				95% BCA Bootstrap UCL		3.925						
1893				90% Chebyshev(Mean, Sd) UCL		4.35		95% Chebyshev(Mean, Sd) UCL				4.741
1894				97.5% Chebyshev(Mean, Sd) UCL		5.283		99% Chebyshev(Mean, Sd) UCL				6.348
1895												
1896	**Suggested UCL to Use**											
1897				95% Student's-t UCL		4.032						
1898												
1899	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1900	Recommendations are based upon data size, data distribution, and skewness.											
1901	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1902	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1903												
1904												
1905	**Nickel (smw15)**											
1906												
1907	**General Statistics**											
1908				Total Number of Observations		9		Number of Distinct Observations				9
1909								Number of Missing Observations				0
1910				Minimum		5		Mean				89.74
1911				Maximum		260		Median				66
1912				SD		89.48		Std. Error of Mean				29.83
1913				Coefficient of Variation		0.997		Skewness				1.289
1914												
1915	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1916	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1917	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1918	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1919												
1920	**Normal GOF Test**											
1921				Shapiro Wilk Test Statistic		0.802		**Shapiro Wilk GOF Test**				
1922				5% Shapiro Wilk Critical Value		0.829		Data Not Normal at 5% Significance Level				
1923				Lilliefors Test Statistic		0.342		**Lilliefors GOF Test**				
1924				5% Lilliefors Critical Value		0.274		Data Not Normal at 5% Significance Level				

1925	**Data Not Normal at 5% Significance Level**											
1926												
1927	**Assuming Normal Distribution**											
1928	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1929	95% Student's-t UCL				145.2		95% Adjusted-CLT UCL (Chen-1995)				152.5	
1930							95% Modified-t UCL (Johnson-1978)				147.3	
1931												
1932	**Gamma GOF Test**											
1933	A-D Test Statistic				0.46		**Anderson-Darling Gamma GOF Test**					
1934	5% A-D Critical Value				0.745		Detected data appear Gamma Distributed at 5% Significance Level					
1935	K-S Test Statistic				0.206		**Kolmogorov-Smirnov Gamma GOF Test**					
1936	5% K-S Critical Value				0.287		Detected data appear Gamma Distributed at 5% Significance Level					
1937	**Detected data appear Gamma Distributed at 5% Significance Level**											
1938												
1939	**Gamma Statistics**											
1940	k hat (MLE)				0.96		k star (bias corrected MLE)				0.714	
1941	Theta hat (MLE)				93.45		Theta star (bias corrected MLE)				125.6	
1942	nu hat (MLE)				17.29		nu star (bias corrected)				12.86	
1943	MLE Mean (bias corrected)				89.74		MLE Sd (bias corrected)				106.2	
1944							Approximate Chi Square Value (0.05)				5.797	
1945	Adjusted Level of Significance				0.0231		Adjusted Chi Square Value				4.835	
1946												
1947	**Assuming Gamma Distribution**											
1948	95% Approximate Gamma UCL (use when n>=50)				199		95% Adjusted Gamma UCL (use when n<50)				238.7	
1949												
1950	**Lognormal GOF Test**											
1951	Shapiro Wilk Test Statistic				0.871		**Shapiro Wilk Lognormal GOF Test**					
1952	5% Shapiro Wilk Critical Value				0.829		Data appear Lognormal at 5% Significance Level					
1953	Lilliefors Test Statistic				0.249		**Lilliefors Lognormal GOF Test**					
1954	5% Lilliefors Critical Value				0.274		Data appear Lognormal at 5% Significance Level					
1955	**Data appear Lognormal at 5% Significance Level**											
1956												
1957	**Lognormal Statistics**											
1958	Minimum of Logged Data				1.609		Mean of logged Data				3.893	
1959	Maximum of Logged Data				5.561		SD of logged Data				1.368	
1960												
1961	**Assuming Lognormal Distribution**											
1962	95% H-UCL				913.5		90% Chebyshev (MVUE) UCL				257.2	
1963	95% Chebyshev (MVUE) UCL				325.5		97.5% Chebyshev (MVUE) UCL				420.3	
1964	99% Chebyshev (MVUE) UCL				606.6							
1965												
1966	**Nonparametric Distribution Free UCL Statistics**											
1967	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1968												
1969	**Nonparametric Distribution Free UCLs**											
1970	95% CLT UCL				138.8		95% Jackknife UCL				145.2	
1971	95% Standard Bootstrap UCL				134.7		95% Bootstrap-t UCL				225.7	
1972	95% Hall's Bootstrap UCL				549		95% Percentile Bootstrap UCL				141.1	
1973	95% BCA Bootstrap UCL				147.6							
1974	90% Chebyshev(Mean, Sd) UCL				179.2		95% Chebyshev(Mean, Sd) UCL				219.8	
1975	97.5% Chebyshev(Mean, Sd) UCL				276		99% Chebyshev(Mean, Sd) UCL				386.5	
1976												

1977	**Suggested UCL to Use**											
1978					95% Adjusted Gamma UCL	238.7						
1979												
1980	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1981	Recommendations are based upon data size, data distribution, and skewness.											
1982	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1983	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1984												
1985												
1986	**Nickel (smw16)**											
1987												
1988	**General Statistics**											
1989					Total Number of Observations	9			Number of Distinct Observations	9		
1990									Number of Missing Observations	0		
1991					Minimum	5.4			Mean	10.8		
1992					Maximum	18.4			Median	10.1		
1993					SD	3.674			Std. Error of Mean	1.225		
1994					Coefficient of Variation	0.34			Skewness	0.867		
1995												
1996	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1997	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1998	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1999	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2000												
2001	**Normal GOF Test**											
2002					Shapiro Wilk Test Statistic	0.949			**Shapiro Wilk GOF Test**			
2003					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
2004					Lilliefors Test Statistic	0.156			**Lilliefors GOF Test**			
2005					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
2006	**Data appear Normal at 5% Significance Level**											
2007												
2008	**Assuming Normal Distribution**											
2009					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
2010					95% Student's-t UCL	13.08			95% Adjusted-CLT UCL (Chen-1995)	13.19		
2011									95% Modified-t UCL (Johnson-1978)	13.14		
2012												
2013	**Gamma GOF Test**											
2014					A-D Test Statistic	0.202			**Anderson-Darling Gamma GOF Test**			
2015					5% A-D Critical Value	0.722			Detected data appear Gamma Distributed at 5% Significance Level			
2016					K-S Test Statistic	0.128			**Kolmogorov-Smirnov Gamma GOF Test**			
2017					5% K-S Critical Value	0.279			Detected data appear Gamma Distributed at 5% Significance Level			
2018	**Detected data appear Gamma Distributed at 5% Significance Level**											
2019												
2020	**Gamma Statistics**											
2021					k hat (MLE)	9.929			k star (bias corrected MLE)	6.694		
2022					Theta hat (MLE)	1.088			Theta star (bias corrected MLE)	1.613		
2023					nu hat (MLE)	178.7			nu star (bias corrected)	120.5		
2024					MLE Mean (bias corrected)	10.8			MLE Sd (bias corrected)	4.174		
2025									Approximate Chi Square Value (0.05)	96.14		
2026					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	91.56		
2027												
2028	**Assuming Gamma Distribution**											

2029	95% Approximate Gamma UCL (use when n>=50))					13.54	95% Adjusted Gamma UCL (use when n<50)					14.21
2030												
2031	**Lognormal GOF Test**											
2032	Shapiro Wilk Test Statistic					0.977	**Shapiro Wilk Lognormal GOF Test**					
2033	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
2034	Lilliefors Test Statistic					0.153	**Lilliefors Lognormal GOF Test**					
2035	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
2036	**Data appear Lognormal at 5% Significance Level**											
2037												
2038	**Lognormal Statistics**											
2039	Minimum of Logged Data					1.686	Mean of logged Data					2.328
2040	Maximum of Logged Data					2.912	SD of logged Data					0.343
2041												
2042	**Assuming Lognormal Distribution**											
2043	95% H-UCL					13.98	90% Chebyshev (MVUE) UCL					14.55
2044	95% Chebyshev (MVUE) UCL					16.24	97.5% Chebyshev (MVUE) UCL					18.59
2045	99% Chebyshev (MVUE) UCL					23.21						
2046												
2047	**Nonparametric Distribution Free UCL Statistics**											
2048	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2049												
2050	**Nonparametric Distribution Free UCLs**											
2051	95% CLT UCL					12.81	95% Jackknife UCL					13.08
2052	95% Standard Bootstrap UCL					12.68	95% Bootstrap-t UCL					13.84
2053	95% Hall's Bootstrap UCL					15.3	95% Percentile Bootstrap UCL					12.86
2054	95% BCA Bootstrap UCL					13.04						
2055	90% Chebyshev(Mean, Sd) UCL					14.47	95% Chebyshev(Mean, Sd) UCL					16.14
2056	97.5% Chebyshev(Mean, Sd) UCL					18.45	99% Chebyshev(Mean, Sd) UCL					22.99
2057												
2058	**Suggested UCL to Use**											
2059	95% Student's-t UCL					13.08						
2060												
2061	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2062	Recommendations are based upon data size, data distribution, and skewness.											
2063	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2064	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2065												
2066	**Nickel (smw16d)**											
2067												
2068	**General Statistics**											
2069	Total Number of Observations					8	Number of Distinct Observations					6
2070	Number of Detects					6	Number of Non-Detects					2
2071	Number of Distinct Detects					4	Number of Distinct Non-Detects					2
2072	Minimum Detect					1.1	Minimum Non-Detect					2.1
2073	Maximum Detect					1.7	Maximum Non-Detect					5.3
2074	Variance Detects					0.063	Percent Non-Detects					25%
2075	Mean Detects					1.45	SD Detects					0.251
2076	Median Detects					1.5	CV Detects					0.173
2077	Skewness Detects					-0.512	Kurtosis Detects					-1.534
2078	Mean of Logged Detects					0.358	SD of Logged Detects					0.181
2079												
2080	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											

	A	B	C	D	E	F	G	H	I	J	K	L
2081	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
2082	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
2083	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
2084												
2085	Normal GOF Test on Detects Only											
2086					Shapiro Wilk Test Statistic	0.879	Shapiro Wilk GOF Test					
2087					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
2088					Lilliefors Test Statistic	0.246	Lilliefors GOF Test					
2089					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
2090	Detected Data appear Normal at 5% Significance Level											
2091												
2092	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
2093					KM Mean	1.45	KM Standard Error of Mean	0.102				
2094					KM SD	0.229	95% KM (BCA) UCL	N/A				
2095					95% KM (t) UCL	1.644	95% KM (Percentile Bootstrap) UCL	N/A				
2096					95% KM (z) UCL	1.619	95% KM Bootstrap t UCL	N/A				
2097					90% KM Chebyshev UCL	1.757	95% KM Chebyshev UCL	1.897				
2098					97.5% KM Chebyshev UCL	2.09	99% KM Chebyshev UCL	2.47				
2099												
2100	Gamma GOF Tests on Detected Observations Only											
2101					A-D Test Statistic	0.461	Anderson-Darling GOF Test					
2102					5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level					
2103					K-S Test Statistic	0.271	Kolmogorov-Smirnov GOF					
2104					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
2105	Detected data appear Gamma Distributed at 5% Significance Level											
2106												
2107	Gamma Statistics on Detected Data Only											
2108					k hat (MLE)	37.87	k star (bias corrected MLE)	19.05				
2109					Theta hat (MLE)	0.0383	Theta star (bias corrected MLE)	0.0761				
2110					nu hat (MLE)	454.5	nu star (bias corrected)	228.6				
2111					Mean (detects)	1.45						
2112												
2113	Gamma ROS Statistics using Imputed Non-Detects											
2114	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2115	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2116	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2117	This is especially true when the sample size is small.											
2118	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2119					Minimum	1.1	Mean	1.448				
2120					Maximum	1.7	Median	1.471				
2121					SD	0.212	CV	0.147				
2122					k hat (MLE)	50.43	k star (bias corrected MLE)	31.6				
2123					Theta hat (MLE)	0.0287	Theta star (bias corrected MLE)	0.0458				
2124					nu hat (MLE)	806.8	nu star (bias corrected)	505.6				
2125					Adjusted Level of Significance (β)	0.0195						
2126					Approximate Chi Square Value (505.59, α)	454.4	Adjusted Chi Square Value (505.59, β)	442.1				
2127					95% Gamma Approximate UCL (use when n>=50)	1.611	95% Gamma Adjusted UCL (use when n<50)	1.656				
2128												
2129	Estimates of Gamma Parameters using KM Estimates											
2130					Mean (KM)	1.45	SD (KM)	0.229				
2131					Variance (KM)	0.0525	SE of Mean (KM)	0.102				
2132					k hat (KM)	40.05	k star (KM)	25.11				

	A	B	C	D	E	F	G	H	I	J	K	L
2133					nu hat (KM)	640.8				nu star (KM)		401.8
2134					theta hat (KM)	0.0362				theta star (KM)		0.0577
2135					80% gamma percentile (KM)	1.686				90% gamma percentile (KM)		1.831
2136					95% gamma percentile (KM)	1.956				99% gamma percentile (KM)		2.207
2137												
2138					**Gamma Kaplan-Meier (KM) Statistics**							
2139					Approximate Chi Square Value (401.81, α)	356.3				Adjusted Chi Square Value (401.81, β)		345.5
2140					95% Gamma Approximate KM-UCL (use when n>=50)	1.635				95% Gamma Adjusted KM-UCL (use when n<50)		1.686
2141												
2142					**Lognormal GOF Test on Detected Observations Only**							
2143					Shapiro Wilk Test Statistic	0.87				**Shapiro Wilk GOF Test**		
2144					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
2145					Lilliefors Test Statistic	0.269				**Lilliefors GOF Test**		
2146					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
2147					**Detected Data appear Lognormal at 5% Significance Level**							
2148												
2149					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2150					Mean in Original Scale	1.445				Mean in Log Scale		0.358
2151					SD in Original Scale	0.212				SD in Log Scale		0.153
2152					95% t UCL (assumes normality of ROS data)	1.587				95% Percentile Bootstrap UCL		1.558
2153					95% BCA Bootstrap UCL	1.554				95% Bootstrap t UCL		1.568
2154					95% H-UCL (Log ROS)	1.616						
2155												
2156					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2157					KM Mean (logged)	0.358				KM Geo Mean		1.431
2158					KM SD (logged)	0.165				95% Critical H Value (KM-Log)		1.908
2159					KM Standard Error of Mean (logged)	0.0739				95% H-UCL (KM -Log)		1.634
2160					KM SD (logged)	0.165				95% Critical H Value (KM-Log)		1.908
2161					KM Standard Error of Mean (logged)	0.0739						
2162												
2163					**DL/2 Statistics**							
2164					**DL/2 Normal**					**DL/2 Log-Transformed**		
2165					Mean in Original Scale	1.55				Mean in Log Scale		0.397
2166					SD in Original Scale	0.512				SD in Log Scale		0.299
2167					95% t UCL (Assumes normality)	1.893				95% H-Stat UCL		1.963
2168					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2169												
2170					**Nonparametric Distribution Free UCL Statistics**							
2171					**Detected Data appear Normal Distributed at 5% Significance Level**							
2172												
2173					**Suggested UCL to Use**							
2174					95% KM (t) UCL	1.644						
2175												
2176					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2177					Recommendations are based upon data size, data distribution, and skewness.							
2178					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2179					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2180												
2181												
2182	**Nickel (smw17)**											
2183												
2184					**General Statistics**							

2185					Total Number of Observations	8					Number of Distinct Observations	8
2186											Number of Missing Observations	0
2187					Minimum	5.8					Mean	10.25
2188					Maximum	11.8					Median	10.9
2189					SD	2.02					Std. Error of Mean	0.714
2190					Coefficient of Variation	0.197					Skewness	-1.855
2191												
2192	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2193	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2194	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2195	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2196												
2197	**Normal GOF Test**											
2198					Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk GOF Test**					
2199					5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level					
2200					Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**					
2201					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
2202	**Data appear Approximate Normal at 5% Significance Level**											
2203												
2204	**Assuming Normal Distribution**											
2205	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2206					95% Student's-t UCL	11.6					95% Adjusted-CLT UCL (Chen-1995)	10.92
2207											95% Modified-t UCL (Johnson-1978)	11.52
2208												
2209	**Gamma GOF Test**											
2210					A-D Test Statistic	0.927	**Anderson-Darling Gamma GOF Test**					
2211					5% A-D Critical Value	0.716	Data Not Gamma Distributed at 5% Significance Level					
2212					K-S Test Statistic	0.287	**Kolmogorov-Smirnov Gamma GOF Test**					
2213					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
2214	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
2215												
2216	**Gamma Statistics**											
2217					k hat (MLE)	23.04					k star (bias corrected MLE)	14.48
2218					Theta hat (MLE)	0.445					Theta star (bias corrected MLE)	0.708
2219					nu hat (MLE)	368.7					nu star (bias corrected)	231.7
2220					MLE Mean (bias corrected)	10.25					MLE Sd (bias corrected)	2.693
2221											Approximate Chi Square Value (0.05)	197.5
2222					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	189.5
2223												
2224	**Assuming Gamma Distribution**											
2225					95% Approximate Gamma UCL (use when n>=50))	12.03					95% Adjusted Gamma UCL (use when n<50)	12.54
2226												
2227	**Lognormal GOF Test**											
2228					Shapiro Wilk Test Statistic	0.719	**Shapiro Wilk Lognormal GOF Test**					
2229					5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level					
2230					Lilliefors Test Statistic	0.295	**Lilliefors Lognormal GOF Test**					
2231					5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level					
2232	**Data Not Lognormal at 5% Significance Level**											
2233												
2234	**Lognormal Statistics**											
2235					Minimum of Logged Data	1.758					Mean of logged Data	2.305
2236					Maximum of Logged Data	2.468					SD of logged Data	0.238

	A	B	C	D	E	F	G	H	I	J	K	L
2237												
2238	**Assuming Lognormal Distribution**											
2239					95% H-UCL	12.34			90% Chebyshev (MVUE) UCL			12.89
2240					95% Chebyshev (MVUE) UCL	14.07			97.5% Chebyshev (MVUE) UCL			15.7
2241					99% Chebyshev (MVUE) UCL	18.92						
2242												
2243	**Nonparametric Distribution Free UCL Statistics**											
2244	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2245												
2246	**Nonparametric Distribution Free UCLs**											
2247					95% CLT UCL	11.42			95% Jackknife UCL			11.6
2248					95% Standard Bootstrap UCL	11.34			95% Bootstrap-t UCL			11.24
2249					95% Hall's Bootstrap UCL	11.03			95% Percentile Bootstrap UCL			11.26
2250					95% BCA Bootstrap UCL	11.09						
2251					90% Chebyshev(Mean, Sd) UCL	12.39			95% Chebyshev(Mean, Sd) UCL			13.36
2252					97.5% Chebyshev(Mean, Sd) UCL	14.71			99% Chebyshev(Mean, Sd) UCL			17.36
2253												
2254	**Suggested UCL to Use**											
2255					95% Student's-t UCL	11.6						
2256												
2257	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2258	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2259												
2260	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2261	Recommendations are based upon data size, data distribution, and skewness.											
2262	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2263	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2264												
2265	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
2266	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
2267												
2268	**Nickel (smw17d)**											
2269												
2270	**General Statistics**											
2271					Total Number of Observations	8			Number of Distinct Observations			7
2272					Number of Detects	7			Number of Non-Detects			1
2273					Number of Distinct Detects	6			Number of Distinct Non-Detects			1
2274					Minimum Detect	0.75			Minimum Non-Detect			5.3
2275					Maximum Detect	4.2			Maximum Non-Detect			5.3
2276					Variance Detects	1.747			Percent Non-Detects			12.5%
2277					Mean Detects	1.664			SD Detects			1.322
2278					Median Detects	0.98			CV Detects			0.794
2279					Skewness Detects	1.581			Kurtosis Detects			1.433
2280					Mean of Logged Detects	0.295			SD of Logged Detects			0.661
2281												
2282	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2283	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2284	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2285	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2286												
2287	**Normal GOF Test on Detects Only**											
2288					Shapiro Wilk Test Statistic	0.722			**Shapiro Wilk GOF Test**			

	A	B	C	D	E	F	G	H	I	J	K	L
2289	5% Shapiro Wilk Critical Value					0.803	Detected Data Not Normal at 5% Significance Level					
2290	Lilliefors Test Statistic					0.38	**Lilliefors GOF Test**					
2291	5% Lilliefors Critical Value					0.304	Detected Data Not Normal at 5% Significance Level					
2292	**Detected Data Not Normal at 5% Significance Level**											
2293												
2294	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2295	KM Mean					1.664	KM Standard Error of Mean					0.5
2296	KM SD					1.224	95% KM (BCA) UCL					2.489
2297	95% KM (t) UCL					2.611	95% KM (Percentile Bootstrap) UCL					2.528
2298	95% KM (z) UCL					2.486	95% KM Bootstrap t UCL					10.42
2299	90% KM Chebyshev UCL					3.163	95% KM Chebyshev UCL					3.842
2300	97.5% KM Chebyshev UCL					4.784	99% KM Chebyshev UCL					6.635
2301												
2302	**Gamma GOF Tests on Detected Observations Only**											
2303	A-D Test Statistic					0.914	**Anderson-Darling GOF Test**					
2304	5% A-D Critical Value					0.714	Detected Data Not Gamma Distributed at 5% Significance Level					
2305	K-S Test Statistic					0.366	**Kolmogorov-Smirnov GOF**					
2306	5% K-S Critical Value					0.314	Detected Data Not Gamma Distributed at 5% Significance Level					
2307	**Detected Data Not Gamma Distributed at 5% Significance Level**											
2308												
2309	**Gamma Statistics on Detected Data Only**											
2310	k hat (MLE)					2.484	k star (bias corrected MLE)					1.515
2311	Theta hat (MLE)					0.67	Theta star (bias corrected MLE)					1.099
2312	nu hat (MLE)					34.77	nu star (bias corrected)					21.2
2313	Mean (detects)					1.664						
2314												
2315	**Gamma ROS Statistics using Imputed Non-Detects**											
2316	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2317	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2318	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2319	This is especially true when the sample size is small.											
2320	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2321	Minimum					0.75	Mean					1.642
2322	Maximum					4.2	Median					1.04
2323	SD					1.225	CV					0.746
2324	k hat (MLE)					2.808	k star (bias corrected MLE)					1.839
2325	Theta hat (MLE)					0.585	Theta star (bias corrected MLE)					0.893
2326	nu hat (MLE)					44.93	nu star (bias corrected)					29.42
2327	Adjusted Level of Significance (β)					0.0195						
2328	Approximate Chi Square Value (29.42, α)					18.04	Adjusted Chi Square Value (29.42, β)					15.82
2329	95% Gamma Approximate UCL (use when n>=50)					2.678	95% Gamma Adjusted UCL (use when n<50)					3.052
2330												
2331	**Estimates of Gamma Parameters using KM Estimates**											
2332	Mean (KM)					1.664	SD (KM)					1.224
2333	Variance (KM)					1.497	SE of Mean (KM)					0.5
2334	k hat (KM)					1.85	k star (KM)					1.24
2335	nu hat (KM)					29.6	nu star (KM)					19.83
2336	theta hat (KM)					0.9	theta star (KM)					1.343
2337	80% gamma percentile (KM)					2.627	90% gamma percentile (KM)					3.634
2338	95% gamma percentile (KM)					4.625	99% gamma percentile (KM)					6.892
2339												
2340	**Gamma Kaplan-Meier (KM) Statistics**											

2341	Approximate Chi Square Value (19.83, α)					10.73	Adjusted Chi Square Value (19.83, β)					9.084
2342	95% Gamma Approximate KM-UCL (use when n>=50)					3.077	95% Gamma Adjusted KM-UCL (use when n<50)					3.634
2343												
2344	**Lognormal GOF Test on Detected Observations Only**											
2345	Shapiro Wilk Test Statistic					0.792	**Shapiro Wilk GOF Test**					
2346	5% Shapiro Wilk Critical Value					0.803	Detected Data Not Lognormal at 5% Significance Level					
2347	Lilliefors Test Statistic					0.333	**Lilliefors GOF Test**					
2348	5% Lilliefors Critical Value					0.304	Detected Data Not Lognormal at 5% Significance Level					
2349	**Detected Data Not Lognormal at 5% Significance Level**											
2350												
2351	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2352	Mean in Original Scale					1.624	Mean in Log Scale					0.295
2353	SD in Original Scale					1.229	SD in Log Scale					0.612
2354	95% t UCL (assumes normality of ROS data)					2.447	95% Percentile Bootstrap UCL					2.306
2355	95% BCA Bootstrap UCL					2.576	95% Bootstrap t UCL					5.764
2356	95% H-UCL (Log ROS)					2.925						
2357												
2358	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2359	KM Mean (logged)					0.295	KM Geo Mean					1.343
2360	KM SD (logged)					0.612	95% Critical H Value (KM-Log)					2.557
2361	KM Standard Error of Mean (logged)					0.25	95% H-UCL (KM -Log)					2.925
2362	KM SD (logged)					0.612	95% Critical H Value (KM-Log)					2.557
2363	KM Standard Error of Mean (logged)					0.25						
2364												
2365	**DL/2 Statistics**											
2366	**DL/2 Normal**						**DL/2 Log-Transformed**					
2367	Mean in Original Scale					1.788	Mean in Log Scale					0.38
2368	SD in Original Scale					1.272	SD in Log Scale					0.657
2369	95% t UCL (Assumes normality)					2.64	95% H-Stat UCL					3.503
2370	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2371												
2372	**Nonparametric Distribution Free UCL Statistics**											
2373	**Data do not follow a Discernible Distribution at 5% Significance Level**											
2374												
2375	**Suggested UCL to Use**											
2376	95% KM (Chebyshev) UCL					3.842						
2377												
2378	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2379	Recommendations are based upon data size, data distribution, and skewness.											
2380	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2381	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2382												
2383	**Nickel (smw18)**											
2384												
2385	**General Statistics**											
2386	Total Number of Observations					8	Number of Distinct Observations					8
2387	Number of Detects					7	Number of Non-Detects					1
2388	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
2389	Minimum Detect					1.8	Minimum Non-Detect					5.3
2390	Maximum Detect					34.7	Maximum Non-Detect					5.3
2391	Variance Detects					143.2	Percent Non-Detects					12.5%
2392	Mean Detects					7.671	SD Detects					11.97

2393					Median Detects	3.4					CV Detects	1.56
2394					Skewness Detects	2.602					Kurtosis Detects	6.821
2395					Mean of Logged Detects	1.446					SD of Logged Detects	0.986
2396												
2397					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2398					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2399					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2400					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2401												
2402					**Normal GOF Test on Detects Only**							
2403					Shapiro Wilk Test Statistic	0.537	**Shapiro Wilk GOF Test**					
2404					5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level					
2405					Lilliefors Test Statistic	0.442	**Lilliefors GOF Test**					
2406					5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level					
2407					**Detected Data Not Normal at 5% Significance Level**							
2408												
2409					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
2410					KM Mean	7.108	KM Standard Error of Mean	4.004				
2411					KM SD	10.48	95% KM (BCA) UCL	14.89				
2412					95% KM (t) UCL	14.69	95% KM (Percentile Bootstrap) UCL	14.91				
2413					95% KM (z) UCL	13.69	95% KM Bootstrap t UCL	71.37				
2414					90% KM Chebyshev UCL	19.12	95% KM Chebyshev UCL	24.56				
2415					97.5% KM Chebyshev UCL	32.11	99% KM Chebyshev UCL	46.95				
2416												
2417					**Gamma GOF Tests on Detected Observations Only**							
2418					A-D Test Statistic	1.151	**Anderson-Darling GOF Test**					
2419					5% A-D Critical Value	0.728	Detected Data Not Gamma Distributed at 5% Significance Level					
2420					K-S Test Statistic	0.368	**Kolmogorov-Smirnov GOF**					
2421					5% K-S Critical Value	0.32	Detected Data Not Gamma Distributed at 5% Significance Level					
2422					**Detected Data Not Gamma Distributed at 5% Significance Level**							
2423												
2424					**Gamma Statistics on Detected Data Only**							
2425					k hat (MLE)	0.978	k star (bias corrected MLE)	0.654				
2426					Theta hat (MLE)	7.842	Theta star (bias corrected MLE)	11.73				
2427					nu hat (MLE)	13.7	nu star (bias corrected)	9.16				
2428					Mean (detects)	7.671						
2429												
2430					**Gamma ROS Statistics using Imputed Non-Detects**							
2431					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2432					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2433					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2434					This is especially true when the sample size is small.							
2435					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2436					Minimum	1.8	Mean	7.082				
2437					Maximum	34.7	Median	3.179				
2438					SD	11.2	CV	1.582				
2439					k hat (MLE)	1.033	k star (bias corrected MLE)	0.729				
2440					Theta hat (MLE)	6.858	Theta star (bias corrected MLE)	9.718				
2441					nu hat (MLE)	16.52	nu star (bias corrected)	11.66				
2442					Adjusted Level of Significance (β)	0.0195						
2443					Approximate Chi Square Value (11.66, α)	5.004	Adjusted Chi Square Value (11.66, β)	3.959				
2444					95% Gamma Approximate UCL (use when n>=50)	16.5	95% Gamma Adjusted UCL (use when n<50)	20.86				

	A	B	C	D	E	F	G	H	I	J	K	L
2445												
2446	**Estimates of Gamma Parameters using KM Estimates**											
2447					Mean (KM)	7.108				SD (KM)	10.48	
2448					Variance (KM)	109.8				SE of Mean (KM)	4.004	
2449					k hat (KM)	0.46				k star (KM)	0.371	
2450					nu hat (KM)	7.366				nu star (KM)	5.937	
2451					theta hat (KM)	15.44				theta star (KM)	19.16	
2452					80% gamma percentile (KM)	11.36				90% gamma percentile (KM)	20.34	
2453					95% gamma percentile (KM)	30.31				99% gamma percentile (KM)	55.58	
2454												
2455	**Gamma Kaplan-Meier (KM) Statistics**											
2456					Approximate Chi Square Value (5.94, α)	1.608				Adjusted Chi Square Value (5.94, β)	1.106	
2457					95% Gamma Approximate KM-UCL (use when n>=50)	26.25				95% Gamma Adjusted KM-UCL (use when n<50)	38.17	
2458												
2459	**Lognormal GOF Test on Detected Observations Only**											
2460					Shapiro Wilk Test Statistic	0.777				**Shapiro Wilk GOF Test**		
2461					5% Shapiro Wilk Critical Value	0.803				Detected Data Not Lognormal at 5% Significance Level		
2462					Lilliefors Test Statistic	0.283				**Lilliefors GOF Test**		
2463					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
2464	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
2465												
2466	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2467					Mean in Original Scale	7.14				Mean in Log Scale	1.419	
2468					SD in Original Scale	11.18				SD in Log Scale	0.916	
2469					95% t UCL (assumes normality of ROS data)	14.63				95% Percentile Bootstrap UCL	14.91	
2470					95% BCA Bootstrap UCL	18.87				95% Bootstrap t UCL	77.92	
2471					95% H-UCL (Log ROS)	19.21						
2472												
2473	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2474					KM Mean (logged)	1.402				KM Geo Mean	4.064	
2475					KM SD (logged)	0.87				95% Critical H Value (KM-Log)	3.114	
2476					KM Standard Error of Mean (logged)	0.336				95% H-UCL (KM -Log)	16.53	
2477					KM SD (logged)	0.87				95% Critical H Value (KM-Log)	3.114	
2478					KM Standard Error of Mean (logged)	0.336						
2479												
2480	**DL/2 Statistics**											
2481	**DL/2 Normal**									**DL/2 Log-Transformed**		
2482					Mean in Original Scale	7.044				Mean in Log Scale	1.387	
2483					SD in Original Scale	11.22				SD in Log Scale	0.928	
2484					95% t UCL (Assumes normality)	14.56				95% H-Stat UCL	19.27	
2485	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2486												
2487	**Nonparametric Distribution Free UCL Statistics**											
2488	**Detected Data appear Approximate Lognormal Distributed at 5% Significance Level**											
2489												
2490	**Suggested UCL to Use**											
2491					KM H-UCL	16.53						
2492												
2493	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2494	Recommendations are based upon data size, data distribution, and skewness.											
2495	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2496	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

	A	B	C	D	E	F	G	H	I	J	K	L
2497												
2498	**Nickel (smw18d)**											
2499												
2500	**General Statistics**											
2501	Total Number of Observations					8	Number of Distinct Observations					8
2502	Number of Detects					7	Number of Non-Detects					1
2503	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
2504	Minimum Detect					1.9	Minimum Non-Detect					5.3
2505	Maximum Detect					4.3	Maximum Non-Detect					5.3
2506	Variance Detects					0.616	Percent Non-Detects					12.5%
2507	Mean Detects					2.857	SD Detects					0.785
2508	Median Detects					2.8	CV Detects					0.275
2509	Skewness Detects					0.923	Kurtosis Detects					1.152
2510	Mean of Logged Detects					1.019	SD of Logged Detects					0.266
2511												
2512	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2513	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2514	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2515	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2516												
2517	**Normal GOF Test on Detects Only**											
2518	Shapiro Wilk Test Statistic					0.943	**Shapiro Wilk GOF Test**					
2519	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Normal at 5% Significance Level					
2520	Lilliefors Test Statistic					0.188	**Lilliefors GOF Test**					
2521	5% Lilliefors Critical Value					0.304	Detected Data appear Normal at 5% Significance Level					
2522	**Detected Data appear Normal at 5% Significance Level**											
2523												
2524	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2525	KM Mean					2.857	KM Standard Error of Mean					0.297
2526	KM SD					0.727	95% KM (BCA) UCL					3.357
2527	95% KM (t) UCL					3.419	95% KM (Percentile Bootstrap) UCL					3.35
2528	95% KM (z) UCL					3.345	95% KM Bootstrap t UCL					3.605
2529	90% KM Chebyshev UCL					3.747	95% KM Chebyshev UCL					4.15
2530	97.5% KM Chebyshev UCL					4.71	99% KM Chebyshev UCL					5.809
2531												
2532	**Gamma GOF Tests on Detected Observations Only**											
2533	A-D Test Statistic					0.205	**Anderson-Darling GOF Test**					
2534	5% A-D Critical Value					0.707	Detected data appear Gamma Distributed at 5% Significance Level					
2535	K-S Test Statistic					0.155	**Kolmogorov-Smirnov GOF**					
2536	5% K-S Critical Value					0.312	Detected data appear Gamma Distributed at 5% Significance Level					
2537	**Detected data appear Gamma Distributed at 5% Significance Level**											
2538												
2539	**Gamma Statistics on Detected Data Only**											
2540	k hat (MLE)					16.39	k star (bias corrected MLE)					9.46
2541	Theta hat (MLE)					0.174	Theta star (bias corrected MLE)					0.302
2542	nu hat (MLE)					229.4	nu star (bias corrected)					132.4
2543	Mean (detects)					2.857						
2544												
2545	**Gamma ROS Statistics using Imputed Non-Detects**											
2546	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2547	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2548	For such situations, GROS method may yield incorrect values of UCLs and BTVs											

	A	B	C	D	E	F	G	H	I	J	K	L
2549	This is especially true when the sample size is small.											
2550	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2551					Minimum	1.9				Mean		2.852
2552					Maximum	4.3				Median		2.807
2553					SD	0.727				CV		0.255
2554					k hat (MLE)	18.7				k star (bias corrected MLE)		11.77
2555					Theta hat (MLE)	0.153				Theta star (bias corrected MLE)		0.242
2556					nu hat (MLE)	299.2				nu star (bias corrected)		188.3
2557					Adjusted Level of Significance (β)	0.0195						
2558					Approximate Chi Square Value (188.31, α)	157.6				Adjusted Chi Square Value (188.31, β)		150.4
2559					95% Gamma Approximate UCL (use when n>=50)	3.408				95% Gamma Adjusted UCL (use when n<50)		3.57
2560												
2561	**Estimates of Gamma Parameters using KM Estimates**											
2562					Mean (KM)	2.857				SD (KM)		0.727
2563					Variance (KM)	0.528				SE of Mean (KM)		0.297
2564					k hat (KM)	15.46				k star (KM)		9.743
2565					nu hat (KM)	247.3				nu star (KM)		155.9
2566					theta hat (KM)	0.185				theta star (KM)		0.293
2567					80% gamma percentile (KM)	3.585				90% gamma percentile (KM)		4.075
2568					95% gamma percentile (KM)	4.51				99% gamma percentile (KM)		5.405
2569												
2570	**Gamma Kaplan-Meier (KM) Statistics**											
2571					Approximate Chi Square Value (155.89, α)	128				Adjusted Chi Square Value (155.89, β)		121.6
2572					95% Gamma Approximate KM-UCL (use when n>=50)	3.479				95% Gamma Adjusted KM-UCL (use when n<50)		3.662
2573												
2574	**Lognormal GOF Test on Detected Observations Only**											
2575					Shapiro Wilk Test Statistic	0.981				**Shapiro Wilk GOF Test**		
2576					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
2577					Lilliefors Test Statistic	0.151				**Lilliefors GOF Test**		
2578					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
2579	**Detected Data appear Lognormal at 5% Significance Level**											
2580												
2581	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2582					Mean in Original Scale	2.846				Mean in Log Scale		1.019
2583					SD in Original Scale	0.727				SD in Log Scale		0.246
2584					95% t UCL (assumes normality of ROS data)	3.334				95% Percentile Bootstrap UCL		3.259
2585					95% BCA Bootstrap UCL	3.313				95% Bootstrap t UCL		3.473
2586					95% H-UCL (Log ROS)	3.438						
2587												
2588	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2589					KM Mean (logged)	1.019				KM Geo Mean		2.77
2590					KM SD (logged)	0.246				95% Critical H Value (KM-Log)		1.994
2591					KM Standard Error of Mean (logged)	0.101				95% H-UCL (KM -Log)		3.438
2592					KM SD (logged)	0.246				95% Critical H Value (KM-Log)		1.994
2593					KM Standard Error of Mean (logged)	0.101						
2594												
2595	**DL/2 Statistics**											
2596	**DL/2 Normal**						**DL/2 Log-Transformed**					
2597					Mean in Original Scale	2.831				Mean in Log Scale		1.013
2598					SD in Original Scale	0.73				SD in Log Scale		0.247
2599					95% t UCL (Assumes normality)	3.321				95% H-Stat UCL		3.421
2600	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											

	A	B	C	D	E	F	G	H	I	J	K	L
2601												
2602	**Nonparametric Distribution Free UCL Statistics**											
2603	**Detected Data appear Normal Distributed at 5% Significance Level**											
2604												
2605	**Suggested UCL to Use**											
2606	95% KM (t) UCL	3.419										
2607												
2608	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2609	Recommendations are based upon data size, data distribution, and skewness.											
2610	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2611	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2612												
2613	**Nickel (smw19)**											
2614												
2615	**General Statistics**											
2616	Total Number of Observations	8				Number of Distinct Observations	7					
2617	Number of Detects	7				Number of Non-Detects	1					
2618	Number of Distinct Detects	6				Number of Distinct Non-Detects	1					
2619	Minimum Detect	1				Minimum Non-Detect	0.89					
2620	Maximum Detect	8.3				Maximum Non-Detect	0.89					
2621	Variance Detects	6.918				Percent Non-Detects	12.5%					
2622	Mean Detects	2.414				SD Detects	2.63					
2623	Median Detects	1.5				CV Detects	1.089					
2624	Skewness Detects	2.504				Kurtosis Detects	6.41					
2625	Mean of Logged Detects	0.575				SD of Logged Detects	0.738					
2626												
2627	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2628	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2629	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2630	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2631												
2632	**Normal GOF Test on Detects Only**											
2633	Shapiro Wilk Test Statistic	0.598				**Shapiro Wilk GOF Test**						
2634	5% Shapiro Wilk Critical Value	0.803				Detected Data Not Normal at 5% Significance Level						
2635	Lilliefors Test Statistic	0.39				**Lilliefors GOF Test**						
2636	5% Lilliefors Critical Value	0.304				Detected Data Not Normal at 5% Significance Level						
2637	**Detected Data Not Normal at 5% Significance Level**											
2638												
2639	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2640	KM Mean	2.224				KM Standard Error of Mean	0.891					
2641	KM SD	2.333				95% KM (BCA) UCL	4.049					
2642	95% KM (t) UCL	3.912				95% KM (Percentile Bootstrap) UCL	3.899					
2643	95% KM (z) UCL	3.689				95% KM Bootstrap t UCL	11.04					
2644	90% KM Chebyshev UCL	4.896				95% KM Chebyshev UCL	6.107					
2645	97.5% KM Chebyshev UCL	7.788				99% KM Chebyshev UCL	11.09					
2646												
2647	**Gamma GOF Tests on Detected Observations Only**											
2648	A-D Test Statistic	0.941				**Anderson-Darling GOF Test**						
2649	5% A-D Critical Value	0.718				Detected Data Not Gamma Distributed at 5% Significance Level						
2650	K-S Test Statistic	0.305				**Kolmogorov-Smirnov GOF**						
2651	5% K-S Critical Value	0.316				Detected data appear Gamma Distributed at 5% Significance Level						
2652	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											

	A	B	C	D	E	F	G	H	I	J	K	L
2653												
2654	**Gamma Statistics on Detected Data Only**											
2655					k hat (MLE)	1.779			k star (bias corrected MLE)			1.112
2656					Theta hat (MLE)	1.357			Theta star (bias corrected MLE)			2.172
2657					nu hat (MLE)	24.9			nu star (bias corrected)			15.56
2658					Mean (detects)	2.414						
2659												
2660	**Gamma ROS Statistics using Imputed Non-Detects**											
2661	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2662	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2663	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2664	This is especially true when the sample size is small.											
2665	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2666					Minimum	0.01			Mean			2.114
2667					Maximum	8.3			Median			1.35
2668					SD	2.579			CV			1.22
2669					k hat (MLE)	0.731			k star (bias corrected MLE)			0.54
2670					Theta hat (MLE)	2.89			Theta star (bias corrected MLE)			3.911
2671					nu hat (MLE)	11.7			nu star (bias corrected)			8.648
2672					Adjusted Level of Significance (β)	0.0195						
2673					Approximate Chi Square Value (8.65, α)	3.116			Adjusted Chi Square Value (8.65, β)			2.338
2674					95% Gamma Approximate UCL (use when n>=50)	5.867			95% Gamma Adjusted UCL (use when n<50)			7.818
2675												
2676	**Estimates of Gamma Parameters using KM Estimates**											
2677					Mean (KM)	2.224			SD (KM)			2.333
2678					Variance (KM)	5.443			SE of Mean (KM)			0.891
2679					k hat (KM)	0.909			k star (KM)			0.651
2680					nu hat (KM)	14.54			nu star (KM)			10.42
2681					theta hat (KM)	2.448			theta star (KM)			3.415
2682					80% gamma percentile (KM)	3.662			90% gamma percentile (KM)			5.677
2683					95% gamma percentile (KM)	7.769			99% gamma percentile (KM)			12.79
2684												
2685	**Gamma Kaplan-Meier (KM) Statistics**											
2686					Approximate Chi Square Value (10.42, α)	4.205			Adjusted Chi Square Value (10.42, β)			3.266
2687					95% Gamma Approximate KM-UCL (use when n>=50)	5.51			95% Gamma Adjusted KM-UCL (use when n<50)			7.093
2688												
2689	**Lognormal GOF Test on Detected Observations Only**											
2690					Shapiro Wilk Test Statistic	0.79			**Shapiro Wilk GOF Test**			
2691					5% Shapiro Wilk Critical Value	0.803			Detected Data Not Lognormal at 5% Significance Level			
2692					Lilliefors Test Statistic	0.243			**Lilliefors GOF Test**			
2693					5% Lilliefors Critical Value	0.304			Detected Data appear Lognormal at 5% Significance Level			
2694	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
2695												
2696	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2697					Mean in Original Scale	2.154			Mean in Log Scale			0.364
2698					SD in Original Scale	2.544			SD in Log Scale			0.907
2699					95% t UCL (assumes normality of ROS data)	3.858			95% Percentile Bootstrap UCL			3.829
2700					95% BCA Bootstrap UCL	4.591			95% Bootstrap t UCL			8.481
2701					95% H-UCL (Log ROS)	6.511						
2702												
2703	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2704					KM Mean (logged)	0.488			KM Geo Mean			1.63

2705				KM SD (logged)	0.679				95% Critical H Value (KM-Log)			2.69
2706				KM Standard Error of Mean (logged)	0.259				95% H-UCL (KM -Log)			4.091
2707				KM SD (logged)	0.679				95% Critical H Value (KM-Log)			2.69
2708				KM Standard Error of Mean (logged)	0.259							
2709												
2710					**DL/2 Statistics**							
2711				**DL/2 Normal**					**DL/2 Log-Transformed**			
2712				Mean in Original Scale	2.168				Mean in Log Scale			0.402
2713				SD in Original Scale	2.533				SD in Log Scale			0.84
2714				95% t UCL (Assumes normality)	3.865				95% H-Stat UCL			5.594
2715				**DL/2 is not a recommended method, provided for comparisons and historical reasons**								
2716												
2717					**Nonparametric Distribution Free UCL Statistics**							
2718					**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**							
2719												
2720					**Suggested UCL to Use**							
2721				95% KM Adjusted Gamma UCL	7.093				95% GROS Adjusted Gamma UCL			7.818
2722												
2723					When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test							
2724					When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL							
2725												
2726					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2727					Recommendations are based upon data size, data distribution, and skewness.							
2728					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2729					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2730												
2731	**Nickel (smw7)**											
2732												
2733					**General Statistics**							
2734				Total Number of Observations	8				Number of Distinct Observations			7
2735				Number of Detects	6				Number of Non-Detects			2
2736				Number of Distinct Detects	5				Number of Distinct Non-Detects			2
2737				Minimum Detect	0.85				Minimum Non-Detect			2.1
2738				Maximum Detect	1.7				Maximum Non-Detect			5.3
2739				Variance Detects	0.0944				Percent Non-Detects			25%
2740				Mean Detects	1.258				SD Detects			0.307
2741				Median Detects	1.2				CV Detects			0.244
2742				Skewness Detects	0.251				Kurtosis Detects			-0.712
2743				Mean of Logged Detects	0.204				SD of Logged Detects			0.248
2744												
2745					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2746					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2747					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2748					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2749												
2750					**Normal GOF Test on Detects Only**							
2751				Shapiro Wilk Test Statistic	0.969				**Shapiro Wilk GOF Test**			
2752				5% Shapiro Wilk Critical Value	0.788				Detected Data appear Normal at 5% Significance Level			
2753				Lilliefors Test Statistic	0.197				**Lilliefors GOF Test**			
2754				5% Lilliefors Critical Value	0.325				Detected Data appear Normal at 5% Significance Level			
2755					**Detected Data appear Normal at 5% Significance Level**							
2756												

	A	B	C	D	E	F	G	H	I	J	K	L
2757	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2758					KM Mean	1.258				KM Standard Error of Mean		0.125
2759					KM SD	0.281				95% KM (BCA) UCL		1.458
2760					95% KM (t) UCL	1.496				95% KM (Percentile Bootstrap) UCL		1.458
2761					95% KM (z) UCL	1.465				95% KM Bootstrap t UCL		1.557
2762					90% KM Chebyshev UCL	1.635				95% KM Chebyshev UCL		1.805
2763					97.5% KM Chebyshev UCL	2.042				99% KM Chebyshev UCL		2.506
2764												
2765	**Gamma GOF Tests on Detected Observations Only**											
2766					A-D Test Statistic	0.219	**Anderson-Darling GOF Test**					
2767					5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level					
2768					K-S Test Statistic	0.195	**Kolmogorov-Smirnov GOF**					
2769					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
2770	**Detected data appear Gamma Distributed at 5% Significance Level**											
2771												
2772	**Gamma Statistics on Detected Data Only**											
2773					k hat (MLE)	19.88				k star (bias corrected MLE)		10.05
2774					Theta hat (MLE)	0.0633				Theta star (bias corrected MLE)		0.125
2775					nu hat (MLE)	238.6				nu star (bias corrected)		120.6
2776					Mean (detects)	1.258						
2777												
2778	**Gamma ROS Statistics using Imputed Non-Detects**											
2779	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2780	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2781	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2782	This is especially true when the sample size is small.											
2783	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2784					Minimum	0.85				Mean		1.255
2785					Maximum	1.7				Median		1.244
2786					SD	0.26				CV		0.207
2787					k hat (MLE)	26.43				k star (bias corrected MLE)		16.6
2788					Theta hat (MLE)	0.0475				Theta star (bias corrected MLE)		0.0756
2789					nu hat (MLE)	422.9				nu star (bias corrected)		265.7
2790					Adjusted Level of Significance (β)	0.0195						
2791					Approximate Chi Square Value (265.68, α)	228.9				Adjusted Chi Square Value (265.68, β)		220.3
2792					95% Gamma Approximate UCL (use when n>=50)	1.456				95% Gamma Adjusted UCL (use when n<50)		1.513
2793												
2794	**Estimates of Gamma Parameters using KM Estimates**											
2795					Mean (KM)	1.258				SD (KM)		0.281
2796					Variance (KM)	0.0787				SE of Mean (KM)		0.125
2797					k hat (KM)	20.12				k star (KM)		12.66
2798					nu hat (KM)	322				nu star (KM)		202.6
2799					theta hat (KM)	0.0625				theta star (KM)		0.0994
2800					80% gamma percentile (KM)	1.542				90% gamma percentile (KM)		1.727
2801					95% gamma percentile (KM)	1.891				99% gamma percentile (KM)		2.223
2802												
2803	**Gamma Kaplan-Meier (KM) Statistics**											
2804					Approximate Chi Square Value (202.58, α)	170.6				Adjusted Chi Square Value (202.58, β)		163.2
2805					95% Gamma Approximate KM-UCL (use when n>=50)	1.494				95% Gamma Adjusted KM-UCL (use when n<50)		1.562
2806												
2807	**Lognormal GOF Test on Detected Observations Only**											
2808					Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**					

2809				5% Shapiro Wilk Critical Value		0.788	Detected Data appear Lognormal at 5% Significance Level					
2810				Lilliefors Test Statistic		0.17	**Lilliefors GOF Test**					
2811				5% Lilliefors Critical Value		0.325	Detected Data appear Lognormal at 5% Significance Level					
2812	**Detected Data appear Lognormal at 5% Significance Level**											
2813												
2814	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2815				Mean in Original Scale		1.25	Mean in Log Scale					0.204
2816				SD in Original Scale		0.26	SD in Log Scale					0.21
2817				95% t UCL (assumes normality of ROS data)		1.425	95% Percentile Bootstrap UCL					1.391
2818				95% BCA Bootstrap UCL		1.407	95% Bootstrap t UCL					1.457
2819				95% H-UCL (Log ROS)		1.465						
2820												
2821	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2822				KM Mean (logged)		0.204	KM Geo Mean					1.227
2823				KM SD (logged)		0.227	95% Critical H Value (KM-Log)					1.972
2824				KM Standard Error of Mean (logged)		0.101	95% H-UCL (KM -Log)					1.491
2825				KM SD (logged)		0.227	95% Critical H Value (KM-Log)					1.972
2826				KM Standard Error of Mean (logged)		0.101						
2827												
2828	**DL/2 Statistics**											
2829	**DL/2 Normal**						**DL/2 Log-Transformed**					
2830				Mean in Original Scale		1.406	Mean in Log Scale					0.281
2831				SD in Original Scale		0.57	SD in Log Scale					0.354
2832				95% t UCL (Assumes normality)		1.788	95% H-Stat UCL					1.876
2833	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2834												
2835	**Nonparametric Distribution Free UCL Statistics**											
2836	**Detected Data appear Normal Distributed at 5% Significance Level**											
2837												
2838	**Suggested UCL to Use**											
2839				95% KM (t) UCL		1.496						
2840												
2841	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2842	Recommendations are based upon data size, data distribution, and skewness.											
2843	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2844	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2845												
2846	**Nickel (smw8)**											
2847												
2848	**General Statistics**											
2849				Total Number of Observations		8	Number of Distinct Observations					8
2850				Number of Detects		6	Number of Non-Detects					2
2851				Number of Distinct Detects		6	Number of Distinct Non-Detects					2
2852				Minimum Detect		0.2	Minimum Non-Detect					0.15
2853				Maximum Detect		0.46	Maximum Non-Detect					2.1
2854				Variance Detects		0.0101	Percent Non-Detects					25%
2855				Mean Detects		0.297	SD Detects					0.101
2856				Median Detects		0.265	CV Detects					0.339
2857				Skewness Detects		0.949	Kurtosis Detects					-0.269
2858				Mean of Logged Detects		-1.26	SD of Logged Detects					0.322
2859												
2860	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											

	A	B	C	D	E	F	G	H	I	J	K	L
2861	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
2862	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
2863	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
2864												
2865	Normal GOF Test on Detects Only											
2866					Shapiro Wilk Test Statistic	0.903	Shapiro Wilk GOF Test					
2867					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
2868					Lilliefors Test Statistic	0.214	Lilliefors GOF Test					
2869					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
2870	Detected Data appear Normal at 5% Significance Level											
2871												
2872	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
2873					KM Mean	0.276	KM Standard Error of Mean	0.0411				
2874					KM SD	0.0993	95% KM (BCA) UCL	0.34				
2875					95% KM (t) UCL	0.354	95% KM (Percentile Bootstrap) UCL	0.34				
2876					95% KM (z) UCL	0.343	95% KM Bootstrap t UCL	0.392				
2877					90% KM Chebyshev UCL	0.399	95% KM Chebyshev UCL	0.455				
2878					97.5% KM Chebyshev UCL	0.532	99% KM Chebyshev UCL	0.685				
2879												
2880	Gamma GOF Tests on Detected Observations Only											
2881					A-D Test Statistic	0.307	Anderson-Darling GOF Test					
2882					5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level					
2883					K-S Test Statistic	0.222	Kolmogorov-Smirnov GOF					
2884					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
2885	Detected data appear Gamma Distributed at 5% Significance Level											
2886												
2887	Gamma Statistics on Detected Data Only											
2888					k hat (MLE)	11.34	k star (bias corrected MLE)	5.781				
2889					Theta hat (MLE)	0.0262	Theta star (bias corrected MLE)	0.0513				
2890					nu hat (MLE)	136.1	nu star (bias corrected)	69.37				
2891					Mean (detects)	0.297						
2892												
2893	Gamma ROS Statistics using Imputed Non-Detects											
2894	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2895	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2896	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2897	This is especially true when the sample size is small.											
2898	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2899					Minimum	0.0799	Mean	0.265				
2900					Maximum	0.46	Median	0.25				
2901					SD	0.114	CV	0.43				
2902					k hat (MLE)	5.104	k star (bias corrected MLE)	3.274				
2903					Theta hat (MLE)	0.0519	Theta star (bias corrected MLE)	0.0809				
2904					nu hat (MLE)	81.67	nu star (bias corrected)	52.38				
2905					Adjusted Level of Significance (β)	0.0195						
2906					Approximate Chi Square Value (52.38, α)	36.75	Adjusted Chi Square Value (52.38, β)	33.47				
2907					95% Gamma Approximate UCL (use when n>=50)	0.378	95% Gamma Adjusted UCL (use when n<50)	0.415				
2908												
2909	Estimates of Gamma Parameters using KM Estimates											
2910					Mean (KM)	0.276	SD (KM)	0.0993				
2911					Variance (KM)	0.00985	SE of Mean (KM)	0.0411				
2912					k hat (KM)	7.715	k star (KM)	4.905				

	A	B	C	D	E	F	G	H	I	J	K	L
2913					nu hat (KM)	123.4					nu star (KM)	78.49
2914					theta hat (KM)	0.0357					theta star (KM)	0.0562
2915					80% gamma percentile (KM)	0.371					90% gamma percentile (KM)	0.442
2916					95% gamma percentile (KM)	0.507					99% gamma percentile (KM)	0.644
2917												
2918					**Gamma Kaplan-Meier (KM) Statistics**							
2919					Approximate Chi Square Value (78.49, α)	59.08					Adjusted Chi Square Value (78.49, β)	54.83
2920					95% Gamma Approximate KM-UCL (use when n>=50)	0.366					95% Gamma Adjusted KM-UCL (use when n<50)	0.395
2921												
2922					**Lognormal GOF Test on Detected Observations Only**							
2923					Shapiro Wilk Test Statistic	0.938					**Shapiro Wilk GOF Test**	
2924					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Lognormal at 5% Significance Level	
2925					Lilliefors Test Statistic	0.198					**Lilliefors GOF Test**	
2926					5% Lilliefors Critical Value	0.325					Detected Data appear Lognormal at 5% Significance Level	
2927					**Detected Data appear Lognormal at 5% Significance Level**							
2928												
2929					**Lognormal ROS Statistics Using Imputed Non-Detects**							
2930					Mean in Original Scale	0.27					Mean in Log Scale	-1.376
2931					SD in Original Scale	0.104					SD in Log Scale	0.396
2932					95% t UCL (assumes normality of ROS data)	0.34					95% Percentile Bootstrap UCL	0.328
2933					95% BCA Bootstrap UCL	0.336					95% Bootstrap t UCL	0.37
2934					95% H-UCL (Log ROS)	0.379						
2935												
2936					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
2937					KM Mean (logged)	-1.351					KM Geo Mean	0.259
2938					KM SD (logged)	0.352					95% Critical H Value (KM-Log)	2.127
2939					KM Standard Error of Mean (logged)	0.146					95% H-UCL (KM -Log)	0.366
2940					KM SD (logged)	0.352					95% Critical H Value (KM-Log)	2.127
2941					KM Standard Error of Mean (logged)	0.146						
2942												
2943					**DL/2 Statistics**							
2944					**DL/2 Normal**						**DL/2 Log-Transformed**	
2945					Mean in Original Scale	0.363					Mean in Log Scale	-1.263
2946					SD in Original Scale	0.3					SD in Log Scale	0.756
2947					95% t UCL (Assumes normality)	0.564					95% H-Stat UCL	0.851
2948					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
2949												
2950					**Nonparametric Distribution Free UCL Statistics**							
2951					**Detected Data appear Normal Distributed at 5% Significance Level**							
2952												
2953					**Suggested UCL to Use**							
2954					95% KM (t) UCL	0.354						
2955												
2956					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2957					Recommendations are based upon data size, data distribution, and skewness.							
2958					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2959					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2960												
2961	**Nickel (smw9)**											
2962												
2963					**General Statistics**							
2964					Total Number of Observations	9					Number of Distinct Observations	7

2965					Number of Detects	8					Number of Non-Detects	1
2966					Number of Distinct Detects	6					Number of Distinct Non-Detects	1
2967					Minimum Detect	2.7					Minimum Non-Detect	5.3
2968					Maximum Detect	5					Maximum Non-Detect	5.3
2969					Variance Detects	0.563					Percent Non-Detects	11.11%
2970					Mean Detects	3.638					SD Detects	0.75
2971					Median Detects	3.4					CV Detects	0.206
2972					Skewness Detects	0.971					Kurtosis Detects	0.368
2973					Mean of Logged Detects	1.274					SD of Logged Detects	0.197
2974												
2975					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2976					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2977					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2978					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2979												
2980					**Normal GOF Test on Detects Only**							
2981					Shapiro Wilk Test Statistic	0.888	**Shapiro Wilk GOF Test**					
2982					5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level					
2983					Lilliefors Test Statistic	0.27	**Lilliefors GOF Test**					
2984					5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level					
2985					**Detected Data appear Normal at 5% Significance Level**							
2986												
2987					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
2988					KM Mean	3.638					KM Standard Error of Mean	0.265
2989					KM SD	0.702					95% KM (BCA) UCL	4.056
2990					95% KM (t) UCL	4.131					95% KM (Percentile Bootstrap) UCL	4.067
2991					95% KM (z) UCL	4.074					95% KM Bootstrap t UCL	4.651
2992					90% KM Chebyshev UCL	4.433					95% KM Chebyshev UCL	4.794
2993					97.5% KM Chebyshev UCL	5.294					99% KM Chebyshev UCL	6.276
2994												
2995					**Gamma GOF Tests on Detected Observations Only**							
2996					A-D Test Statistic	0.486	**Anderson-Darling GOF Test**					
2997					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
2998					K-S Test Statistic	0.247	**Kolmogorov-Smirnov GOF**					
2999					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
3000					**Detected data appear Gamma Distributed at 5% Significance Level**							
3001												
3002					**Gamma Statistics on Detected Data Only**							
3003					k hat (MLE)	28.75					k star (bias corrected MLE)	18.05
3004					Theta hat (MLE)	0.127					Theta star (bias corrected MLE)	0.202
3005					nu hat (MLE)	460					nu star (bias corrected)	288.8
3006					Mean (detects)	3.638						
3007												
3008					**Gamma ROS Statistics using Imputed Non-Detects**							
3009					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
3010					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
3011					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
3012					This is especially true when the sample size is small.							
3013					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
3014					Minimum	2.7					Mean	3.634
3015					Maximum	5					Median	3.4
3016					SD	0.702					CV	0.193

	A	B	C	D	E	F	G	H	I	J	K	L
3017					k hat (MLE)	32.31				k star (bias corrected MLE)		21.62
3018					Theta hat (MLE)	0.112				Theta star (bias corrected MLE)		0.168
3019					nu hat (MLE)	581.7				nu star (bias corrected)		389.1
3020					Adjusted Level of Significance (β)	0.0231						
3021					Approximate Chi Square Value (389.10, α)	344.4				Adjusted Chi Square Value (389.10, β)		335.5
3022					95% Gamma Approximate UCL (use when n>=50)	4.106				95% Gamma Adjusted UCL (use when n<50)		4.215
3023												
3024					**Estimates of Gamma Parameters using KM Estimates**							
3025					Mean (KM)	3.638				SD (KM)		0.702
3026					Variance (KM)	0.492				SE of Mean (KM)		0.265
3027					k hat (KM)	26.87				k star (KM)		17.99
3028					nu hat (KM)	483.7				nu star (KM)		323.8
3029					theta hat (KM)	0.135				theta star (KM)		0.202
3030					80% gamma percentile (KM)	4.333				90% gamma percentile (KM)		4.771
3031					95% gamma percentile (KM)	5.153				99% gamma percentile (KM)		5.924
3032												
3033					**Gamma Kaplan-Meier (KM) Statistics**							
3034					Approximate Chi Square Value (323.83, α)	283.1				Adjusted Chi Square Value (323.83, β)		275.1
3035					95% Gamma Approximate KM-UCL (use when n>=50)	4.16				95% Gamma Adjusted KM-UCL (use when n<50)		4.282
3036												
3037					**Lognormal GOF Test on Detected Observations Only**							
3038					Shapiro Wilk Test Statistic	0.921				**Shapiro Wilk GOF Test**		
3039					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Lognormal at 5% Significance Level		
3040					Lilliefors Test Statistic	0.236				**Lilliefors GOF Test**		
3041					5% Lilliefors Critical Value	0.283				Detected Data appear Lognormal at 5% Significance Level		
3042					**Detected Data appear Lognormal at 5% Significance Level**							
3043												
3044					**Lognormal ROS Statistics Using Imputed Non-Detects**							
3045					Mean in Original Scale	3.63				Mean in Log Scale		1.274
3046					SD in Original Scale	0.702				SD in Log Scale		0.184
3047					95% t UCL (assumes normality of ROS data)	4.066				95% Percentile Bootstrap UCL		4.008
3048					95% BCA Bootstrap UCL	4.033				95% Bootstrap t UCL		4.47
3049					95% H-UCL (Log ROS)	4.114						
3050												
3051					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
3052					KM Mean (logged)	1.274				KM Geo Mean		3.574
3053					KM SD (logged)	0.184				95% Critical H Value (KM-Log)		1.894
3054					KM Standard Error of Mean (logged)	0.0697				95% H-UCL (KM -Log)		4.114
3055					KM SD (logged)	0.184				95% Critical H Value (KM-Log)		1.894
3056					KM Standard Error of Mean (logged)	0.0697						
3057												
3058					**DL/2 Statistics**							
3059					**DL/2 Normal**					**DL/2 Log-Transformed**		
3060					Mean in Original Scale	3.528				Mean in Log Scale		1.241
3061					SD in Original Scale	0.775				SD in Log Scale		0.21
3062					95% t UCL (Assumes normality)	4.008				95% H-Stat UCL		4.074
3063					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
3064												
3065					**Nonparametric Distribution Free UCL Statistics**							
3066					**Detected Data appear Normal Distributed at 5% Significance Level**							
3067												
3068					**Suggested UCL to Use**							

3069					95% KM (t) UCL	4.131						
3070												
3071	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3072	Recommendations are based upon data size, data distribution, and skewness.											
3073	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3074	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3075												
3076	**Nickel (tw2r)**											
3077												
3078	**General Statistics**											
3079					Total Number of Observations	9			Number of Distinct Observations	8		
3080					Number of Detects	8			Number of Non-Detects	1		
3081					Number of Distinct Detects	7			Number of Distinct Non-Detects	1		
3082					Minimum Detect	0.62			Minimum Non-Detect	0.15		
3083					Maximum Detect	2.4			Maximum Non-Detect	0.15		
3084					Variance Detects	0.303			Percent Non-Detects	11.11%		
3085					Mean Detects	1.284			SD Detects	0.551		
3086					Median Detects	1.25			CV Detects	0.429		
3087					Skewness Detects	1.118			Kurtosis Detects	1.841		
3088					Mean of Logged Detects	0.173			SD of Logged Detects	0.418		
3089												
3090	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3091	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3092	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3093	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3094												
3095	**Normal GOF Test on Detects Only**											
3096					Shapiro Wilk Test Statistic	0.914			**Shapiro Wilk GOF Test**			
3097					5% Shapiro Wilk Critical Value	0.818			Detected Data appear Normal at 5% Significance Level			
3098					Lilliefors Test Statistic	0.222			**Lilliefors GOF Test**			
3099					5% Lilliefors Critical Value	0.283			Detected Data appear Normal at 5% Significance Level			
3100	**Detected Data appear Normal at 5% Significance Level**											
3101												
3102	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3103					KM Mean	1.158			KM Standard Error of Mean	0.215		
3104					KM SD	0.602			95% KM (BCA) UCL	1.5		
3105					95% KM (t) UCL	1.557			95% KM (Percentile Bootstrap) UCL	1.482		
3106					95% KM (z) UCL	1.511			95% KM Bootstrap t UCL	1.572		
3107					90% KM Chebyshev UCL	1.802			95% KM Chebyshev UCL	2.093		
3108					97.5% KM Chebyshev UCL	2.498			99% KM Chebyshev UCL	3.293		
3109												
3110	**Gamma GOF Tests on Detected Observations Only**											
3111					A-D Test Statistic	0.231			**Anderson-Darling GOF Test**			
3112					5% A-D Critical Value	0.718			Detected data appear Gamma Distributed at 5% Significance Level			
3113					K-S Test Statistic	0.169			**Kolmogorov-Smirnov GOF**			
3114					5% K-S Critical Value	0.295			Detected data appear Gamma Distributed at 5% Significance Level			
3115	**Detected data appear Gamma Distributed at 5% Significance Level**											
3116												
3117	**Gamma Statistics on Detected Data Only**											
3118					k hat (MLE)	6.686			k star (bias corrected MLE)	4.262		
3119					Theta hat (MLE)	0.192			Theta star (bias corrected MLE)	0.301		
3120					nu hat (MLE)	107			nu star (bias corrected)	68.2		

	A	B	C	D	E	F	G	H	I	J	K	L
3121					Mean (detects)	1.284						
3122												
3123					**Gamma ROS Statistics using Imputed Non-Detects**							
3124					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
3125					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
3126					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
3127					This is especially true when the sample size is small.							
3128					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
3129					Minimum	0.209				Mean	1.164	
3130					Maximum	2.4				Median	1.2	
3131					SD	0.628				CV	0.539	
3132					k hat (MLE)	3.057				k star (bias corrected MLE)	2.112	
3133					Theta hat (MLE)	0.381				Theta star (bias corrected MLE)	0.551	
3134					nu hat (MLE)	55.03				nu star (bias corrected)	38.02	
3135					Adjusted Level of Significance (β)	0.0231						
3136					Approximate Chi Square Value (38.02, α)	24.9				Adjusted Chi Square Value (38.02, β)	22.69	
3137					95% Gamma Approximate UCL (use when n>=50)	1.778				95% Gamma Adjusted UCL (use when n<50)	1.951	
3138												
3139					**Estimates of Gamma Parameters using KM Estimates**							
3140					Mean (KM)	1.158				SD (KM)	0.602	
3141					Variance (KM)	0.363				SE of Mean (KM)	0.215	
3142					k hat (KM)	3.695				k star (KM)	2.537	
3143					nu hat (KM)	66.5				nu star (KM)	45.67	
3144					theta hat (KM)	0.313				theta star (KM)	0.456	
3145					80% gamma percentile (KM)	1.685				90% gamma percentile (KM)	2.132	
3146					95% gamma percentile (KM)	2.552				99% gamma percentile (KM)	3.472	
3147												
3148					**Gamma Kaplan-Meier (KM) Statistics**							
3149					Approximate Chi Square Value (45.67, α)	31.16				Adjusted Chi Square Value (45.67, β)	28.66	
3150					95% Gamma Approximate KM-UCL (use when n>=50)	1.697				95% Gamma Adjusted KM-UCL (use when n<50)	1.845	
3151												
3152					**Lognormal GOF Test on Detected Observations Only**							
3153					Shapiro Wilk Test Statistic	0.975				**Shapiro Wilk GOF Test**		
3154					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Lognormal at 5% Significance Level		
3155					Lilliefors Test Statistic	0.164				**Lilliefors GOF Test**		
3156					5% Lilliefors Critical Value	0.283				Detected Data appear Lognormal at 5% Significance Level		
3157					**Detected Data appear Lognormal at 5% Significance Level**							
3158												
3159					**Lognormal ROS Statistics Using Imputed Non-Detects**							
3160					Mean in Original Scale	1.188				Mean in Log Scale	0.0585	
3161					SD in Original Scale	0.59				SD in Log Scale	0.521	
3162					95% t UCL (assumes normality of ROS data)	1.554				95% Percentile Bootstrap UCL	1.5	
3163					95% BCA Bootstrap UCL	1.544				95% Bootstrap t UCL	1.635	
3164					95% H-UCL (Log ROS)	1.841						
3165												
3166					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
3167					KM Mean (logged)	-0.0569				KM Geo Mean	0.945	
3168					KM SD (logged)	0.748				95% Critical H Value (KM-Log)	2.709	
3169					KM Standard Error of Mean (logged)	0.266				95% H-UCL (KM -Log)	2.558	
3170					KM SD (logged)	0.748				95% Critical H Value (KM-Log)	2.709	
3171					KM Standard Error of Mean (logged)	0.266						
3172												

3173	**DL/2 Statistics**											
3174	**DL/2 Normal**						**DL/2 Log-Transformed**					
3175					Mean in Original Scale	1.149				Mean in Log Scale	-0.134	
3176					SD in Original Scale	0.654				SD in Log Scale	1.001	
3177					95% t UCL (Assumes normality)	1.555				95% H-Stat UCL	4.542	
3178	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3179												
3180	**Nonparametric Distribution Free UCL Statistics**											
3181	**Detected Data appear Normal Distributed at 5% Significance Level**											
3182												
3183	**Suggested UCL to Use**											
3184					95% KM (t) UCL	1.557						
3185												
3186	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3187	Recommendations are based upon data size, data distribution, and skewness.											
3188	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3189	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3190												
3191	**Nickel (tw5r)**											
3192												
3193	**General Statistics**											
3194					Total Number of Observations	8				Number of Distinct Observations	8	
3195					Number of Detects	7				Number of Non-Detects	1	
3196					Number of Distinct Detects	7				Number of Distinct Non-Detects	1	
3197					Minimum Detect	0.66				Minimum Non-Detect	5.3	
3198					Maximum Detect	2.2				Maximum Non-Detect	5.3	
3199					Variance Detects	0.298				Percent Non-Detects	12.5%	
3200					Mean Detects	1.566				SD Detects	0.545	
3201					Median Detects	1.5				CV Detects	0.348	
3202					Skewness Detects	-0.506				Kurtosis Detects	-0.407	
3203					Mean of Logged Detects	0.383				SD of Logged Detects	0.416	
3204												
3205	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3206	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3207	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
3208	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3209												
3210	**Normal GOF Test on Detects Only**											
3211					Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**					
3212					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level					
3213					Lilliefors Test Statistic	0.159	**Lilliefors GOF Test**					
3214					5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level					
3215	**Detected Data appear Normal at 5% Significance Level**											
3216												
3217	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3218					KM Mean	1.566				KM Standard Error of Mean	0.206	
3219					KM SD	0.505				95% KM (BCA) UCL	1.871	
3220					95% KM (t) UCL	1.956				95% KM (Percentile Bootstrap) UCL	1.863	
3221					95% KM (z) UCL	1.905				95% KM Bootstrap t UCL	1.918	
3222					90% KM Chebyshev UCL	2.184				95% KM Chebyshev UCL	2.464	
3223					97.5% KM Chebyshev UCL	2.853				99% KM Chebyshev UCL	3.617	
3224												

	A	B	C	D	E	F	G	H	I	J	K	L
3225	**Gamma GOF Tests on Detected Observations Only**											
3226					A-D Test Statistic	0.318	**Anderson-Darling GOF Test**					
3227					5% A-D Critical Value	0.709	Detected data appear Gamma Distributed at 5% Significance Level					
3228					K-S Test Statistic	0.179	**Kolmogorov-Smirnov GOF**					
3229					5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level					
3230	**Detected data appear Gamma Distributed at 5% Significance Level**											
3231												
3232	**Gamma Statistics on Detected Data Only**											
3233					k hat (MLE)	7.815	k star (bias corrected MLE)					4.561
3234					Theta hat (MLE)	0.2	Theta star (bias corrected MLE)					0.343
3235					nu hat (MLE)	109.4	nu star (bias corrected)					63.85
3236					Mean (detects)	1.566						
3237												
3238	**Gamma ROS Statistics using Imputed Non-Detects**											
3239	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3240	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3241	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3242	This is especially true when the sample size is small.											
3243	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3244					Minimum	0.66	Mean					1.56
3245					Maximum	2.2	Median					1.511
3246					SD	0.505	CV					0.324
3247					k hat (MLE)	8.902	k star (bias corrected MLE)					5.647
3248					Theta hat (MLE)	0.175	Theta star (bias corrected MLE)					0.276
3249					nu hat (MLE)	142.4	nu star (bias corrected)					90.35
3250					Adjusted Level of Significance (β)	0.0195						
3251					Approximate Chi Square Value (90.35, α)	69.44	Adjusted Chi Square Value (90.35, β)					64.81
3252					95% Gamma Approximate UCL (use when n>=50)	2.03	95% Gamma Adjusted UCL (use when n<50)					2.175
3253												
3254	**Estimates of Gamma Parameters using KM Estimates**											
3255					Mean (KM)	1.566	SD (KM)					0.505
3256					Variance (KM)	0.255	SE of Mean (KM)					0.206
3257					k hat (KM)	9.612	k star (KM)					6.091
3258					nu hat (KM)	153.8	nu star (KM)					97.45
3259					theta hat (KM)	0.163	theta star (KM)					0.257
3260					80% gamma percentile (KM)	2.06	90% gamma percentile (KM)					2.414
3261					95% gamma percentile (KM)	2.734	99% gamma percentile (KM)					3.404
3262												
3263	**Gamma Kaplan-Meier (KM) Statistics**											
3264					Approximate Chi Square Value (97.45, α)	75.68	Adjusted Chi Square Value (97.45, β)					70.84
3265					95% Gamma Approximate KM-UCL (use when n>=50)	2.016	95% Gamma Adjusted KM-UCL (use when n<50)					2.154
3266												
3267	**Lognormal GOF Test on Detected Observations Only**											
3268					Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**					
3269					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
3270					Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**					
3271					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
3272	**Detected Data appear Lognormal at 5% Significance Level**											
3273												
3274	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3275					Mean in Original Scale	1.553	Mean in Log Scale					0.383
3276					SD in Original Scale	0.506	SD in Log Scale					0.386

	A	B	C	D	E	F	G	H	I	J	K	L
3277				95% t UCL (assumes normality of ROS data)		1.892				95% Percentile Bootstrap UCL		1.804
3278				95% BCA Bootstrap UCL		1.804				95% Bootstrap t UCL		1.86
3279				95% H-UCL (Log ROS)		2.169						
3280												
3281	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3282				KM Mean (logged)		0.383				KM Geo Mean		1.467
3283				KM SD (logged)		0.386				95% Critical H Value (KM-Log)		2.174
3284				KM Standard Error of Mean (logged)		0.157				95% H-UCL (KM -Log)		2.169
3285				KM SD (logged)		0.386				95% Critical H Value (KM-Log)		2.174
3286				KM Standard Error of Mean (logged)		0.157						
3287												
3288	**DL/2 Statistics**											
3289	**DL/2 Normal**						**DL/2 Log-Transformed**					
3290				Mean in Original Scale		1.701				Mean in Log Scale		0.457
3291				SD in Original Scale		0.634				SD in Log Scale		0.439
3292				95% t UCL (Assumes normality)		2.126				95% H-Stat UCL		2.527
3293	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3294												
3295	**Nonparametric Distribution Free UCL Statistics**											
3296	**Detected Data appear Normal Distributed at 5% Significance Level**											
3297												
3298	**Suggested UCL to Use**											
3299				95% KM (t) UCL		1.956						
3300												
3301	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3302	Recommendations are based upon data size, data distribution, and skewness.											
3303	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3304	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3305												
3306												
3307	**Nickel (waste water clarifier well)**											
3308												
3309	**General Statistics**											
3310				Total Number of Observations		1				Number of Distinct Observations		1
3311										Number of Missing Observations		0
3312				Minimum		8.8				Mean		8.8
3313				Maximum		8.8				Median		8.8
3314												
3315	**Warning: This data set only has 1 observations!**											
3316	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
3317	**The data set for variable Nickel (waste water clarifier well) was not processed!**											
3318												
3319	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
3320	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:07:22 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Thallium (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	6
Number of Detects	0	Number of Non-Detects	9
Number of Distinct Detects	0	Number of Distinct Non-Detects	6

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium (atmw6) was not processed!

Thallium (nfmw10)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
Number of Detects	0	Number of Non-Detects	8
Number of Distinct Detects	0	Number of Distinct Non-Detects	6

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium (nfmw10) was not processed!

Thallium (nfmw11)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	4
Number of Detects	0	Number of Non-Detects	8
Number of Distinct Detects	0	Number of Distinct Non-Detects	4

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium (nfmw11) was not processed!

Thallium (nfmw12)

53												
54	General Statistics											
55					Total Number of Observations	8				Number of Distinct Observations		5
56					Number of Detects	0				Number of Non-Detects		8
57					Number of Distinct Detects	0				Number of Distinct Non-Detects		5
58												
59	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
60	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
61	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
62												
63	The data set for variable Thallium (nfmw12) was not processed!											
64												
65												
66	Thallium (nfmw19)											
67												
68	General Statistics											
69					Total Number of Observations	8				Number of Distinct Observations		6
70					Number of Detects	0				Number of Non-Detects		8
71					Number of Distinct Detects	0				Number of Distinct Non-Detects		6
72												
73	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
74	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
75	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
76												
77	The data set for variable Thallium (nfmw19) was not processed!											
78												
79												
80	Thallium (nfmw1d)											
81												
82	General Statistics											
83					Total Number of Observations	9				Number of Distinct Observations		5
84					Number of Detects	0				Number of Non-Detects		9
85					Number of Distinct Detects	0				Number of Distinct Non-Detects		5
86												
87	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
88	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
89	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
90												
91	The data set for variable Thallium (nfmw1d) was not processed!											
92												
93												
94	Thallium (nfmw1s)											
95												
96	General Statistics											
97					Total Number of Observations	7				Number of Distinct Observations		6
98					Number of Detects	1				Number of Non-Detects		6
99					Number of Distinct Detects	1				Number of Distinct Non-Detects		5
100												
101	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
102	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
103												
104	The data set for variable Thallium (nfmw1s) was not processed!											

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106												
107	**Thallium (nfmw2)**											
108												
109	**General Statistics**											
110					Total Number of Observations	9			Number of Distinct Observations	5		
111					Number of Detects	0			Number of Non-Detects	9		
112					Number of Distinct Detects	0			Number of Distinct Non-Detects	5		
113												
114	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
115	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
116	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
117												
118	**The data set for variable Thallium (nfmw2) was not processed!**											
119												
120												
121	**Thallium (nfmw20)**											
122												
123	**General Statistics**											
124					Total Number of Observations	8			Number of Distinct Observations	5		
125					Number of Detects	0			Number of Non-Detects	8		
126					Number of Distinct Detects	0			Number of Distinct Non-Detects	5		
127												
128	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
129	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
130	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
131												
132	**The data set for variable Thallium (nfmw20) was not processed!**											
133												
134												
135	**Thallium (nfmw22)**											
136												
137	**General Statistics**											
138					Total Number of Observations	4			Number of Distinct Observations	2		
139					Number of Detects	0			Number of Non-Detects	4		
140					Number of Distinct Detects	0			Number of Distinct Non-Detects	2		
141												
142	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
143	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
144	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
145												
146	**The data set for variable Thallium (nfmw22) was not processed!**											
147												
148												
149	**Thallium (nfmw23)**											
150												
151	**General Statistics**											
152					Total Number of Observations	4			Number of Distinct Observations	2		
153					Number of Detects	0			Number of Non-Detects	4		
154					Number of Distinct Detects	0			Number of Distinct Non-Detects	2		
155												
156	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											

	A	B	C	D	E	F	G	H	I	J	K	L
157	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
158	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
159												
160	The data set for variable Thallium (nfmw23) was not processed!											
161												
162												
163	Thallium (nfmw3)											
164												
165	General Statistics											
166						Total Number of Observations	9			Number of Distinct Observations	6	
167						Number of Detects	0			Number of Non-Detects	9	
168						Number of Distinct Detects	0			Number of Distinct Non-Detects	6	
169												
170	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
171	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
172	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
173												
174	The data set for variable Thallium (nfmw3) was not processed!											
175												
176												
177	Thallium (nfmw4)											
178												
179	General Statistics											
180						Total Number of Observations	9			Number of Distinct Observations	7	
181						Number of Detects	0			Number of Non-Detects	9	
182						Number of Distinct Detects	0			Number of Distinct Non-Detects	7	
183												
184	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
185	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
186	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
187												
188	The data set for variable Thallium (nfmw4) was not processed!											
189												
190												
191	Thallium (nfmw7)											
192												
193	General Statistics											
194						Total Number of Observations	9			Number of Distinct Observations	4	
195						Number of Detects	1			Number of Non-Detects	8	
196						Number of Distinct Detects	1			Number of Distinct Non-Detects	3	
197												
198	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
199	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
200												
201	The data set for variable Thallium (nfmw7) was not processed!											
202												
203												
204	Thallium (nfmw8)											
205												
206	General Statistics											
207						Total Number of Observations	8			Number of Distinct Observations	4	
208						Number of Detects	0			Number of Non-Detects	8	

209					Number of Distinct Detects	0				Number of Distinct Non-Detects		4
210												
211					Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!							
212					Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!							
213					The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).							
214												
215					The data set for variable Thallium (nfmw8) was not processed!							
216												
217												
218	Thallium (nfmw9)											
219												
220					General Statistics							
221					Total Number of Observations	8				Number of Distinct Observations		6
222					Number of Detects	0				Number of Non-Detects		8
223					Number of Distinct Detects	0				Number of Distinct Non-Detects		6
224												
225					Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!							
226					Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!							
227					The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).							
228												
229					The data set for variable Thallium (nfmw9) was not processed!							
230												
231												
232	Thallium (smw10)											
233												
234					General Statistics							
235					Total Number of Observations	8				Number of Distinct Observations		5
236					Number of Detects	0				Number of Non-Detects		8
237					Number of Distinct Detects	0				Number of Distinct Non-Detects		5
238												
239					Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!							
240					Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!							
241					The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).							
242												
243					The data set for variable Thallium (smw10) was not processed!							
244												
245												
246	Thallium (smw11)											
247												
248					General Statistics							
249					Total Number of Observations	9				Number of Distinct Observations		7
250					Number of Detects	1				Number of Non-Detects		8
251					Number of Distinct Detects	1				Number of Distinct Non-Detects		6
252												
253					Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!							
254					It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).							
255												
256					The data set for variable Thallium (smw11) was not processed!							
257												
258												
259	Thallium (smw12)											
260												

	A	B	C	D	E	F	G	H	I	J	K	L
261	General Statistics											
262	Total Number of Observations					8	Number of Distinct Observations					6
263	Number of Detects					0	Number of Non-Detects					8
264	Number of Distinct Detects					0	Number of Distinct Non-Detects					6
265												
266	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
267	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
268	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
269												
270	The data set for variable Thallium (smw12) was not processed!											
271												
272												
273	Thallium (smw13)											
274												
275	General Statistics											
276	Total Number of Observations					8	Number of Distinct Observations					6
277	Number of Detects					1	Number of Non-Detects					7
278	Number of Distinct Detects					1	Number of Distinct Non-Detects					5
279												
280	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
281	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
282												
283	The data set for variable Thallium (smw13) was not processed!											
284												
285												
286	Thallium (smw14)											
287												
288	General Statistics											
289	Total Number of Observations					8	Number of Distinct Observations					6
290	Number of Detects					0	Number of Non-Detects					8
291	Number of Distinct Detects					0	Number of Distinct Non-Detects					6
292												
293	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
294	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
295	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
296												
297	The data set for variable Thallium (smw14) was not processed!											
298												
299												
300	Thallium (smw15)											
301												
302	General Statistics											
303	Total Number of Observations					9	Number of Distinct Observations					8
304	Number of Detects					6	Number of Non-Detects					3
305	Number of Distinct Detects					6	Number of Distinct Non-Detects					2
306	Minimum Detect					0.05	Minimum Non-Detect					0.047
307	Maximum Detect					0.15	Maximum Non-Detect					0.13
308	Variance Detects					0.00137	Percent Non-Detects					33.33%
309	Mean Detects					0.0927	SD Detects					0.037
310	Median Detects					0.0835	CV Detects					0.399
311	Skewness Detects					0.646	Kurtosis Detects					-0.587
312	Mean of Logged Detects					-2.445	SD of Logged Detects					0.401

313												
314	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
315	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
316	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
317	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
318												
319	**Normal GOF Test on Detects Only**											
320						Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk GOF Test**				
321						5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level				
322						Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**				
323						5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level				
324	**Detected Data appear Normal at 5% Significance Level**											
325												
326	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
327						KM Mean	0.0838	KM Standard Error of Mean	0.0132			
328						KM SD	0.0335	95% KM (BCA) UCL	0.104			
329						95% KM (t) UCL	0.108	95% KM (Percentile Bootstrap) UCL	0.104			
330						95% KM (z) UCL	0.106	95% KM Bootstrap t UCL	0.114			
331						90% KM Chebyshev UCL	0.123	95% KM Chebyshev UCL	0.141			
332						97.5% KM Chebyshev UCL	0.166	99% KM Chebyshev UCL	0.215			
333												
334	**Gamma GOF Tests on Detected Observations Only**											
335						A-D Test Statistic	0.214	**Anderson-Darling GOF Test**				
336						5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level				
337						K-S Test Statistic	0.208	**Kolmogorov-Smirnov GOF**				
338						5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level				
339	**Detected data appear Gamma Distributed at 5% Significance Level**											
340												
341	**Gamma Statistics on Detected Data Only**											
342						k hat (MLE)	7.677	k star (bias corrected MLE)	3.95			
343						Theta hat (MLE)	0.0121	Theta star (bias corrected MLE)	0.0235			
344						nu hat (MLE)	92.12	nu star (bias corrected)	47.39			
345						Mean (detects)	0.0927					
346												
347	**Gamma ROS Statistics using Imputed Non-Detects**											
348	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
349	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
350	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
351	This is especially true when the sample size is small.											
352	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
353						Minimum	0.0276	Mean	0.0807			
354						Maximum	0.15	Median	0.072			
355						SD	0.0373	CV	0.462			
356						k hat (MLE)	4.98	k star (bias corrected MLE)	3.394			
357						Theta hat (MLE)	0.0162	Theta star (bias corrected MLE)	0.0238			
358						nu hat (MLE)	89.63	nu star (bias corrected)	61.09			
359						Adjusted Level of Significance (β)	0.0231					
360						Approximate Chi Square Value (61.09, α)	44.11	Adjusted Chi Square Value (61.09, β)	41.09			
361						95% Gamma Approximate UCL (use when n>=50)	0.112	95% Gamma Adjusted UCL (use when n<50)	0.12			
362												
363	**Estimates of Gamma Parameters using KM Estimates**											
364						Mean (KM)	0.0838	SD (KM)	0.0335			

365					Variance (KM)	0.00112				SE of Mean (KM)		0.0132
366					k hat (KM)	6.252				k star (KM)		4.242
367					nu hat (KM)	112.5				nu star (KM)		76.36
368					theta hat (KM)	0.0134				theta star (KM)		0.0197
369					80% gamma percentile (KM)	0.115				90% gamma percentile (KM)		0.138
370					95% gamma percentile (KM)	0.16				99% gamma percentile (KM)		0.206
371												
372					**Gamma Kaplan-Meier (KM) Statistics**							
373					Approximate Chi Square Value (76.36, α)	57.23				Adjusted Chi Square Value (76.36, β)		53.75
374					95% Gamma Approximate KM-UCL (use when n>=50)	0.112				95% Gamma Adjusted KM-UCL (use when n<50)		0.119
375												
376					**Lognormal GOF Test on Detected Observations Only**							
377					Shapiro Wilk Test Statistic	0.976				**Shapiro Wilk GOF Test**		
378					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
379					Lilliefors Test Statistic	0.178				**Lilliefors GOF Test**		
380					5% Lilliefors Critical Value	0.325				Detected Data appear Lognormal at 5% Significance Level		
381					**Detected Data appear Lognormal at 5% Significance Level**							
382												
383					**Lognormal ROS Statistics Using Imputed Non-Detects**							
384					Mean in Original Scale	0.0814				Mean in Log Scale		-2.593
385					SD in Original Scale	0.0358				SD in Log Scale		0.44
386					95% t UCL (assumes normality of ROS data)	0.104				95% Percentile Bootstrap UCL		0.101
387					95% BCA Bootstrap UCL	0.103				95% Bootstrap t UCL		0.114
388					95% H-UCL (Log ROS)	0.116						
389												
390					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
391					KM Mean (logged)	-2.556				KM Geo Mean		0.0776
392					KM SD (logged)	0.389				95% Critical H Value (KM-Log)		2.119
393					KM Standard Error of Mean (logged)	0.156				95% H-UCL (KM -Log)		0.112
394					KM SD (logged)	0.389				95% Critical H Value (KM-Log)		2.119
395					KM Standard Error of Mean (logged)	0.156						
396												
397					**DL/2 Statistics**							
398					**DL/2 Normal**					**DL/2 Log-Transformed**		
399					Mean in Original Scale	0.0788				Mean in Log Scale		-2.654
400					SD in Original Scale	0.0378				SD in Log Scale		0.534
401					95% t UCL (Assumes normality)	0.102				95% H-Stat UCL		0.125
402					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
403												
404					**Nonparametric Distribution Free UCL Statistics**							
405					**Detected Data appear Normal Distributed at 5% Significance Level**							
406												
407					**Suggested UCL to Use**							
408					95% KM (t) UCL	0.108						
409												
410					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
411					Recommendations are based upon data size, data distribution, and skewness.							
412					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
413					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
414												
415	**Thallium (smw16)**											
416												

	A	B	C	D	E	F	G	H	I	J	K	L
417	General Statistics											
418	Total Number of Observations					9	Number of Distinct Observations					8
419	Number of Detects					1	Number of Non-Detects					8
420	Number of Distinct Detects					1	Number of Distinct Non-Detects					7
421												
422	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
423	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
424												
425	The data set for variable Thallium (smw16) was not processed!											
426												
427												
428	Thallium (smw16d)											
429												
430	General Statistics											
431	Total Number of Observations					8	Number of Distinct Observations					5
432	Number of Detects					0	Number of Non-Detects					8
433	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
434												
435	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
436	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
437	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
438												
439	The data set for variable Thallium (smw16d) was not processed!											
440												
441												
442	Thallium (smw17)											
443												
444	General Statistics											
445	Total Number of Observations					8	Number of Distinct Observations					5
446	Number of Detects					1	Number of Non-Detects					7
447	Number of Distinct Detects					1	Number of Distinct Non-Detects					4
448												
449	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
450	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
451												
452	The data set for variable Thallium (smw17) was not processed!											
453												
454												
455	Thallium (smw17d)											
456												
457	General Statistics											
458	Total Number of Observations					8	Number of Distinct Observations					5
459	Number of Detects					1	Number of Non-Detects					7
460	Number of Distinct Detects					1	Number of Distinct Non-Detects					4
461												
462	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
463	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
464												
465	The data set for variable Thallium (smw17d) was not processed!											
466												
467												
468	Thallium (smw18)											

469												
470	General Statistics											
471					Total Number of Observations	8				Number of Distinct Observations		6
472					Number of Detects	0				Number of Non-Detects		8
473					Number of Distinct Detects	0				Number of Distinct Non-Detects		6
474												
475	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
476	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
477	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
478												
479	The data set for variable Thallium (smw18) was not processed!											
480												
481												
482	Thallium (smw18d)											
483												
484	General Statistics											
485					Total Number of Observations	8				Number of Distinct Observations		5
486					Number of Detects	0				Number of Non-Detects		8
487					Number of Distinct Detects	0				Number of Distinct Non-Detects		5
488												
489	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
490	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
491	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
492												
493	The data set for variable Thallium (smw18d) was not processed!											
494												
495												
496	Thallium (smw19)											
497												
498	General Statistics											
499					Total Number of Observations	8				Number of Distinct Observations		6
500					Number of Detects	0				Number of Non-Detects		8
501					Number of Distinct Detects	0				Number of Distinct Non-Detects		6
502												
503	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
504	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
505	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
506												
507	The data set for variable Thallium (smw19) was not processed!											
508												
509												
510	Thallium (smw7)											
511												
512	General Statistics											
513					Total Number of Observations	8				Number of Distinct Observations		5
514					Number of Detects	0				Number of Non-Detects		8
515					Number of Distinct Detects	0				Number of Distinct Non-Detects		5
516												
517	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
518	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
519	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
520												

	A	B	C	D	E	F	G	H	I	J	K	L
521	**The data set for variable Thallium (smw7) was not processed!**											
522												
523												
524	**Thallium (smw8)**											
525												
526	**General Statistics**											
527	Total Number of Observations					8	Number of Distinct Observations					5
528	Number of Detects					0	Number of Non-Detects					8
529	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
530												
531	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
532	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
533	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
534												
535	**The data set for variable Thallium (smw8) was not processed!**											
536												
537												
538	**Thallium (smw9)**											
539												
540	**General Statistics**											
541	Total Number of Observations					9	Number of Distinct Observations					6
542	Number of Detects					0	Number of Non-Detects					9
543	Number of Distinct Detects					0	Number of Distinct Non-Detects					6
544												
545	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
546	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
547	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
548												
549	**The data set for variable Thallium (smw9) was not processed!**											
550												
551												
552	**Thallium (tw2r)**											
553												
554	**General Statistics**											
555	Total Number of Observations					9	Number of Distinct Observations					7
556	Number of Detects					0	Number of Non-Detects					9
557	Number of Distinct Detects					0	Number of Distinct Non-Detects					7
558												
559	**Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!**											
560	**Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!**											
561	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
562												
563	**The data set for variable Thallium (tw2r) was not processed!**											
564												
565												
566	**Thallium (tw5r)**											
567												
568	**General Statistics**											
569	Total Number of Observations					8	Number of Distinct Observations					5
570	Number of Detects					0	Number of Non-Detects					8
571	Number of Distinct Detects					0	Number of Distinct Non-Detects					5
572												

	A	B	C	D	E	F	G	H	I	J	K	L
573	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
574	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
575	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
576												
577	The data set for variable Thallium (tw5r) was not processed!											
578												
579												
580												
581	Thallium (waste water clarifier well)											
582												
583	General Statistics											
584					Total Number of Observations	1				Number of Distinct Observations	1	
585										Number of Missing Observations	0	
586					Minimum	0.17				Mean	0.17	
587					Maximum	0.17				Median	0.17	
588												
589	Warning: This data set only has 1 observations!											
590	Data set is too small to compute reliable and meaningful statistics and estimates!											
591	The data set for variable Thallium (waste water clarifier well) was not processed!											
592												
593	It is suggested to collect at least 8 to 10 observations before using these statistical methods!											
594	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.											

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/10/2021 11:08:08 AM
From File	OU3 ProUCL Input 05.07.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Vanadium (atmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	4.2	Mean	9.344
Maximum	17	Median	8.8
SD	4.247	Std. Error of Mean	1.416
Coefficient of Variation	0.454	Skewness	0.612

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.98	95% Adjusted-CLT UCL (Chen-1995)	11.98
		95% Modified-t UCL (Johnson-1978)	12.02

Gamma GOF Test

A-D Test Statistic	0.204	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.163	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.464	k star (bias corrected MLE)	3.716
Theta hat (MLE)	1.71	Theta star (bias corrected MLE)	2.514
nu hat (MLE)	98.34	nu star (bias corrected)	66.9
MLE Mean (bias corrected)	9.344	MLE Sd (bias corrected)	4.847
		Approximate Chi Square Value (0.05)	49.07
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	45.87

53	**Assuming Gamma Distribution**											
54	95% Approximate Gamma UCL (use when n>=50))					12.74	95% Adjusted Gamma UCL (use when n<50)					13.63
55												
56	**Lognormal GOF Test**											
57	Shapiro Wilk Test Statistic					0.969	**Shapiro Wilk Lognormal GOF Test**					
58	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
59	Lilliefors Test Statistic					0.148	**Lilliefors Lognormal GOF Test**					
60	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64	Minimum of Logged Data					1.435	Mean of logged Data					2.14
65	Maximum of Logged Data					2.833	SD of logged Data					0.466
66												
67	**Assuming Lognormal Distribution**											
68	95% H-UCL					13.62	90% Chebyshev (MVUE) UCL					13.78
69	95% Chebyshev (MVUE) UCL					15.78	97.5% Chebyshev (MVUE) UCL					18.55
70	99% Chebyshev (MVUE) UCL					24.01						
71												
72	**Nonparametric Distribution Free UCL Statistics**											
73	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
74												
75	**Nonparametric Distribution Free UCLs**											
76	95% CLT UCL					11.67	95% Jackknife UCL					11.98
77	95% Standard Bootstrap UCL					11.53	95% Bootstrap-t UCL					12.51
78	95% Hall's Bootstrap UCL					12.51	95% Percentile Bootstrap UCL					11.59
79	95% BCA Bootstrap UCL					11.9						
80	90% Chebyshev(Mean, Sd) UCL					13.59	95% Chebyshev(Mean, Sd) UCL					15.51
81	97.5% Chebyshev(Mean, Sd) UCL					18.18	99% Chebyshev(Mean, Sd) UCL					23.43
82												
83	**Suggested UCL to Use**											
84	95% Student's-t UCL					11.98						
85												
86	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
87	Recommendations are based upon data size, data distribution, and skewness.											
88	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
89	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
90												
91												
92	**Vanadium (nfmw10)**											
93												
94	**General Statistics**											
95	Total Number of Observations					8	Number of Distinct Observations					8
96							Number of Missing Observations					0
97	Minimum					11.7	Mean					25.7
98	Maximum					44.9	Median					24.85
99	SD					12.3	Std. Error of Mean					4.35
100	Coefficient of Variation					0.479	Skewness					0.434
101												
102	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
103	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
104	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											

105	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
106												
107	**Normal GOF Test**											
108					Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**					
109					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
110					Lilliefors Test Statistic	0.145	**Lilliefors GOF Test**					
111					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
112	**Data appear Normal at 5% Significance Level**											
113												
114	**Assuming Normal Distribution**											
115	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
116					95% Student's-t UCL	33.94	95% Adjusted-CLT UCL (Chen-1995)	33.57				
117							95% Modified-t UCL (Johnson-1978)	34.05				
118												
119	**Gamma GOF Test**											
120					A-D Test Statistic	0.25	**Anderson-Darling Gamma GOF Test**					
121					5% A-D Critical Value	0.719	Detected data appear Gamma Distributed at 5% Significance Level					
122					K-S Test Statistic	0.144	**Kolmogorov-Smirnov Gamma GOF Test**					
123					5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level					
124	**Detected data appear Gamma Distributed at 5% Significance Level**											
125												
126	**Gamma Statistics**											
127					k hat (MLE)	4.817	k star (bias corrected MLE)	3.094				
128					Theta hat (MLE)	5.336	Theta star (bias corrected MLE)	8.307				
129					nu hat (MLE)	77.07	nu star (bias corrected)	49.5				
130					MLE Mean (bias corrected)	25.7	MLE Sd (bias corrected)	14.61				
131							Approximate Chi Square Value (0.05)	34.35				
132					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	31.19				
133												
134	**Assuming Gamma Distribution**											
135					95% Approximate Gamma UCL (use when n>=50))	37.04	95% Adjusted Gamma UCL (use when n<50)	40.79				
136												
137	**Lognormal GOF Test**											
138					Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk Lognormal GOF Test**					
139					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
140					Lilliefors Test Statistic	0.143	**Lilliefors Lognormal GOF Test**					
141					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
142	**Data appear Lognormal at 5% Significance Level**											
143												
144	**Lognormal Statistics**											
145					Minimum of Logged Data	2.46	Mean of logged Data	3.139				
146					Maximum of Logged Data	3.804	SD of logged Data	0.505				
147												
148	**Assuming Lognormal Distribution**											
149					95% H-UCL	41.2	90% Chebyshev (MVUE) UCL	39.74				
150					95% Chebyshev (MVUE) UCL	46.07	97.5% Chebyshev (MVUE) UCL	54.84				
151					99% Chebyshev (MVUE) UCL	72.09						
152												
153	**Nonparametric Distribution Free UCL Statistics**											
154	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
155												
156	**Nonparametric Distribution Free UCLs**											

157					95% CLT UCL	32.86					95% Jackknife UCL	33.94
158					95% Standard Bootstrap UCL	32.49					95% Bootstrap-t UCL	34.66
159					95% Hall's Bootstrap UCL	34.49					95% Percentile Bootstrap UCL	32.28
160					95% BCA Bootstrap UCL	32.96						
161					90% Chebyshev(Mean, Sd) UCL	38.75					95% Chebyshev(Mean, Sd) UCL	44.66
162					97.5% Chebyshev(Mean, Sd) UCL	52.87					99% Chebyshev(Mean, Sd) UCL	68.98
163												
164					**Suggested UCL to Use**							
165					95% Student's-t UCL	33.94						
166												
167	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
168	Recommendations are based upon data size, data distribution, and skewness.											
169	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
170	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
171												
172	**Vanadium (nfmw11)**											
173												
174					**General Statistics**							
175					Total Number of Observations	8					Number of Distinct Observations	8
176					Number of Detects	6					Number of Non-Detects	2
177					Number of Distinct Detects	6					Number of Distinct Non-Detects	2
178					Minimum Detect	0.88					Minimum Non-Detect	1.3
179					Maximum Detect	4.7					Maximum Non-Detect	5.3
180					Variance Detects	2.206					Percent Non-Detects	25%
181					Mean Detects	2.097					SD Detects	1.485
182					Median Detects	1.45					CV Detects	0.708
183					Skewness Detects	1.356					Kurtosis Detects	1.009
184					Mean of Logged Detects	0.554					SD of Logged Detects	0.648
185												
186	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
187	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
188	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
189	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
190												
191					**Normal GOF Test on Detects Only**							
192					Shapiro Wilk Test Statistic	0.834					**Shapiro Wilk GOF Test**	
193					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Normal at 5% Significance Level	
194					Lilliefors Test Statistic	0.272					**Lilliefors GOF Test**	
195					5% Lilliefors Critical Value	0.325					Detected Data appear Normal at 5% Significance Level	
196	**Detected Data appear Normal at 5% Significance Level**											
197												
198	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
199					KM Mean	1.949					KM Standard Error of Mean	0.542
200					KM SD	1.308					95% KM (BCA) UCL	2.818
201					95% KM (t) UCL	2.975					95% KM (Percentile Bootstrap) UCL	2.871
202					95% KM (z) UCL	2.84					95% KM Bootstrap t UCL	5.284
203					90% KM Chebyshev UCL	3.574					95% KM Chebyshev UCL	4.311
204					97.5% KM Chebyshev UCL	5.333					99% KM Chebyshev UCL	7.34
205												
206					**Gamma GOF Tests on Detected Observations Only**							
207					A-D Test Statistic	0.403					**Anderson-Darling GOF Test**	
208					5% A-D Critical Value	0.702					Detected data appear Gamma Distributed at 5% Significance Level	

209					K-S Test Statistic	0.244	**Kolmogorov-Smirnov GOF**					
210					5% K-S Critical Value	0.335	Detected data appear Gamma Distributed at 5% Significance Level					
211	**Detected data appear Gamma Distributed at 5% Significance Level**											
212												
213	**Gamma Statistics on Detected Data Only**											
214					k hat (MLE)	2.845	k star (bias corrected MLE)	1.534				
215					Theta hat (MLE)	0.737	Theta star (bias corrected MLE)	1.367				
216					nu hat (MLE)	34.14	nu star (bias corrected)	18.4				
217					Mean (detects)	2.097						
218												
219	**Gamma ROS Statistics using Imputed Non-Detects**											
220	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
221	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
222	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
223	This is especially true when the sample size is small.											
224	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
225					Minimum	0.88	Mean	1.907				
226					Maximum	4.7	Median	1.45				
227					SD	1.319	CV	0.692				
228					k hat (MLE)	3.141	k star (bias corrected MLE)	2.047				
229					Theta hat (MLE)	0.607	Theta star (bias corrected MLE)	0.932				
230					nu hat (MLE)	50.26	nu star (bias corrected)	32.74				
231					Adjusted Level of Significance (β)	0.0195						
232					Approximate Chi Square Value (32.74, α)	20.66	Adjusted Chi Square Value (32.74, β)	18.28				
233					95% Gamma Approximate UCL (use when n>=50)	3.021	95% Gamma Adjusted UCL (use when n<50)	3.416				
234												
235	**Estimates of Gamma Parameters using KM Estimates**											
236					Mean (KM)	1.949	SD (KM)	1.308				
237					Variance (KM)	1.71	SE of Mean (KM)	0.542				
238					k hat (KM)	2.221	k star (KM)	1.471				
239					nu hat (KM)	35.53	nu star (KM)	23.54				
240					theta hat (KM)	0.877	theta star (KM)	1.324				
241					80% gamma percentile (KM)	3.021	90% gamma percentile (KM)	4.08				
242					95% gamma percentile (KM)	5.109	99% gamma percentile (KM)	7.435				
243												
244	**Gamma Kaplan-Meier (KM) Statistics**											
245					Approximate Chi Square Value (23.54, α)	13.5	Adjusted Chi Square Value (23.54, β)	11.62				
246					95% Gamma Approximate KM-UCL (use when n>=50)	3.398	95% Gamma Adjusted KM-UCL (use when n<50)	3.947				
247												
248	**Lognormal GOF Test on Detected Observations Only**											
249					Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk GOF Test**					
250					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level					
251					Lilliefors Test Statistic	0.217	**Lilliefors GOF Test**					
252					5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level					
253	**Detected Data appear Lognormal at 5% Significance Level**											
254												
255	**Lognormal ROS Statistics Using Imputed Non-Detects**											
256					Mean in Original Scale	1.907	Mean in Log Scale	0.484				
257					SD in Original Scale	1.311	SD in Log Scale	0.573				
258					95% t UCL (assumes normality of ROS data)	2.785	95% Percentile Bootstrap UCL	2.66				
259					95% BCA Bootstrap UCL	2.957	95% Bootstrap t UCL	4.739				
260					95% H-UCL (Log ROS)	3.274						

261												
262	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
263					KM Mean (logged)	0.482			KM Geo Mean	1.62		
264					KM SD (logged)	0.577			95% Critical H Value (KM-Log)	2.491		
265					KM Standard Error of Mean (logged)	0.24			95% H-UCL (KM -Log)	3.296		
266					KM SD (logged)	0.577			95% Critical H Value (KM-Log)	2.491		
267					KM Standard Error of Mean (logged)	0.24						
268												
269	**DL/2 Statistics**											
270	**DL/2 Normal**						**DL/2 Log-Transformed**					
271					Mean in Original Scale	1.985			Mean in Log Scale	0.484		
272					SD in Original Scale	1.38			SD in Log Scale	0.677		
273					95% t UCL (Assumes normality)	2.909			95% H-Stat UCL	4.054		
274	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
275												
276	**Nonparametric Distribution Free UCL Statistics**											
277	**Detected Data appear Normal Distributed at 5% Significance Level**											
278												
279	**Suggested UCL to Use**											
280					95% KM (t) UCL	2.975						
281												
282	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
283	Recommendations are based upon data size, data distribution, and skewness.											
284	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
285	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
286												
287	**Vanadium (nfmw12)**											
288												
289	**General Statistics**											
290					Total Number of Observations	8			Number of Distinct Observations	8		
291					Number of Detects	5			Number of Non-Detects	3		
292					Number of Distinct Detects	5			Number of Distinct Non-Detects	3		
293					Minimum Detect	0.36			Minimum Non-Detect	0.27		
294					Maximum Detect	0.88			Maximum Non-Detect	1.3		
295					Variance Detects	0.0384			Percent Non-Detects	37.5%		
296					Mean Detects	0.554			SD Detects	0.196		
297					Median Detects	0.53			CV Detects	0.354		
298					Skewness Detects	1.468			Kurtosis Detects	2.853		
299					Mean of Logged Detects	-0.635			SD of Logged Detects	0.327		
300												
301	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
302	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
303	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
304	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
305												
306	**Normal GOF Test on Detects Only**											
307					Shapiro Wilk Test Statistic	0.867			**Shapiro Wilk GOF Test**			
308					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Normal at 5% Significance Level			
309					Lilliefors Test Statistic	0.328			**Lilliefors GOF Test**			
310					5% Lilliefors Critical Value	0.343			Detected Data appear Normal at 5% Significance Level			
311	**Detected Data appear Normal at 5% Significance Level**											
312												

	A	B	C	D	E	F	G	H	I	J	K	L
313	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
314					KM Mean	0.507				KM Standard Error of Mean		0.0875
315					KM SD	0.192				95% KM (BCA) UCL		0.65
316					95% KM (t) UCL	0.673				95% KM (Percentile Bootstrap) UCL		0.645
317					95% KM (z) UCL	0.651				95% KM Bootstrap t UCL		0.721
318					90% KM Chebyshev UCL	0.769				95% KM Chebyshev UCL		0.888
319					97.5% KM Chebyshev UCL	1.053				99% KM Chebyshev UCL		1.378
320												
321	**Gamma GOF Tests on Detected Observations Only**											
322					A-D Test Statistic	0.364	**Anderson-Darling GOF Test**					
323					5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level					
324					K-S Test Statistic	0.295	**Kolmogorov-Smirnov GOF**					
325					5% K-S Critical Value	0.358	Detected data appear Gamma Distributed at 5% Significance Level					
326	**Detected data appear Gamma Distributed at 5% Significance Level**											
327												
328	**Gamma Statistics on Detected Data Only**											
329					k hat (MLE)	11.32				k star (bias corrected MLE)		4.661
330					Theta hat (MLE)	0.0489				Theta star (bias corrected MLE)		0.119
331					nu hat (MLE)	113.2				nu star (bias corrected)		46.61
332					Mean (detects)	0.554						
333												
334	**Gamma ROS Statistics using Imputed Non-Detects**											
335	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
336	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
337	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
338	This is especially true when the sample size is small.											
339	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
340					Minimum	0.139				Mean		0.482
341					Maximum	0.88				Median		0.474
342					SD	0.206				CV		0.427
343					k hat (MLE)	5.128				k star (bias corrected MLE)		3.288
344					Theta hat (MLE)	0.094				Theta star (bias corrected MLE)		0.147
345					nu hat (MLE)	82.04				nu star (bias corrected)		52.61
346					Adjusted Level of Significance (β)	0.0195						
347					Approximate Chi Square Value (52.61, α)	36.95				Adjusted Chi Square Value (52.61, β)		33.66
348					95% Gamma Approximate UCL (use when n>=50)	0.687				95% Gamma Adjusted UCL (use when n<50)		0.754
349												
350	**Estimates of Gamma Parameters using KM Estimates**											
351					Mean (KM)	0.507				SD (KM)		0.192
352					Variance (KM)	0.0368				SE of Mean (KM)		0.0875
353					k hat (KM)	6.978				k star (KM)		4.445
354					nu hat (KM)	111.6				nu star (KM)		71.11
355					theta hat (KM)	0.0726				theta star (KM)		0.114
356					80% gamma percentile (KM)	0.69				90% gamma percentile (KM)		0.829
357					95% gamma percentile (KM)	0.956				99% gamma percentile (KM)		1.225
358												
359	**Gamma Kaplan-Meier (KM) Statistics**											
360					Approximate Chi Square Value (71.11, α)	52.7				Adjusted Chi Square Value (71.11, β)		48.71
361					95% Gamma Approximate KM-UCL (use when n>=50)	0.684				95% Gamma Adjusted KM-UCL (use when n<50)		0.74
362												
363	**Lognormal GOF Test on Detected Observations Only**											
364					Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
365					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level					
366					Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**					
367					5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level					
368	**Detected Data appear Lognormal at 5% Significance Level**											
369												
370	**Lognormal ROS Statistics Using Imputed Non-Detects**											
371					Mean in Original Scale	0.492	Mean in Log Scale	-0.77				
372					SD in Original Scale	0.186	SD in Log Scale	0.376				
373					95% t UCL (assumes normality of ROS data)	0.617	95% Percentile Bootstrap UCL	0.604				
374					95% BCA Bootstrap UCL	0.624	95% Bootstrap t UCL	0.646				
375					95% H-UCL (Log ROS)	0.676						
376												
377	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
378					KM Mean (logged)	-0.748	KM Geo Mean	0.473				
379					KM SD (logged)	0.366	95% Critical H Value (KM-Log)	2.147				
380					KM Standard Error of Mean (logged)	0.167	95% H-UCL (KM -Log)	0.682				
381					KM SD (logged)	0.366	95% Critical H Value (KM-Log)	2.147				
382					KM Standard Error of Mean (logged)	0.167						
383												
384	**DL/2 Statistics**											
385	**DL/2 Normal**						**DL/2 Log-Transformed**					
386					Mean in Original Scale	0.507	Mean in Log Scale	-0.788				
387					SD in Original Scale	0.215	SD in Log Scale	0.555				
388					95% t UCL (Assumes normality)	0.651	95% H-Stat UCL	0.887				
389	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
390												
391	**Nonparametric Distribution Free UCL Statistics**											
392	**Detected Data appear Normal Distributed at 5% Significance Level**											
393												
394	**Suggested UCL to Use**											
395					95% KM (t) UCL	0.673						
396												
397	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
398	Recommendations are based upon data size, data distribution, and skewness.											
399	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
400	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
401												
402	**Vanadium (nfmw19)**											
403												
404	**General Statistics**											
405					Total Number of Observations	8	Number of Distinct Observations	7				
406					Number of Detects	5	Number of Non-Detects	3				
407					Number of Distinct Detects	5	Number of Distinct Non-Detects	2				
408					Minimum Detect	1	Minimum Non-Detect	1.3				
409					Maximum Detect	4	Maximum Non-Detect	5.3				
410					Variance Detects	1.487	Percent Non-Detects	37.5%				
411					Mean Detects	1.92	SD Detects	1.219				
412					Median Detects	1.6	CV Detects	0.635				
413					Skewness Detects	1.755	Kurtosis Detects	3.248				
414					Mean of Logged Detects	0.519	SD of Logged Detects	0.552				
415												
416	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											

	A	B	C	D	E	F	G	H	I	J	K	L
417	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
418	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
419	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
420												
421	Normal GOF Test on Detects Only											
422					Shapiro Wilk Test Statistic	0.804	Shapiro Wilk GOF Test					
423					5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level					
424					Lilliefors Test Statistic	0.307	Lilliefors GOF Test					
425					5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level					
426	Detected Data appear Normal at 5% Significance Level											
427												
428	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
429					KM Mean	1.671	KM Standard Error of Mean	0.424				
430					KM SD	1.002	95% KM (BCA) UCL	2.393				
431					95% KM (t) UCL	2.475	95% KM (Percentile Bootstrap) UCL	2.388				
432					95% KM (z) UCL	2.369	95% KM Bootstrap t UCL	3.582				
433					90% KM Chebyshev UCL	2.943	95% KM Chebyshev UCL	3.519				
434					97.5% KM Chebyshev UCL	4.319	99% KM Chebyshev UCL	5.889				
435												
436	Gamma GOF Tests on Detected Observations Only											
437					A-D Test Statistic	0.402	Anderson-Darling GOF Test					
438					5% A-D Critical Value	0.681	Detected data appear Gamma Distributed at 5% Significance Level					
439					K-S Test Statistic	0.241	Kolmogorov-Smirnov GOF					
440					5% K-S Critical Value	0.359	Detected data appear Gamma Distributed at 5% Significance Level					
441	Detected data appear Gamma Distributed at 5% Significance Level											
442												
443	Gamma Statistics on Detected Data Only											
444					k hat (MLE)	3.9	k star (bias corrected MLE)	1.694				
445					Theta hat (MLE)	0.492	Theta star (bias corrected MLE)	1.134				
446					nu hat (MLE)	39	nu star (bias corrected)	16.94				
447					Mean (detects)	1.92						
448												
449	Gamma ROS Statistics using Imputed Non-Detects											
450	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
451	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
452	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
453	This is especially true when the sample size is small.											
454	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
455					Minimum	0.59	Mean	1.599				
456					Maximum	4	Median	1.302				
457					SD	1.05	CV	0.656				
458					k hat (MLE)	3.549	k star (bias corrected MLE)	2.301				
459					Theta hat (MLE)	0.451	Theta star (bias corrected MLE)	0.695				
460					nu hat (MLE)	56.78	nu star (bias corrected)	36.82				
461					Adjusted Level of Significance (β)	0.0195						
462					Approximate Chi Square Value (36.82, α)	23.93	Adjusted Chi Square Value (36.82, β)	21.34				
463					95% Gamma Approximate UCL (use when n>=50)	2.461	95% Gamma Adjusted UCL (use when n<50)	2.759				
464												
465	Estimates of Gamma Parameters using KM Estimates											
466					Mean (KM)	1.671	SD (KM)	1.002				
467					Variance (KM)	1.005	SE of Mean (KM)	0.424				
468					k hat (KM)	2.78	k star (KM)	1.821				

	A	B	C	D	E	F	G	H	I	J	K	L
469					nu hat (KM)	44.48				nu star (KM)		29.13
470					theta hat (KM)	0.601				theta star (KM)		0.918
471					80% gamma percentile (KM)	2.53				90% gamma percentile (KM)		3.324
472					95% gamma percentile (KM)	4.085				99% gamma percentile (KM)		5.784
473												
474					**Gamma Kaplan-Meier (KM) Statistics**							
475					Approximate Chi Square Value (29.13, α)	17.81				Adjusted Chi Square Value (29.13, β)		15.62
476					95% Gamma Approximate KM-UCL (use when n>=50)	2.734				95% Gamma Adjusted KM-UCL (use when n<50)		3.118
477												
478					**Lognormal GOF Test on Detected Observations Only**							
479					Shapiro Wilk Test Statistic	0.91				**Shapiro Wilk GOF Test**		
480					5% Shapiro Wilk Critical Value	0.762				Detected Data appear Lognormal at 5% Significance Level		
481					Lilliefors Test Statistic	0.212				**Lilliefors GOF Test**		
482					5% Lilliefors Critical Value	0.343				Detected Data appear Lognormal at 5% Significance Level		
483					**Detected Data appear Lognormal at 5% Significance Level**							
484												
485					**Lognormal ROS Statistics Using Imputed Non-Detects**							
486					Mean in Original Scale	1.635				Mean in Log Scale		0.371
487					SD in Original Scale	1.015				SD in Log Scale		0.486
488					95% t UCL (assumes normality of ROS data)	2.314				95% Percentile Bootstrap UCL		2.256
489					95% BCA Bootstrap UCL	2.441				95% Bootstrap t UCL		3.244
490					95% H-UCL (Log ROS)	2.501						
491												
492					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
493					KM Mean (logged)	0.384				KM Geo Mean		1.468
494					KM SD (logged)	0.469				95% Critical H Value (KM-Log)		2.302
495					KM Standard Error of Mean (logged)	0.199				95% H-UCL (KM -Log)		2.465
496					KM SD (logged)	0.469				95% Critical H Value (KM-Log)		2.302
497					KM Standard Error of Mean (logged)	0.199						
498												
499					**DL/2 Statistics**							
500					**DL/2 Normal**					**DL/2 Log-Transformed**		
501					Mean in Original Scale	1.694				Mean in Log Scale		0.338
502					SD in Original Scale	1.152				SD in Log Scale		0.651
503					95% t UCL (Assumes normality)	2.466				95% H-Stat UCL		3.316
504					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
505												
506					**Nonparametric Distribution Free UCL Statistics**							
507					**Detected Data appear Normal Distributed at 5% Significance Level**							
508												
509					**Suggested UCL to Use**							
510					95% KM (t) UCL	2.475						
511												
512					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
513					Recommendations are based upon data size, data distribution, and skewness.							
514					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
515					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
516												
517												
518	**Vanadium (nfmw1d)**											
519												
520					**General Statistics**							

521	Total Number of Observations					9	Number of Distinct Observations					9
522							Number of Missing Observations					0
523	Minimum					19.4	Mean					29.27
524	Maximum					36.4	Median					32.1
525	SD					6.263	Std. Error of Mean					2.088
526	Coefficient of Variation					0.214	Skewness					-0.37
527												
528	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
529	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
530	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
531	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
532												
533	**Normal GOF Test**											
534	Shapiro Wilk Test Statistic					0.882	**Shapiro Wilk GOF Test**					
535	5% Shapiro Wilk Critical Value					0.829	Data appear Normal at 5% Significance Level					
536	Lilliefors Test Statistic					0.23	**Lilliefors GOF Test**					
537	5% Lilliefors Critical Value					0.274	Data appear Normal at 5% Significance Level					
538	**Data appear Normal at 5% Significance Level**											
539												
540	**Assuming Normal Distribution**											
541	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
542	95% Student's-t UCL					33.15	95% Adjusted-CLT UCL (Chen-1995)					32.43
543							95% Modified-t UCL (Johnson-1978)					33.11
544												
545	**Gamma GOF Test**											
546	A-D Test Statistic					0.605	**Anderson-Darling Gamma GOF Test**					
547	5% A-D Critical Value					0.721	Detected data appear Gamma Distributed at 5% Significance Level					
548	K-S Test Statistic					0.254	**Kolmogorov-Smirnov Gamma GOF Test**					
549	5% K-S Critical Value					0.279	Detected data appear Gamma Distributed at 5% Significance Level					
550	**Detected data appear Gamma Distributed at 5% Significance Level**											
551												
552	**Gamma Statistics**											
553	k hat (MLE)					22.96	k star (bias corrected MLE)					15.38
554	Theta hat (MLE)					1.275	Theta star (bias corrected MLE)					1.903
555	nu hat (MLE)					413.2	nu star (bias corrected)					276.8
556	MLE Mean (bias corrected)					29.27	MLE Sd (bias corrected)					7.463
557							Approximate Chi Square Value (0.05)					239.3
558	Adjusted Level of Significance					0.0231	Adjusted Chi Square Value					231.9
559												
560	**Assuming Gamma Distribution**											
561	95% Approximate Gamma UCL (use when n>=50))					33.86	95% Adjusted Gamma UCL (use when n<50)					34.93
562												
563	**Lognormal GOF Test**											
564	Shapiro Wilk Test Statistic					0.875	**Shapiro Wilk Lognormal GOF Test**					
565	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
566	Lilliefors Test Statistic					0.249	**Lilliefors Lognormal GOF Test**					
567	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
568	**Data appear Lognormal at 5% Significance Level**											
569												
570	**Lognormal Statistics**											
571	Minimum of Logged Data					2.965	Mean of logged Data					3.355
572	Maximum of Logged Data					3.595	SD of logged Data					0.226

573												
574	**Assuming Lognormal Distribution**											
575					95% H-UCL	34.29			90% Chebyshev (MVUE) UCL	35.94		
576					95% Chebyshev (MVUE) UCL	38.96			97.5% Chebyshev (MVUE) UCL	43.14		
577					99% Chebyshev (MVUE) UCL	51.36						
578												
579	**Nonparametric Distribution Free UCL Statistics**											
580	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
581												
582	**Nonparametric Distribution Free UCLs**											
583					95% CLT UCL	32.7			95% Jackknife UCL	33.15		
584					95% Standard Bootstrap UCL	32.5			95% Bootstrap-t UCL	32.83		
585					95% Hall's Bootstrap UCL	31.99			95% Percentile Bootstrap UCL	32.57		
586					95% BCA Bootstrap UCL	32.2						
587					90% Chebyshev(Mean, Sd) UCL	35.53			95% Chebyshev(Mean, Sd) UCL	38.37		
588					97.5% Chebyshev(Mean, Sd) UCL	42.3			99% Chebyshev(Mean, Sd) UCL	50.04		
589												
590	**Suggested UCL to Use**											
591					95% Student's-t UCL	33.15						
592												
593	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
594	Recommendations are based upon data size, data distribution, and skewness.											
595	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
596	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
597												
598	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
599	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
600												
601												
602	**Vanadium (nfmw1s)**											
603												
604	**General Statistics**											
605					Total Number of Observations	7			Number of Distinct Observations	7		
606									Number of Missing Observations	0		
607					Minimum	44.2			Mean	89.56		
608					Maximum	178			Median	83		
609					SD	46.8			Std. Error of Mean	17.69		
610					Coefficient of Variation	0.523			Skewness	1.218		
611												
612	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
613	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
614	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
615	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
616												
617	**Normal GOF Test**											
618					Shapiro Wilk Test Statistic	0.886			**Shapiro Wilk GOF Test**			
619					5% Shapiro Wilk Critical Value	0.803			Data appear Normal at 5% Significance Level			
620					Lilliefors Test Statistic	0.253			**Lilliefors GOF Test**			
621					5% Lilliefors Critical Value	0.304			Data appear Normal at 5% Significance Level			
622	**Data appear Normal at 5% Significance Level**											
623												
624	**Assuming Normal Distribution**											

	A	B	C	D	E	F	G	H	I	J	K	L
625	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
626					95% Student's-t UCL	123.9					95% Adjusted-CLT UCL (Chen-1995)	127.4
627											95% Modified-t UCL (Johnson-1978)	125.3
628												
629	**Gamma GOF Test**											
630					A-D Test Statistic	0.287	**Anderson-Darling Gamma GOF Test**					
631					5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance Level					
632					K-S Test Statistic	0.198	**Kolmogorov-Smirnov Gamma GOF Test**					
633					5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level					
634	**Detected data appear Gamma Distributed at 5% Significance Level**											
635												
636	**Gamma Statistics**											
637					k hat (MLE)	4.762	k star (bias corrected MLE)					2.816
638					Theta hat (MLE)	18.81	Theta star (bias corrected MLE)					31.8
639					nu hat (MLE)	66.66	nu star (bias corrected)					39.43
640					MLE Mean (bias corrected)	89.56	MLE Sd (bias corrected)					53.37
641							Approximate Chi Square Value (0.05)					26.04
642					Adjusted Level of Significance	0.0158	Adjusted Chi Square Value					22.81
643												
644	**Assuming Gamma Distribution**											
645				95% Approximate Gamma UCL (use when n>=50))		135.6	95% Adjusted Gamma UCL (use when n<50)					154.8
646												
647	**Lognormal GOF Test**											
648					Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**					
649					5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level					
650					Lilliefors Test Statistic	0.169	**Lilliefors Lognormal GOF Test**					
651					5% Lilliefors Critical Value	0.304	Data appear Lognormal at 5% Significance Level					
652	**Data appear Lognormal at 5% Significance Level**											
653												
654	**Lognormal Statistics**											
655					Minimum of Logged Data	3.789	Mean of logged Data					4.386
656					Maximum of Logged Data	5.182	SD of logged Data					0.498
657												
658	**Assuming Lognormal Distribution**											
659					95% H-UCL	150.1	90% Chebyshev (MVUE) UCL					139.9
660					95% Chebyshev (MVUE) UCL	162.9	97.5% Chebyshev (MVUE) UCL					194.7
661					99% Chebyshev (MVUE) UCL	257.3						
662												
663	**Nonparametric Distribution Free UCL Statistics**											
664	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
665												
666	**Nonparametric Distribution Free UCLs**											
667					95% CLT UCL	118.7	95% Jackknife UCL					123.9
668					95% Standard Bootstrap UCL	116.3	95% Bootstrap-t UCL					145.2
669					95% Hall's Bootstrap UCL	305.5	95% Percentile Bootstrap UCL					118.4
670					95% BCA Bootstrap UCL	122						
671					90% Chebyshev(Mean, Sd) UCL	142.6	95% Chebyshev(Mean, Sd) UCL					166.7
672					97.5% Chebyshev(Mean, Sd) UCL	200	99% Chebyshev(Mean, Sd) UCL					265.6
673												
674	**Suggested UCL to Use**											
675					95% Student's-t UCL	123.9						
676												

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium (nfmw2)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
Number of Detects	6	Number of Non-Detects	3
Number of Distinct Detects	6	Number of Distinct Non-Detects	2
Minimum Detect	0.56	Minimum Non-Detect	0.89
Maximum Detect	7.2	Maximum Non-Detect	5.3
Variance Detects	6.498	Percent Non-Detects	33.33%
Mean Detects	2.02	SD Detects	2.549
Median Detects	1.045	CV Detects	1.262
Skewness Detects	2.399	Kurtosis Detects	5.815
Mean of Logged Detects	0.285	SD of Logged Detects	0.875

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.588	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.445	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.612	KM Standard Error of Mean	0.729
KM SD	1.992	95% KM (BCA) UCL	3.132
95% KM (t) UCL	2.968	95% KM (Percentile Bootstrap) UCL	3.02
95% KM (z) UCL	2.812	95% KM Bootstrap t UCL	9.154
90% KM Chebyshev UCL	3.8	95% KM Chebyshev UCL	4.792
97.5% KM Chebyshev UCL	6.167	99% KM Chebyshev UCL	8.87

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.995	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.71	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.403	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.339	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.339	k star (bias corrected MLE)	0.78
Theta hat (MLE)	1.509	Theta star (bias corrected MLE)	2.588
nu hat (MLE)	16.06	nu star (bias corrected)	9.366
Mean (detects)	2.02		

729	**Gamma ROS Statistics using Imputed Non-Detects**											
730	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
731	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
732	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
733	This is especially true when the sample size is small.											
734	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
735					Minimum	0.01			Mean	1.521		
736					Maximum	7.2			Median	0.99		
737					SD	2.19			CV	1.44		
738					k hat (MLE)	0.617			k star (bias corrected MLE)	0.485		
739					Theta hat (MLE)	2.466			Theta star (bias corrected MLE)	3.134		
740					nu hat (MLE)	11.1			nu star (bias corrected)	8.736		
741					Adjusted Level of Significance (β)	0.0231						
742					Approximate Chi Square Value (8.74, α)	3.168			Adjusted Chi Square Value (8.74, β)	2.504		
743					95% Gamma Approximate UCL (use when n>=50)	4.194			95% Gamma Adjusted UCL (use when n<50)	5.307		
744												
745	**Estimates of Gamma Parameters using KM Estimates**											
746					Mean (KM)	1.612			SD (KM)	1.992		
747					Variance (KM)	3.969			SE of Mean (KM)	0.729		
748					k hat (KM)	0.655			k star (KM)	0.51		
749					nu hat (KM)	11.78			nu star (KM)	9.188		
750					theta hat (KM)	2.462			theta star (KM)	3.158		
751					80% gamma percentile (KM)	2.649			90% gamma percentile (KM)	4.342		
752					95% gamma percentile (KM)	6.146			99% gamma percentile (KM)	10.57		
753												
754	**Gamma Kaplan-Meier (KM) Statistics**											
755					Approximate Chi Square Value (9.19, α)	3.441			Adjusted Chi Square Value (9.19, β)	2.741		
756					95% Gamma Approximate KM-UCL (use when n>=50)	4.304			95% Gamma Adjusted KM-UCL (use when n<50)	5.402		
757												
758	**Lognormal GOF Test on Detected Observations Only**											
759					Shapiro Wilk Test Statistic	0.786			**Shapiro Wilk GOF Test**			
760					5% Shapiro Wilk Critical Value	0.788			Detected Data Not Lognormal at 5% Significance Level			
761					Lilliefors Test Statistic	0.344			**Lilliefors GOF Test**			
762					5% Lilliefors Critical Value	0.325			Detected Data Not Lognormal at 5% Significance Level			
763	**Detected Data Not Lognormal at 5% Significance Level**											
764												
765	**Lognormal ROS Statistics Using Imputed Non-Detects**											
766					Mean in Original Scale	1.611			Mean in Log Scale	0.0756		
767					SD in Original Scale	2.119			SD in Log Scale	0.812		
768					95% t UCL (assumes normality of ROS data)	2.924			95% Percentile Bootstrap UCL	2.992		
769					95% BCA Bootstrap UCL	3.671			95% Bootstrap t UCL	7.652		
770					95% H-UCL (Log ROS)	3.385						
771												
772	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
773					KM Mean (logged)	0.0945			KM Geo Mean	1.099		
774					KM SD (logged)	0.732			95% Critical H Value (KM-Log)	2.678		
775					KM Standard Error of Mean (logged)	0.275			95% H-UCL (KM -Log)	2.872		
776					KM SD (logged)	0.732			95% Critical H Value (KM-Log)	2.678		
777					KM Standard Error of Mean (logged)	0.275						
778												
779	**DL/2 Statistics**											
780	**DL/2 Normal**								**DL/2 Log-Transformed**			

781				Mean in Original Scale		1.985				Mean in Log Scale		0.317
782				SD in Original Scale		2.114				SD in Log Scale		0.863
783				95% t UCL (Assumes normality)		3.295				95% H-Stat UCL		4.894
784	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
785												
786	**Nonparametric Distribution Free UCL Statistics**											
787	**Data do not follow a Discernible Distribution at 5% Significance Level**											
788												
789	**Suggested UCL to Use**											
790				95% KM (Chebyshev) UCL		4.792						
791												
792	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
793	Recommendations are based upon data size, data distribution, and skewness.											
794	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
795	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
796												
797												
798	**Vanadium (nfmw20)**											
799												
800	**General Statistics**											
801				Total Number of Observations		8				Number of Distinct Observations		7
802										Number of Missing Observations		0
803				Minimum		2.9				Mean		4.675
804				Maximum		6.8				Median		4.5
805				SD		1.579				Std. Error of Mean		0.558
806				Coefficient of Variation		0.338				Skewness		0.357
807												
808	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
809	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
810	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
811	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
812												
813	**Normal GOF Test**											
814				Shapiro Wilk Test Statistic		0.894				**Shapiro Wilk GOF Test**		
815				5% Shapiro Wilk Critical Value		0.818				Data appear Normal at 5% Significance Level		
816				Lilliefors Test Statistic		0.165				**Lilliefors GOF Test**		
817				5% Lilliefors Critical Value		0.283				Data appear Normal at 5% Significance Level		
818	**Data appear Normal at 5% Significance Level**											
819												
820	**Assuming Normal Distribution**											
821	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
822				95% Student's-t UCL		5.733				95% Adjusted-CLT UCL (Chen-1995)		5.669
823										95% Modified-t UCL (Johnson-1978)		5.744
824												
825	**Gamma GOF Test**											
826				A-D Test Statistic		0.355				**Anderson-Darling Gamma GOF Test**		
827				5% A-D Critical Value		0.715				Detected data appear Gamma Distributed at 5% Significance Level		
828				K-S Test Statistic		0.164				**Kolmogorov-Smirnov Gamma GOF Test**		
829				5% K-S Critical Value		0.294				Detected data appear Gamma Distributed at 5% Significance Level		
830	**Detected data appear Gamma Distributed at 5% Significance Level**											
831												
832	**Gamma Statistics**											

833					k hat (MLE)	10.02				k star (bias corrected MLE)		6.347
834					Theta hat (MLE)	0.466				Theta star (bias corrected MLE)		0.737
835					nu hat (MLE)	160.3				nu star (bias corrected)		101.5
836					MLE Mean (bias corrected)	4.675				MLE Sd (bias corrected)		1.856
837										Approximate Chi Square Value (0.05)		79.3
838					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		74.34
839												
840					**Assuming Gamma Distribution**							
841					95% Approximate Gamma UCL (use when n>=50))	5.987				95% Adjusted Gamma UCL (use when n<50)		6.386
842												
843					**Lognormal GOF Test**							
844					Shapiro Wilk Test Statistic	0.91				**Shapiro Wilk Lognormal GOF Test**		
845					5% Shapiro Wilk Critical Value	0.818				Data appear Lognormal at 5% Significance Level		
846					Lilliefors Test Statistic	0.143				**Lilliefors Lognormal GOF Test**		
847					5% Lilliefors Critical Value	0.283				Data appear Lognormal at 5% Significance Level		
848					**Data appear Lognormal at 5% Significance Level**							
849												
850					**Lognormal Statistics**							
851					Minimum of Logged Data	1.065				Mean of logged Data		1.492
852					Maximum of Logged Data	1.917				SD of logged Data		0.342
853												
854					**Assuming Lognormal Distribution**							
855					95% H-UCL	6.191				90% Chebyshev (MVUE) UCL		6.38
856					95% Chebyshev (MVUE) UCL	7.152				97.5% Chebyshev (MVUE) UCL		8.224
857					99% Chebyshev (MVUE) UCL	10.33						
858												
859					**Nonparametric Distribution Free UCL Statistics**							
860					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
861												
862					**Nonparametric Distribution Free UCLs**							
863					95% CLT UCL	5.593				95% Jackknife UCL		5.733
864					95% Standard Bootstrap UCL	5.535				95% Bootstrap-t UCL		5.956
865					95% Hall's Bootstrap UCL	5.712				95% Percentile Bootstrap UCL		5.575
866					95% BCA Bootstrap UCL	5.613						
867					90% Chebyshev(Mean, Sd) UCL	6.35				95% Chebyshev(Mean, Sd) UCL		7.109
868					97.5% Chebyshev(Mean, Sd) UCL	8.162				99% Chebyshev(Mean, Sd) UCL		10.23
869												
870					**Suggested UCL to Use**							
871					95% Student's-t UCL	5.733						
872												
873					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
874					Recommendations are based upon data size, data distribution, and skewness.							
875					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
876					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
877												
878												
879	**Vanadium (nfmw22)**											
880												
881					**General Statistics**							
882					Total Number of Observations	4				Number of Distinct Observations		4
883										Number of Missing Observations		0
884					Minimum	33.9				Mean		34.43

885				Maximum	35.5			Median	34.15			
886				SD	0.727			Std. Error of Mean	0.364			
887				Coefficient of Variation	0.0211			Skewness	1.822			
888												
889	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
890	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
891	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
892	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
893												
894	**Normal GOF Test**											
895				Shapiro Wilk Test Statistic	0.785	**Shapiro Wilk GOF Test**						
896				5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level						
897				Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**						
898				5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level						
899	**Data appear Normal at 5% Significance Level**											
900												
901	**Assuming Normal Distribution**											
902	**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**						
903				95% Student's-t UCL	35.28			95% Adjusted-CLT UCL (Chen-1995)	35.38			
904								95% Modified-t UCL (Johnson-1978)	35.34			
905												
906	**Gamma GOF Test**											
907				A-D Test Statistic	0.646	**Anderson-Darling Gamma GOF Test**						
908				5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level						
909				K-S Test Statistic	0.403	**Kolmogorov-Smirnov Gamma GOF Test**						
910				5% K-S Critical Value	0.394	Data Not Gamma Distributed at 5% Significance Level						
911	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
912												
913	**Gamma Statistics**											
914				k hat (MLE)	3024			k star (bias corrected MLE)	756.1			
915				Theta hat (MLE)	0.0114			Theta star (bias corrected MLE)	0.0455			
916				nu hat (MLE)	24191			nu star (bias corrected)	6049			
917				MLE Mean (bias corrected)	34.43			MLE Sd (bias corrected)	1.252			
918								Approximate Chi Square Value (0.05)	5869			
919				Adjusted Level of Significance	N/A			Adjusted Chi Square Value	N/A			
920												
921	**Assuming Gamma Distribution**											
922				95% Approximate Gamma UCL (use when n>=50))	35.48			95% Adjusted Gamma UCL (use when n<50)	N/A			
923												
924	**Lognormal GOF Test**											
925				Shapiro Wilk Test Statistic	0.788	**Shapiro Wilk Lognormal GOF Test**						
926				5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level						
927				Lilliefors Test Statistic	0.37	**Lilliefors Lognormal GOF Test**						
928				5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level						
929	**Data appear Lognormal at 5% Significance Level**											
930												
931	**Lognormal Statistics**											
932				Minimum of Logged Data	3.523			Mean of logged Data	3.539			
933				Maximum of Logged Data	3.57			SD of logged Data	0.0209			
934												
935	**Assuming Lognormal Distribution**											
936				95% H-UCL	N/A			90% Chebyshev (MVUE) UCL	35.51			

937				95% Chebyshev (MVUE) UCL		36			97.5% Chebyshev (MVUE) UCL			36.68
938				99% Chebyshev (MVUE) UCL		38.01						
939												
940						**Nonparametric Distribution Free UCL Statistics**							
941						**Data appear to follow a Discernible Distribution at 5% Significance Level**							
942												
943						**Nonparametric Distribution Free UCLs**							
944				95% CLT UCL		35.02			95% Jackknife UCL			35.28
945				95% Standard Bootstrap UCL		N/A			95% Bootstrap-t UCL			N/A
946				95% Hall's Bootstrap UCL		N/A			95% Percentile Bootstrap UCL			N/A
947				95% BCA Bootstrap UCL		N/A						
948				90% Chebyshev(Mean, Sd) UCL		35.52			95% Chebyshev(Mean, Sd) UCL			36.01
949				97.5% Chebyshev(Mean, Sd) UCL		36.7			99% Chebyshev(Mean, Sd) UCL			38.04
950												
951						**Suggested UCL to Use**							
952				95% Student's-t UCL		35.28						
953												
954	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
955	Recommendations are based upon data size, data distribution, and skewness.											
956	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
957	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
958												
959												
960	**Vanadium (nfmw23)**											
961												
962						**General Statistics**							
963				Total Number of Observations		4			Number of Distinct Observations			4
964									Number of Missing Observations			0
965				Minimum		41.9			Mean			48.83
966				Maximum		54.7			Median			49.35
967				SD		5.375			Std. Error of Mean			2.687
968				Coefficient of Variation		0.11			Skewness			-0.529
969												
970	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
971	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
972	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
973	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
974												
975						**Normal GOF Test**							
976				Shapiro Wilk Test Statistic		0.987			**Shapiro Wilk GOF Test**			
977				5% Shapiro Wilk Critical Value		0.748			Data appear Normal at 5% Significance Level			
978				Lilliefors Test Statistic		0.189			**Lilliefors GOF Test**			
979				5% Lilliefors Critical Value		0.375			Data appear Normal at 5% Significance Level			
980						**Data appear Normal at 5% Significance Level**							
981												
982						**Assuming Normal Distribution**							
983				**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**			
984				95% Student's-t UCL		55.15			95% Adjusted-CLT UCL (Chen-1995)			52.49
985									95% Modified-t UCL (Johnson-1978)			55.03
986												
987						**Gamma GOF Test**							
988				A-D Test Statistic		0.228			**Anderson-Darling Gamma GOF Test**			

	A	B	C	D	E	F	G	H	I	J	K	L
989					5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level					
990					K-S Test Statistic	0.193	**Kolmogorov-Smirnov Gamma GOF Test**					
991					5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level					
992	**Detected data appear Gamma Distributed at 5% Significance Level**											
993												
994	**Gamma Statistics**											
995					k hat (MLE)	107.2				k star (bias corrected MLE)		26.96
996					Theta hat (MLE)	0.456				Theta star (bias corrected MLE)		1.811
997					nu hat (MLE)	857.2				nu star (bias corrected)		215.6
998					MLE Mean (bias corrected)	48.83				MLE Sd (bias corrected)		9.404
999										Approximate Chi Square Value (0.05)		182.7
1000					Adjusted Level of Significance	N/A				Adjusted Chi Square Value		N/A
1001												
1002	**Assuming Gamma Distribution**											
1003			95% Approximate Gamma UCL (use when n>=50))			57.64				95% Adjusted Gamma UCL (use when n<50)		N/A
1004												
1005	**Lognormal GOF Test**											
1006					Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk Lognormal GOF Test**					
1007					5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level					
1008					Lilliefors Test Statistic	0.206	**Lilliefors Lognormal GOF Test**					
1009					5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level					
1010	**Data appear Lognormal at 5% Significance Level**											
1011												
1012	**Lognormal Statistics**											
1013					Minimum of Logged Data	3.735				Mean of logged Data		3.884
1014					Maximum of Logged Data	4.002				SD of logged Data		0.112
1015												
1016	**Assuming Lognormal Distribution**											
1017					95% H-UCL	56.59				90% Chebyshev (MVUE) UCL		57.06
1018					95% Chebyshev (MVUE) UCL	60.78				97.5% Chebyshev (MVUE) UCL		65.96
1019					99% Chebyshev (MVUE) UCL	76.12						
1020												
1021	**Nonparametric Distribution Free UCL Statistics**											
1022	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1023												
1024	**Nonparametric Distribution Free UCLs**											
1025					95% CLT UCL	53.25				95% Jackknife UCL		55.15
1026					95% Standard Bootstrap UCL	N/A				95% Bootstrap-t UCL		N/A
1027					95% Hall's Bootstrap UCL	N/A				95% Percentile Bootstrap UCL		N/A
1028					95% BCA Bootstrap UCL	N/A						
1029					90% Chebyshev(Mean, Sd) UCL	56.89				95% Chebyshev(Mean, Sd) UCL		60.54
1030					97.5% Chebyshev(Mean, Sd) UCL	65.61				99% Chebyshev(Mean, Sd) UCL		75.56
1031												
1032	**Suggested UCL to Use**											
1033					95% Student's-t UCL	55.15						
1034												
1035	**Recommended UCL exceeds the maximum observation**											
1036												
1037	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1038	Recommendations are based upon data size, data distribution, and skewness.											
1039	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1040	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

	A	B	C	D	E	F	G	H	I	J	K	L
1041												
1042	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1043	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1044												
1045												
1046	**Vanadium (nfmw3)**											
1047												
1048	**General Statistics**											
1049					Total Number of Observations	9			Number of Distinct Observations	9		
1050									Number of Missing Observations	0		
1051					Minimum	6.3			Mean	10.4		
1052					Maximum	16.8			Median	8.6		
1053					SD	3.382			Std. Error of Mean	1.127		
1054					Coefficient of Variation	0.325			Skewness	0.784		
1055												
1056	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1057	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1058	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1059	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1060												
1061	**Normal GOF Test**											
1062					Shapiro Wilk Test Statistic	0.917			**Shapiro Wilk GOF Test**			
1063					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
1064					Lilliefors Test Statistic	0.258			**Lilliefors GOF Test**			
1065					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
1066	**Data appear Normal at 5% Significance Level**											
1067												
1068	**Assuming Normal Distribution**											
1069	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
1070					95% Student's-t UCL	12.5			95% Adjusted-CLT UCL (Chen-1995)	12.57		
1071									95% Modified-t UCL (Johnson-1978)	12.55		
1072												
1073	**Gamma GOF Test**											
1074					A-D Test Statistic	0.369			**Anderson-Darling Gamma GOF Test**			
1075					5% A-D Critical Value	0.722			Detected data appear Gamma Distributed at 5% Significance Level			
1076					K-S Test Statistic	0.253			**Kolmogorov-Smirnov Gamma GOF Test**			
1077					5% K-S Critical Value	0.279			Detected data appear Gamma Distributed at 5% Significance Level			
1078	**Detected data appear Gamma Distributed at 5% Significance Level**											
1079												
1080	**Gamma Statistics**											
1081					k hat (MLE)	11.29			k star (bias corrected MLE)	7.6		
1082					Theta hat (MLE)	0.921			Theta star (bias corrected MLE)	1.368		
1083					nu hat (MLE)	203.2			nu star (bias corrected)	136.8		
1084					MLE Mean (bias corrected)	10.4			MLE Sd (bias corrected)	3.773		
1085									Approximate Chi Square Value (0.05)	110.8		
1086					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	105.8		
1087												
1088	**Assuming Gamma Distribution**											
1089					95% Approximate Gamma UCL (use when n>=50))	12.84			95% Adjusted Gamma UCL (use when n<50)	13.44		
1090												
1091	**Lognormal GOF Test**											
1092					Shapiro Wilk Test Statistic	0.948			**Shapiro Wilk Lognormal GOF Test**			

1093			5% Shapiro Wilk Critical Value			0.829	Data appear Lognormal at 5% Significance Level					
1094			Lilliefors Test Statistic			0.233	**Lilliefors Lognormal GOF Test**					
1095			5% Lilliefors Critical Value			0.274	Data appear Lognormal at 5% Significance Level					
1096	**Data appear Lognormal at 5% Significance Level**											
1097												
1098	**Lognormal Statistics**											
1099			Minimum of Logged Data			1.841	Mean of logged Data					2.297
1100			Maximum of Logged Data			2.821	SD of logged Data					0.315
1101												
1102	**Assuming Lognormal Distribution**											
1103			95% H-UCL			13.1	90% Chebyshev (MVUE) UCL					13.69
1104			95% Chebyshev (MVUE) UCL			15.18	97.5% Chebyshev (MVUE) UCL					17.25
1105			99% Chebyshev (MVUE) UCL			21.32						
1106												
1107	**Nonparametric Distribution Free UCL Statistics**											
1108	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1109												
1110	**Nonparametric Distribution Free UCLs**											
1111			95% CLT UCL			12.25	95% Jackknife UCL					12.5
1112			95% Standard Bootstrap UCL			12.15	95% Bootstrap-t UCL					13.13
1113			95% Hall's Bootstrap UCL			12.47	95% Percentile Bootstrap UCL					12.21
1114			95% BCA Bootstrap UCL			12.34						
1115			90% Chebyshev(Mean, Sd) UCL			13.78	95% Chebyshev(Mean, Sd) UCL					15.31
1116			97.5% Chebyshev(Mean, Sd) UCL			17.44	99% Chebyshev(Mean, Sd) UCL					21.62
1117												
1118	**Suggested UCL to Use**											
1119			95% Student's-t UCL			12.5						
1120												
1121	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1122	Recommendations are based upon data size, data distribution, and skewness.											
1123	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1124	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1125												
1126	**Vanadium (nfmw4)**											
1127												
1128	**General Statistics**											
1129			Total Number of Observations			9	Number of Distinct Observations					6
1130			Number of Detects			8	Number of Non-Detects					1
1131			Number of Distinct Detects			5	Number of Distinct Non-Detects					1
1132			Minimum Detect			1	Minimum Non-Detect					5.3
1133			Maximum Detect			1.8	Maximum Non-Detect					5.3
1134			Variance Detects			0.077	Percent Non-Detects					11.11%
1135			Mean Detects			1.263	SD Detects					0.277
1136			Median Detects			1.2	CV Detects					0.22
1137			Skewness Detects			1.106	Kurtosis Detects					0.746
1138			Mean of Logged Detects			0.214	SD of Logged Detects					0.207
1139												
1140	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1141	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1142	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1143	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1144												

1145	**Normal GOF Test on Detects Only**											
1146					Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**					
1147					5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level					
1148					Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**					
1149					5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level					
1150	**Detected Data appear Normal at 5% Significance Level**											
1151												
1152	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1153					KM Mean	1.263	KM Standard Error of Mean	0.0981				
1154					KM SD	0.26	95% KM (BCA) UCL	1.429				
1155					95% KM (t) UCL	1.445	95% KM (Percentile Bootstrap) UCL	1.425				
1156					95% KM (z) UCL	1.424	95% KM Bootstrap t UCL	1.559				
1157					90% KM Chebyshev UCL	1.557	95% KM Chebyshev UCL	1.69				
1158					97.5% KM Chebyshev UCL	1.875	99% KM Chebyshev UCL	2.238				
1159												
1160	**Gamma GOF Tests on Detected Observations Only**											
1161					A-D Test Statistic	0.405	**Anderson-Darling GOF Test**					
1162					5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level					
1163					K-S Test Statistic	0.232	**Kolmogorov-Smirnov GOF**					
1164					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1165	**Detected data appear Gamma Distributed at 5% Significance Level**											
1166												
1167	**Gamma Statistics on Detected Data Only**											
1168					k hat (MLE)	25.78	k star (bias corrected MLE)	16.2				
1169					Theta hat (MLE)	0.049	Theta star (bias corrected MLE)	0.0779				
1170					nu hat (MLE)	412.5	nu star (bias corrected)	259.2				
1171					Mean (detects)	1.263						
1172												
1173	**Gamma ROS Statistics using Imputed Non-Detects**											
1174	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1175	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1176	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1177	This is especially true when the sample size is small.											
1178	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1179					Minimum	1	Mean	1.261				
1180					Maximum	1.8	Median	1.25				
1181					SD	0.26	CV	0.206				
1182					k hat (MLE)	28.98	k star (bias corrected MLE)	19.39				
1183					Theta hat (MLE)	0.0435	Theta star (bias corrected MLE)	0.065				
1184					nu hat (MLE)	521.6	nu star (bias corrected)	349				
1185					Adjusted Level of Significance (β)	0.0231						
1186					Approximate Chi Square Value (349.05, α)	306.8	Adjusted Chi Square Value (349.05, β)	298.4				
1187					95% Gamma Approximate UCL (use when n>=50)	1.435	95% Gamma Adjusted UCL (use when n<50)	1.475				
1188												
1189	**Estimates of Gamma Parameters using KM Estimates**											
1190					Mean (KM)	1.263	SD (KM)	0.26				
1191					Variance (KM)	0.0673	SE of Mean (KM)	0.0981				
1192					k hat (KM)	23.67	k star (KM)	15.85				
1193					nu hat (KM)	426	nu star (KM)	285.4				
1194					theta hat (KM)	0.0533	theta star (KM)	0.0796				
1195					80% gamma percentile (KM)	1.519	90% gamma percentile (KM)	1.682				
1196					95% gamma percentile (KM)	1.825	99% gamma percentile (KM)	2.115				

1197												
1198	**Gamma Kaplan-Meier (KM) Statistics**											
1199	Approximate Chi Square Value (285.35, α)				247.2	Adjusted Chi Square Value (285.35, β)					239.7	
1200	95% Gamma Approximate KM-UCL (use when n>=50)				1.457	95% Gamma Adjusted KM-UCL (use when n<50)					1.503	
1201												
1202	**Lognormal GOF Test on Detected Observations Only**											
1203	Shapiro Wilk Test Statistic				0.908	**Shapiro Wilk GOF Test**						
1204	5% Shapiro Wilk Critical Value				0.818	Detected Data appear Lognormal at 5% Significance Level						
1205	Lilliefors Test Statistic				0.216	**Lilliefors GOF Test**						
1206	5% Lilliefors Critical Value				0.283	Detected Data appear Lognormal at 5% Significance Level						
1207	**Detected Data appear Lognormal at 5% Significance Level**											
1208												
1209	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1210	Mean in Original Scale				1.26	Mean in Log Scale					0.214	
1211	SD in Original Scale				0.26	SD in Log Scale					0.194	
1212	95% t UCL (assumes normality of ROS data)				1.421	95% Percentile Bootstrap UCL					1.404	
1213	95% BCA Bootstrap UCL				1.444	95% Bootstrap t UCL					1.499	
1214	95% H-UCL (Log ROS)				1.437							
1215												
1216	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1217	KM Mean (logged)				0.214	KM Geo Mean					1.238	
1218	KM SD (logged)				0.194	95% Critical H Value (KM-Log)					1.902	
1219	KM Standard Error of Mean (logged)				0.0733	95% H-UCL (KM -Log)					1.437	
1220	KM SD (logged)				0.194	95% Critical H Value (KM-Log)					1.902	
1221	KM Standard Error of Mean (logged)				0.0733							
1222												
1223	**DL/2 Statistics**											
1224	**DL/2 Normal**					**DL/2 Log-Transformed**						
1225	Mean in Original Scale				1.417	Mean in Log Scale					0.298	
1226	SD in Original Scale				0.53	SD in Log Scale					0.319	
1227	95% t UCL (Assumes normality)				1.745	95% H-Stat UCL					1.784	
1228	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1229												
1230	**Nonparametric Distribution Free UCL Statistics**											
1231	**Detected Data appear Normal Distributed at 5% Significance Level**											
1232												
1233	**Suggested UCL to Use**											
1234	95% KM (t) UCL				1.445							
1235												
1236	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1237	Recommendations are based upon data size, data distribution, and skewness.											
1238	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1239	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1240												
1241												
1242	**Vanadium (nfmw7)**											
1243												
1244	**General Statistics**											
1245	Total Number of Observations				9	Number of Distinct Observations					8	
1246						Number of Missing Observations					0	
1247	Minimum				3.7	Mean					10.13	
1248	Maximum				31.8	Median					5.7	

1249					SD	9.639					Std. Error of Mean	3.213
1250					Coefficient of Variation	0.951					Skewness	1.849
1251												
1252	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1253	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1254	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1255	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1256												
1257	**Normal GOF Test**											
1258					Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk GOF Test**					
1259					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
1260					Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**					
1261					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
1262	**Data Not Normal at 5% Significance Level**											
1263												
1264	**Assuming Normal Distribution**											
1265	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1266					95% Student's-t UCL	16.11					95% Adjusted-CLT UCL (Chen-1995)	17.53
1267											95% Modified-t UCL (Johnson-1978)	16.44
1268												
1269	**Gamma GOF Test**											
1270					A-D Test Statistic	0.794	**Anderson-Darling Gamma GOF Test**					
1271					5% A-D Critical Value	0.731	Data Not Gamma Distributed at 5% Significance Level					
1272					K-S Test Statistic	0.257	**Kolmogorov-Smirnov Gamma GOF Test**					
1273					5% K-S Critical Value	0.283	Detected data appear Gamma Distributed at 5% Significance Level					
1274	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
1275												
1276	**Gamma Statistics**											
1277					k hat (MLE)	1.821					k star (bias corrected MLE)	1.288
1278					Theta hat (MLE)	5.563					Theta star (bias corrected MLE)	7.865
1279					nu hat (MLE)	32.79					nu star (bias corrected)	23.19
1280					MLE Mean (bias corrected)	10.13					MLE Sd (bias corrected)	8.927
1281											Approximate Chi Square Value (0.05)	13.24
1282					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	11.68
1283												
1284	**Assuming Gamma Distribution**											
1285					95% Approximate Gamma UCL (use when n>=50)	17.76					95% Adjusted Gamma UCL (use when n<50)	20.12
1286												
1287	**Lognormal GOF Test**											
1288					Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk Lognormal GOF Test**					
1289					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1290					Lilliefors Test Statistic	0.201	**Lilliefors Lognormal GOF Test**					
1291					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1292	**Data appear Lognormal at 5% Significance Level**											
1293												
1294	**Lognormal Statistics**											
1295					Minimum of Logged Data	1.308					Mean of logged Data	2.017
1296					Maximum of Logged Data	3.459					SD of logged Data	0.759
1297												
1298	**Assuming Lognormal Distribution**											
1299					95% H-UCL	20.84					90% Chebyshev (MVUE) UCL	17.16
1300					95% Chebyshev (MVUE) UCL	20.56					97.5% Chebyshev (MVUE) UCL	25.29

1301				99% Chebyshev (MVUE) UCL		34.57						
1302												
1303						**Nonparametric Distribution Free UCL Statistics**							
1304						**Data appear to follow a Discernible Distribution at 5% Significance Level**						
1305												
1306						**Nonparametric Distribution Free UCLs**							
1307				95% CLT UCL		15.42			95% Jackknife UCL		16.11	
1308				95% Standard Bootstrap UCL		15.06			95% Bootstrap-t UCL		33.85	
1309				95% Hall's Bootstrap UCL		44.16			95% Percentile Bootstrap UCL		15.91	
1310				95% BCA Bootstrap UCL		17.47						
1311				90% Chebyshev(Mean, Sd) UCL		19.77			95% Chebyshev(Mean, Sd) UCL		24.14	
1312				97.5% Chebyshev(Mean, Sd) UCL		30.2			99% Chebyshev(Mean, Sd) UCL		42.1	
1313												
1314						**Suggested UCL to Use**							
1315				95% Adjusted Gamma UCL		20.12						
1316												
1317						When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test						
1318						When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL						
1319												
1320						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1321						Recommendations are based upon data size, data distribution, and skewness.						
1322						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1323						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1324												
1325	**Vanadium (nfmw8)**											
1326												
1327						**General Statistics**						
1328				Total Number of Observations		8			Number of Distinct Observations		8	
1329				Number of Detects		7			Number of Non-Detects		1	
1330				Number of Distinct Detects		7			Number of Distinct Non-Detects		1	
1331				Minimum Detect		5.6			Minimum Non-Detect		5.3	
1332				Maximum Detect		9			Maximum Non-Detect		5.3	
1333				Variance Detects		1.21			Percent Non-Detects		12.5%	
1334				Mean Detects		6.943			SD Detects		1.1	
1335				Median Detects		6.7			CV Detects		0.158	
1336				Skewness Detects		1.019			Kurtosis Detects		1.547	
1337				Mean of Logged Detects		1.927			SD of Logged Detects		0.153	
1338												
1339						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
1340						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
1341						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
1342						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
1343												
1344						**Normal GOF Test on Detects Only**							
1345				Shapiro Wilk Test Statistic		0.941			**Shapiro Wilk GOF Test**			
1346				5% Shapiro Wilk Critical Value		0.803			Detected Data appear Normal at 5% Significance Level			
1347				Lilliefors Test Statistic		0.163			**Lilliefors GOF Test**			
1348				5% Lilliefors Critical Value		0.304			Detected Data appear Normal at 5% Significance Level			
1349						**Detected Data appear Normal at 5% Significance Level**						
1350												
1351						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
1352				KM Mean		6.738			KM Standard Error of Mean		0.419	

1353					KM SD	1.097					95% KM (BCA) UCL	7.45
1354					95% KM (t) UCL	7.531					95% KM (Percentile Bootstrap) UCL	7.4
1355					95% KM (z) UCL	7.426					95% KM Bootstrap t UCL	7.734
1356					90% KM Chebyshev UCL	7.994					95% KM Chebyshev UCL	8.563
1357					97.5% KM Chebyshev UCL	9.353					99% KM Chebyshev UCL	10.9
1358												
1359					**Gamma GOF Tests on Detected Observations Only**							
1360					A-D Test Statistic	0.223					**Anderson-Darling GOF Test**	
1361					5% A-D Critical Value	0.708					Detected data appear Gamma Distributed at 5% Significance Level	
1362					K-S Test Statistic	0.151					**Kolmogorov-Smirnov GOF**	
1363					5% K-S Critical Value	0.311					Detected data appear Gamma Distributed at 5% Significance Level	
1364					**Detected data appear Gamma Distributed at 5% Significance Level**							
1365												
1366					**Gamma Statistics on Detected Data Only**							
1367					k hat (MLE)	49.09					k star (bias corrected MLE)	28.15
1368					Theta hat (MLE)	0.141					Theta star (bias corrected MLE)	0.247
1369					nu hat (MLE)	687.3					nu star (bias corrected)	394.1
1370					Mean (detects)	6.943						
1371												
1372					**Gamma ROS Statistics using Imputed Non-Detects**							
1373					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1374					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1375					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1376					This is especially true when the sample size is small.							
1377					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1378					Minimum	4.423					Mean	6.628
1379					Maximum	9					Median	6.65
1380					SD	1.353					CV	0.204
1381					k hat (MLE)	26.66					k star (bias corrected MLE)	16.74
1382					Theta hat (MLE)	0.249					Theta star (bias corrected MLE)	0.396
1383					nu hat (MLE)	426.5					nu star (bias corrected)	267.9
1384					Adjusted Level of Significance (β)	0.0195						
1385					Approximate Chi Square Value (267.90, α)	231					Adjusted Chi Square Value (267.90, β)	222.3
1386					95% Gamma Approximate UCL (use when n>=50)	7.687					95% Gamma Adjusted UCL (use when n<50)	7.987
1387												
1388					**Estimates of Gamma Parameters using KM Estimates**							
1389					Mean (KM)	6.738					SD (KM)	1.097
1390					Variance (KM)	1.202					SE of Mean (KM)	0.419
1391					k hat (KM)	37.75					k star (KM)	23.68
1392					nu hat (KM)	604.1					nu star (KM)	378.9
1393					theta hat (KM)	0.178					theta star (KM)	0.285
1394					80% gamma percentile (KM)	7.867					90% gamma percentile (KM)	8.562
1395					95% gamma percentile (KM)	9.165					99% gamma percentile (KM)	10.37
1396												
1397					**Gamma Kaplan-Meier (KM) Statistics**							
1398					Approximate Chi Square Value (378.88, α)	334.8					Adjusted Chi Square Value (378.88, β)	324.2
1399					95% Gamma Approximate KM-UCL (use when n>=50)	7.625					95% Gamma Adjusted KM-UCL (use when n<50)	7.873
1400												
1401					**Lognormal GOF Test on Detected Observations Only**							
1402					Shapiro Wilk Test Statistic	0.971					**Shapiro Wilk GOF Test**	
1403					5% Shapiro Wilk Critical Value	0.803					Detected Data appear Lognormal at 5% Significance Level	
1404					Lilliefors Test Statistic	0.141					**Lilliefors GOF Test**	

1405	5% Lilliefors Critical Value					0.304	Detected Data appear Lognormal at 5% Significance Level					
1406	**Detected Data appear Lognormal at 5% Significance Level**											
1407												
1408	**Lognormal ROS Statistics Using Imputed Non-Detects**											
1409	Mean in Original Scale					6.662	Mean in Log Scale					1.88
1410	SD in Original Scale					1.292	SD in Log Scale					0.195
1411	95% t UCL (assumes normality of ROS data)					7.527	95% Percentile Bootstrap UCL					7.375
1412	95% BCA Bootstrap UCL					7.375	95% Bootstrap t UCL					7.609
1413	95% H-UCL (Log ROS)					7.706						
1414												
1415	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
1416	KM Mean (logged)					1.895	KM Geo Mean					6.653
1417	KM SD (logged)					0.158	95% Critical H Value (KM-Log)					1.901
1418	KM Standard Error of Mean (logged)					0.0602	95% H-UCL (KM -Log)					7.544
1419	KM SD (logged)					0.158	95% Critical H Value (KM-Log)					1.901
1420	KM Standard Error of Mean (logged)					0.0602						
1421												
1422	**DL/2 Statistics**											
1423	**DL/2 Normal**						**DL/2 Log-Transformed**					
1424	Mean in Original Scale					6.406	Mean in Log Scale					1.808
1425	SD in Original Scale					1.828	SD in Log Scale					0.365
1426	95% t UCL (Assumes normality)					7.63	95% H-Stat UCL					8.77
1427	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
1428												
1429	**Nonparametric Distribution Free UCL Statistics**											
1430	**Detected Data appear Normal Distributed at 5% Significance Level**											
1431												
1432	**Suggested UCL to Use**											
1433	95% KM (t) UCL					7.531						
1434												
1435	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1436	Recommendations are based upon data size, data distribution, and skewness.											
1437	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1438	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1439												
1440												
1441	**Vanadium (nfmw9)**											
1442												
1443	**General Statistics**											
1444	Total Number of Observations					8	Number of Distinct Observations					8
1445							Number of Missing Observations					0
1446	Minimum					11.6	Mean					21.86
1447	Maximum					33.1	Median					20.95
1448	SD					7.309	Std. Error of Mean					2.584
1449	Coefficient of Variation					0.334	Skewness					0.351
1450												
1451	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1452	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1453	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1454	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1455												
1456	**Normal GOF Test**											

	A	B	C	D	E	F	G	H	I	J	K	L
1457					Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk GOF Test**					
1458					5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level					
1459					Lilliefors Test Statistic	0.161	**Lilliefors GOF Test**					
1460					5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level					
1461	**Data appear Normal at 5% Significance Level**											
1462												
1463	**Assuming Normal Distribution**											
1464	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1465					95% Student's-t UCL	26.76				95% Adjusted-CLT UCL (Chen-1995)		26.46
1466										95% Modified-t UCL (Johnson-1978)		26.81
1467												
1468	**Gamma GOF Test**											
1469					A-D Test Statistic	0.193	**Anderson-Darling Gamma GOF Test**					
1470					5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level					
1471					K-S Test Statistic	0.14	**Kolmogorov-Smirnov Gamma GOF Test**					
1472					5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1473	**Detected data appear Gamma Distributed at 5% Significance Level**											
1474												
1475	**Gamma Statistics**											
1476					k hat (MLE)	9.981				k star (bias corrected MLE)		6.322
1477					Theta hat (MLE)	2.19				Theta star (bias corrected MLE)		3.458
1478					nu hat (MLE)	159.7				nu star (bias corrected)		101.1
1479					MLE Mean (bias corrected)	21.86				MLE Sd (bias corrected)		8.695
1480										Approximate Chi Square Value (0.05)		78.94
1481					Adjusted Level of Significance	0.0195				Adjusted Chi Square Value		73.99
1482												
1483	**Assuming Gamma Distribution**											
1484					95% Approximate Gamma UCL (use when n>=50))	28.01				95% Adjusted Gamma UCL (use when n<50)		29.89
1485												
1486	**Lognormal GOF Test**											
1487					Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk Lognormal GOF Test**					
1488					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1489					Lilliefors Test Statistic	0.121	**Lilliefors Lognormal GOF Test**					
1490					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1491	**Data appear Lognormal at 5% Significance Level**											
1492												
1493	**Lognormal Statistics**											
1494					Minimum of Logged Data	2.451				Mean of logged Data		3.034
1495					Maximum of Logged Data	3.5				SD of logged Data		0.346
1496												
1497	**Assuming Lognormal Distribution**											
1498					95% H-UCL	29.12				90% Chebyshev (MVUE) UCL		29.98
1499					95% Chebyshev (MVUE) UCL	33.64				97.5% Chebyshev (MVUE) UCL		38.72
1500					99% Chebyshev (MVUE) UCL	48.71						
1501												
1502	**Nonparametric Distribution Free UCL Statistics**											
1503	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1504												
1505	**Nonparametric Distribution Free UCLs**											
1506					95% CLT UCL	26.11				95% Jackknife UCL		26.76
1507					95% Standard Bootstrap UCL	25.91				95% Bootstrap-t UCL		28.22
1508					95% Hall's Bootstrap UCL	27.67				95% Percentile Bootstrap UCL		25.79

1509				95% BCA Bootstrap UCL		26						
1510				90% Chebyshev(Mean, Sd) UCL		29.61				95% Chebyshev(Mean, Sd) UCL		33.13
1511				97.5% Chebyshev(Mean, Sd) UCL		38				99% Chebyshev(Mean, Sd) UCL		47.57
1512												
1513					**Suggested UCL to Use**							
1514				95% Student's-t UCL		26.76						
1515												
1516	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1517	Recommendations are based upon data size, data distribution, and skewness.											
1518	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1519	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1520												
1521												
1522	**Vanadium (smw10)**											
1523												
1524					**General Statistics**							
1525				Total Number of Observations		8				Number of Distinct Observations		7
1526										Number of Missing Observations		0
1527				Minimum		9.3				Mean		13.39
1528				Maximum		15.8				Median		15.3
1529				SD		2.881				Std. Error of Mean		1.018
1530				Coefficient of Variation		0.215				Skewness		-0.676
1531												
1532	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1533	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1534	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1535	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1536												
1537					**Normal GOF Test**							
1538				Shapiro Wilk Test Statistic		0.73				**Shapiro Wilk GOF Test**		
1539				5% Shapiro Wilk Critical Value		0.818				Data Not Normal at 5% Significance Level		
1540				Lilliefors Test Statistic		0.372				**Lilliefors GOF Test**		
1541				5% Lilliefors Critical Value		0.283				Data Not Normal at 5% Significance Level		
1542					**Data Not Normal at 5% Significance Level**							
1543												
1544					**Assuming Normal Distribution**							
1545				**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**		
1546				95% Student's-t UCL		15.32				95% Adjusted-CLT UCL (Chen-1995)		14.8
1547										95% Modified-t UCL (Johnson-1978)		15.28
1548												
1549					**Gamma GOF Test**							
1550				A-D Test Statistic		1.189				**Anderson-Darling Gamma GOF Test**		
1551				5% A-D Critical Value		0.716				Data Not Gamma Distributed at 5% Significance Level		
1552				K-S Test Statistic		0.388				**Kolmogorov-Smirnov Gamma GOF Test**		
1553				5% K-S Critical Value		0.294				Data Not Gamma Distributed at 5% Significance Level		
1554					**Data Not Gamma Distributed at 5% Significance Level**							
1555												
1556					**Gamma Statistics**							
1557				k hat (MLE)		22.48				k star (bias corrected MLE)		14.13
1558				Theta hat (MLE)		0.596				Theta star (bias corrected MLE)		0.947
1559				nu hat (MLE)		359.6				nu star (bias corrected)		226.1
1560				MLE Mean (bias corrected)		13.39				MLE Sd (bias corrected)		3.561

1561											Approximate Chi Square Value (0.05)	192.3
1562					Adjusted Level of Significance	0.0195					Adjusted Chi Square Value	184.4
1563												
1564					**Assuming Gamma Distribution**							
1565					95% Approximate Gamma UCL (use when n>=50))	15.74					95% Adjusted Gamma UCL (use when n<50)	16.42
1566												
1567					**Lognormal GOF Test**							
1568					Shapiro Wilk Test Statistic	0.732					**Shapiro Wilk Lognormal GOF Test**	
1569					5% Shapiro Wilk Critical Value	0.818					Data Not Lognormal at 5% Significance Level	
1570					Lilliefors Test Statistic	0.374					**Lilliefors Lognormal GOF Test**	
1571					5% Lilliefors Critical Value	0.283					Data Not Lognormal at 5% Significance Level	
1572					**Data Not Lognormal at 5% Significance Level**							
1573												
1574					**Lognormal Statistics**							
1575					Minimum of Logged Data	2.23					Mean of logged Data	2.572
1576					Maximum of Logged Data	2.76					SD of logged Data	0.232
1577												
1578					**Assuming Lognormal Distribution**							
1579					95% H-UCL	15.99					90% Chebyshev (MVUE) UCL	16.7
1580					95% Chebyshev (MVUE) UCL	18.2					97.5% Chebyshev (MVUE) UCL	20.28
1581					99% Chebyshev (MVUE) UCL	24.36						
1582												
1583					**Nonparametric Distribution Free UCL Statistics**							
1584					**Data do not follow a Discernible Distribution (0.05)**							
1585												
1586					**Nonparametric Distribution Free UCLs**							
1587					95% CLT UCL	15.06					95% Jackknife UCL	15.32
1588					95% Standard Bootstrap UCL	14.95					95% Bootstrap-t UCL	14.89
1589					95% Hall's Bootstrap UCL	14.55					95% Percentile Bootstrap UCL	14.81
1590					95% BCA Bootstrap UCL	14.76						
1591					90% Chebyshev(Mean, Sd) UCL	16.44					95% Chebyshev(Mean, Sd) UCL	17.83
1592					97.5% Chebyshev(Mean, Sd) UCL	19.75					99% Chebyshev(Mean, Sd) UCL	23.52
1593												
1594					**Suggested UCL to Use**							
1595					95% Student's-t UCL	15.32					or 95% Modified-t UCL	15.28
1596												
1597	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1598	Recommendations are based upon data size, data distribution, and skewness.											
1599	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1600	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1601												
1602	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
1603	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
1604												
1605												
1606	**Vanadium (smw11)**											
1607												
1608					**General Statistics**							
1609					Total Number of Observations	9					Number of Distinct Observations	8
1610											Number of Missing Observations	0
1611					Minimum	2.7					Mean	17.97
1612					Maximum	23.8					Median	21

1613					SD	7.671					Std. Error of Mean	2.557
1614					Coefficient of Variation	0.427					Skewness	-1.532
1615												
1616	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1617	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1618	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1619	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1620												
1621	**Normal GOF Test**											
1622					Shapiro Wilk Test Statistic	0.739	**Shapiro Wilk GOF Test**					
1623					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
1624					Lilliefors Test Statistic	0.321	**Lilliefors GOF Test**					
1625					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
1626	**Data Not Normal at 5% Significance Level**											
1627												
1628	**Assuming Normal Distribution**											
1629	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1630					95% Student's-t UCL	22.72					95% Adjusted-CLT UCL (Chen-1995)	20.78
1631											95% Modified-t UCL (Johnson-1978)	22.5
1632												
1633	**Gamma GOF Test**											
1634					A-D Test Statistic	1.45	**Anderson-Darling Gamma GOF Test**					
1635					5% A-D Critical Value	0.727	Data Not Gamma Distributed at 5% Significance Level					
1636					K-S Test Statistic	0.384	**Kolmogorov-Smirnov Gamma GOF Test**					
1637					5% K-S Critical Value	0.281	Data Not Gamma Distributed at 5% Significance Level					
1638	**Data Not Gamma Distributed at 5% Significance Level**											
1639												
1640	**Gamma Statistics**											
1641					k hat (MLE)	3.093					k star (bias corrected MLE)	2.136
1642					Theta hat (MLE)	5.808					Theta star (bias corrected MLE)	8.41
1643					nu hat (MLE)	55.68					nu star (bias corrected)	38.45
1644					MLE Mean (bias corrected)	17.97					MLE Sd (bias corrected)	12.29
1645											Approximate Chi Square Value (0.05)	25.25
1646					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	23.02
1647												
1648	**Assuming Gamma Distribution**											
1649					95% Approximate Gamma UCL (use when n>=50))	27.36					95% Adjusted Gamma UCL (use when n<50)	30.01
1650												
1651	**Lognormal GOF Test**											
1652					Shapiro Wilk Test Statistic	0.654	**Shapiro Wilk Lognormal GOF Test**					
1653					5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level					
1654					Lilliefors Test Statistic	0.391	**Lilliefors Lognormal GOF Test**					
1655					5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level					
1656	**Data Not Lognormal at 5% Significance Level**											
1657												
1658	**Lognormal Statistics**											
1659					Minimum of Logged Data	0.993					Mean of logged Data	2.718
1660					Maximum of Logged Data	3.17					SD of logged Data	0.75
1661												
1662	**Assuming Lognormal Distribution**											
1663					95% H-UCL	41.26					90% Chebyshev (MVUE) UCL	34.25
1664					95% Chebyshev (MVUE) UCL	41					97.5% Chebyshev (MVUE) UCL	50.37

1665				99% Chebyshev (MVUE) UCL		68.78						
1666												
1667						**Nonparametric Distribution Free UCL Statistics**							
1668						**Data do not follow a Discernible Distribution (0.05)**							
1669												
1670						**Nonparametric Distribution Free UCLs**							
1671				95% CLT UCL		22.17		95% Jackknife UCL		22.72		
1672				95% Standard Bootstrap UCL		21.87		95% Bootstrap-t UCL		21.53		
1673				95% Hall's Bootstrap UCL		20.84		95% Percentile Bootstrap UCL		21.89		
1674				95% BCA Bootstrap UCL		21.14						
1675				90% Chebyshev(Mean, Sd) UCL		25.64		95% Chebyshev(Mean, Sd) UCL		29.11		
1676				97.5% Chebyshev(Mean, Sd) UCL		33.94		99% Chebyshev(Mean, Sd) UCL		43.41		
1677												
1678						**Suggested UCL to Use**							
1679				95% Chebyshev (Mean, Sd) UCL		29.11						
1680												
1681						**Recommended UCL exceeds the maximum observation**							
1682												
1683						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1684						Recommendations are based upon data size, data distribution, and skewness.							
1685						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1686						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1687												
1688						**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**							
1689						**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**							
1690												
1691												
1692	**Vanadium (smw12)**											
1693												
1694						**General Statistics**							
1695				Total Number of Observations		8		Number of Distinct Observations		8		
1696								Number of Missing Observations		0		
1697				Minimum		7.3		Mean		14.6		
1698				Maximum		26.8		Median		12.5		
1699				SD		6.407		Std. Error of Mean		2.265		
1700				Coefficient of Variation		0.439		Skewness		1.058		
1701												
1702						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
1703						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
1704						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
1705						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
1706												
1707						**Normal GOF Test**							
1708				Shapiro Wilk Test Statistic		0.916		**Shapiro Wilk GOF Test**				
1709				5% Shapiro Wilk Critical Value		0.818		Data appear Normal at 5% Significance Level				
1710				Lilliefors Test Statistic		0.218		**Lilliefors GOF Test**				
1711				5% Lilliefors Critical Value		0.283		Data appear Normal at 5% Significance Level				
1712						**Data appear Normal at 5% Significance Level**							
1713												
1714						**Assuming Normal Distribution**							
1715				**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**				
1716				95% Student's-t UCL		18.89		95% Adjusted-CLT UCL (Chen-1995)		19.23		

1717											95% Modified-t UCL (Johnson-1978)	19.03
1718												
1719	**Gamma GOF Test**											
1720					A-D Test Statistic	0.23	**Anderson-Darling Gamma GOF Test**					
1721					5% A-D Critical Value	0.718	Detected data appear Gamma Distributed at 5% Significance Level					
1722					K-S Test Statistic	0.18	**Kolmogorov-Smirnov Gamma GOF Test**					
1723					5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level					
1724	**Detected data appear Gamma Distributed at 5% Significance Level**											
1725												
1726	**Gamma Statistics**											
1727					k hat (MLE)	6.507	k star (bias corrected MLE)					4.15
1728					Theta hat (MLE)	2.244	Theta star (bias corrected MLE)					3.518
1729					nu hat (MLE)	104.1	nu star (bias corrected)					66.4
1730					MLE Mean (bias corrected)	14.6	MLE Sd (bias corrected)					7.167
1731							Approximate Chi Square Value (0.05)					48.65
1732					Adjusted Level of Significance	0.0195	Adjusted Chi Square Value					44.83
1733												
1734	**Assuming Gamma Distribution**											
1735				95% Approximate Gamma UCL (use when n>=50))		19.93	95% Adjusted Gamma UCL (use when n<50)					21.63
1736												
1737	**Lognormal GOF Test**											
1738					Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk Lognormal GOF Test**					
1739					5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level					
1740					Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**					
1741					5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level					
1742	**Data appear Lognormal at 5% Significance Level**											
1743												
1744	**Lognormal Statistics**											
1745					Minimum of Logged Data	1.988	Mean of logged Data					2.602
1746					Maximum of Logged Data	3.288	SD of logged Data					0.42
1747												
1748	**Assuming Lognormal Distribution**											
1749					95% H-UCL	20.99	90% Chebyshev (MVUE) UCL					21.11
1750					95% Chebyshev (MVUE) UCL	24.07	97.5% Chebyshev (MVUE) UCL					28.18
1751					99% Chebyshev (MVUE) UCL	36.26						
1752												
1753	**Nonparametric Distribution Free UCL Statistics**											
1754	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1755												
1756	**Nonparametric Distribution Free UCLs**											
1757					95% CLT UCL	18.33	95% Jackknife UCL					18.89
1758					95% Standard Bootstrap UCL	18.08	95% Bootstrap-t UCL					22.16
1759					95% Hall's Bootstrap UCL	40.26	95% Percentile Bootstrap UCL					18.2
1760					95% BCA Bootstrap UCL	18.51						
1761					90% Chebyshev(Mean, Sd) UCL	21.4	95% Chebyshev(Mean, Sd) UCL					24.47
1762					97.5% Chebyshev(Mean, Sd) UCL	28.75	99% Chebyshev(Mean, Sd) UCL					37.14
1763												
1764	**Suggested UCL to Use**											
1765					95% Student's-t UCL	18.89						
1766												
1767	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1768	Recommendations are based upon data size, data distribution, and skewness.											

1769	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1770	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1771												
1772												
1773	**Vanadium (smw13)**											
1774												
1775	**General Statistics**											
1776						Total Number of Observations	8			Number of Distinct Observations	8	
1777										Number of Missing Observations	0	
1778						Minimum	2.6			Mean	7.863	
1779						Maximum	17.7			Median	3.9	
1780						SD	6.33			Std. Error of Mean	2.238	
1781						Coefficient of Variation	0.805			Skewness	0.752	
1782												
1783	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1784	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1785	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1786	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1787												
1788	**Normal GOF Test**											
1789						Shapiro Wilk Test Statistic	0.765			**Shapiro Wilk GOF Test**		
1790						5% Shapiro Wilk Critical Value	0.818			Data Not Normal at 5% Significance Level		
1791						Lilliefors Test Statistic	0.354			**Lilliefors GOF Test**		
1792						5% Lilliefors Critical Value	0.283			Data Not Normal at 5% Significance Level		
1793	**Data Not Normal at 5% Significance Level**											
1794												
1795	**Assuming Normal Distribution**											
1796						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
1797						95% Student's-t UCL	12.1			95% Adjusted-CLT UCL (Chen-1995)	12.18	
1798										95% Modified-t UCL (Johnson-1978)	12.2	
1799												
1800	**Gamma GOF Test**											
1801						A-D Test Statistic	0.928			**Anderson-Darling Gamma GOF Test**		
1802						5% A-D Critical Value	0.725			Data Not Gamma Distributed at 5% Significance Level		
1803						K-S Test Statistic	0.343			**Kolmogorov-Smirnov Gamma GOF Test**		
1804						5% K-S Critical Value	0.298			Data Not Gamma Distributed at 5% Significance Level		
1805	**Data Not Gamma Distributed at 5% Significance Level**											
1806												
1807	**Gamma Statistics**											
1808						k hat (MLE)	1.876			k star (bias corrected MLE)	1.256	
1809						Theta hat (MLE)	4.19			Theta star (bias corrected MLE)	6.26	
1810						nu hat (MLE)	30.02			nu star (bias corrected)	20.1	
1811						MLE Mean (bias corrected)	7.863			MLE Sd (bias corrected)	7.016	
1812										Approximate Chi Square Value (0.05)	10.92	
1813						Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	9.26	
1814												
1815	**Assuming Gamma Distribution**											
1816						95% Approximate Gamma UCL (use when n>=50))	14.47			95% Adjusted Gamma UCL (use when n<50)	17.06	
1817												
1818	**Lognormal GOF Test**											
1819						Shapiro Wilk Test Statistic	0.803			**Shapiro Wilk Lognormal GOF Test**		
1820						5% Shapiro Wilk Critical Value	0.818			Data Not Lognormal at 5% Significance Level		

1821				Lilliefors Test Statistic		0.31	**Lilliefors Lognormal GOF Test**					
1822				5% Lilliefors Critical Value		0.283	Data Not Lognormal at 5% Significance Level					
1823	**Data Not Lognormal at 5% Significance Level**											
1824												
1825	**Lognormal Statistics**											
1826				Minimum of Logged Data		0.956				Mean of logged Data		1.773
1827				Maximum of Logged Data		2.874				SD of logged Data		0.803
1828												
1829	**Assuming Lognormal Distribution**											
1830				95% H-UCL		19.96				90% Chebyshev (MVUE) UCL		14.46
1831				95% Chebyshev (MVUE) UCL		17.51				97.5% Chebyshev (MVUE) UCL		21.73
1832				99% Chebyshev (MVUE) UCL		30.03						
1833												
1834	**Nonparametric Distribution Free UCL Statistics**											
1835	**Data do not follow a Discernible Distribution (0.05)**											
1836												
1837	**Nonparametric Distribution Free UCLs**											
1838				95% CLT UCL		11.54				95% Jackknife UCL		12.1
1839				95% Standard Bootstrap UCL		11.28				95% Bootstrap-t UCL		13.21
1840				95% Hall's Bootstrap UCL		10.1				95% Percentile Bootstrap UCL		11.51
1841				95% BCA Bootstrap UCL		11.96						
1842				90% Chebyshev(Mean, Sd) UCL		14.58				95% Chebyshev(Mean, Sd) UCL		17.62
1843				97.5% Chebyshev(Mean, Sd) UCL		21.84				99% Chebyshev(Mean, Sd) UCL		30.13
1844												
1845	**Suggested UCL to Use**											
1846				95% Chebyshev (Mean, Sd) UCL		17.62						
1847												
1848	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1849	Recommendations are based upon data size, data distribution, and skewness.											
1850	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1851	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1852												
1853												
1854	**Vanadium (smw14)**											
1855												
1856	**General Statistics**											
1857				Total Number of Observations		8				Number of Distinct Observations		8
1858										Number of Missing Observations		0
1859				Minimum		9.3				Mean		11.59
1860				Maximum		14.7				Median		11.15
1861				SD		1.958				Std. Error of Mean		0.692
1862				Coefficient of Variation		0.169				Skewness		0.391
1863												
1864	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1865	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1866	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1867	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1868												
1869	**Normal GOF Test**											
1870				Shapiro Wilk Test Statistic		0.927	**Shapiro Wilk GOF Test**					
1871				5% Shapiro Wilk Critical Value		0.818	Data appear Normal at 5% Significance Level					
1872				Lilliefors Test Statistic		0.183	**Lilliefors GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
1873	5% Lilliefors Critical Value					0.283	Data appear Normal at 5% Significance Level					
1874	**Data appear Normal at 5% Significance Level**											
1875												
1876	**Assuming Normal Distribution**											
1877	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1878	95% Student's-t UCL					12.9	95% Adjusted-CLT UCL (Chen-1995)					12.83
1879							95% Modified-t UCL (Johnson-1978)					12.92
1880												
1881	**Gamma GOF Test**											
1882	A-D Test Statistic					0.318	**Anderson-Darling Gamma GOF Test**					
1883	5% A-D Critical Value					0.715	Detected data appear Gamma Distributed at 5% Significance Level					
1884	K-S Test Statistic					0.191	**Kolmogorov-Smirnov Gamma GOF Test**					
1885	5% K-S Critical Value					0.294	Detected data appear Gamma Distributed at 5% Significance Level					
1886	**Detected data appear Gamma Distributed at 5% Significance Level**											
1887												
1888	**Gamma Statistics**											
1889	k hat (MLE)					40.66	k star (bias corrected MLE)					25.49
1890	Theta hat (MLE)					0.285	Theta star (bias corrected MLE)					0.455
1891	nu hat (MLE)					650.5	nu star (bias corrected)					407.9
1892	MLE Mean (bias corrected)					11.59	MLE Sd (bias corrected)					2.295
1893							Approximate Chi Square Value (0.05)					362.1
1894	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					351.1
1895												
1896	**Assuming Gamma Distribution**											
1897	95% Approximate Gamma UCL (use when n>=50))					13.05	95% Adjusted Gamma UCL (use when n<50)					13.46
1898												
1899	**Lognormal GOF Test**											
1900	Shapiro Wilk Test Statistic					0.933	**Shapiro Wilk Lognormal GOF Test**					
1901	5% Shapiro Wilk Critical Value					0.818	Data appear Lognormal at 5% Significance Level					
1902	Lilliefors Test Statistic					0.178	**Lilliefors Lognormal GOF Test**					
1903	5% Lilliefors Critical Value					0.283	Data appear Lognormal at 5% Significance Level					
1904	**Data appear Lognormal at 5% Significance Level**											
1905												
1906	**Lognormal Statistics**											
1907	Minimum of Logged Data					2.23	Mean of logged Data					2.438
1908	Maximum of Logged Data					2.688	SD of logged Data					0.168
1909												
1910	**Assuming Lognormal Distribution**											
1911	95% H-UCL					13.1	90% Chebyshev (MVUE) UCL					13.65
1912	95% Chebyshev (MVUE) UCL					14.58	97.5% Chebyshev (MVUE) UCL					15.88
1913	99% Chebyshev (MVUE) UCL					18.43						
1914												
1915	**Nonparametric Distribution Free UCL Statistics**											
1916	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
1917												
1918	**Nonparametric Distribution Free UCLs**											
1919	95% CLT UCL					12.73	95% Jackknife UCL					12.9
1920	95% Standard Bootstrap UCL					12.65	95% Bootstrap-t UCL					13
1921	95% Hall's Bootstrap UCL					12.74	95% Percentile Bootstrap UCL					12.63
1922	95% BCA Bootstrap UCL					12.73						
1923	90% Chebyshev(Mean, Sd) UCL					13.66	95% Chebyshev(Mean, Sd) UCL					14.61
1924	97.5% Chebyshev(Mean, Sd) UCL					15.91	99% Chebyshev(Mean, Sd) UCL					18.48

	A	B	C	D	E	F	G	H	I	J	K	L
1925												
1926	**Suggested UCL to Use**											
1927					95% Student's-t UCL	12.9						
1928												
1929	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1930	Recommendations are based upon data size, data distribution, and skewness.											
1931	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1932	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1933												
1934	**Vanadium (smw15)**											
1935												
1936	**General Statistics**											
1937					Total Number of Observations	9			Number of Distinct Observations	8		
1938					Number of Detects	8			Number of Non-Detects	1		
1939					Number of Distinct Detects	8			Number of Distinct Non-Detects	1		
1940					Minimum Detect	0.73			Minimum Non-Detect	1.3		
1941					Maximum Detect	25.6			Maximum Non-Detect	1.3		
1942					Variance Detects	119.3			Percent Non-Detects	11.11%		
1943					Mean Detects	7.6			SD Detects	10.92		
1944					Median Detects	2.1			CV Detects	1.437		
1945					Skewness Detects	1.399			Kurtosis Detects	-0.0499		
1946					Mean of Logged Detects	1.054			SD of Logged Detects	1.469		
1947												
1948	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1949	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1950	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1951	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1952												
1953	**Normal GOF Test on Detects Only**											
1954					Shapiro Wilk Test Statistic	0.648			**Shapiro Wilk GOF Test**			
1955					5% Shapiro Wilk Critical Value	0.818			Detected Data Not Normal at 5% Significance Level			
1956					Lilliefors Test Statistic	0.386			**Lilliefors GOF Test**			
1957					5% Lilliefors Critical Value	0.283			Detected Data Not Normal at 5% Significance Level			
1958	**Detected Data Not Normal at 5% Significance Level**											
1959												
1960	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1961					KM Mean	6.844			KM Standard Error of Mean	3.515		
1962					KM SD	9.865			95% KM (BCA) UCL	12.46		
1963					95% KM (t) UCL	13.38			95% KM (Percentile Bootstrap) UCL	12.25		
1964					95% KM (z) UCL	12.63			95% KM Bootstrap t UCL	56.22		
1965					90% KM Chebyshev UCL	17.39			95% KM Chebyshev UCL	22.17		
1966					97.5% KM Chebyshev UCL	28.8			99% KM Chebyshev UCL	41.82		
1967												
1968	**Gamma GOF Tests on Detected Observations Only**											
1969					A-D Test Statistic	0.867			**Anderson-Darling GOF Test**			
1970					5% A-D Critical Value	0.753			Detected Data Not Gamma Distributed at 5% Significance Level			
1971					K-S Test Statistic	0.271			**Kolmogorov-Smirnov GOF**			
1972					5% K-S Critical Value	0.306			Detected data appear Gamma Distributed at 5% Significance Level			
1973	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
1974												
1975	**Gamma Statistics on Detected Data Only**											
1976					k hat (MLE)	0.63			k star (bias corrected MLE)	0.477		

1977					Theta hat (MLE)	12.07				Theta star (bias corrected MLE)		15.94
1978					nu hat (MLE)	10.07				nu star (bias corrected)		7.63
1979					Mean (detects)	7.6						
1980												
1981	**Gamma ROS Statistics using Imputed Non-Detects**											
1982	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1983	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1984	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1985	This is especially true when the sample size is small.											
1986	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1987					Minimum	0.01				Mean		6.757
1988					Maximum	25.6				Median		1.3
1989					SD	10.52				CV		1.558
1990					k hat (MLE)	0.437				k star (bias corrected MLE)		0.365
1991					Theta hat (MLE)	15.47				Theta star (bias corrected MLE)		18.5
1992					nu hat (MLE)	7.862				nu star (bias corrected)		6.574
1993					Adjusted Level of Significance (β)	0.0231						
1994					Approximate Chi Square Value (6.57, α)	1.94				Adjusted Chi Square Value (6.57, β)		1.456
1995					95% Gamma Approximate UCL (use when n>=50)	22.9				95% Gamma Adjusted UCL (use when n<50)		30.51
1996												
1997	**Estimates of Gamma Parameters using KM Estimates**											
1998					Mean (KM)	6.844				SD (KM)		9.865
1999					Variance (KM)	97.32				SE of Mean (KM)		3.515
2000					k hat (KM)	0.481				k star (KM)		0.395
2001					nu hat (KM)	8.664				nu star (KM)		7.11
2002					theta hat (KM)	14.22				theta star (KM)		17.33
2003					80% gamma percentile (KM)	11.03				90% gamma percentile (KM)		19.38
2004					95% gamma percentile (KM)	28.56				99% gamma percentile (KM)		51.7
2005												
2006	**Gamma Kaplan-Meier (KM) Statistics**											
2007					Approximate Chi Square Value (7.11, α)	2.231				Adjusted Chi Square Value (7.11, β)		1.7
2008					95% Gamma Approximate KM-UCL (use when n>=50)	21.81				95% Gamma Adjusted KM-UCL (use when n<50)		28.62
2009												
2010	**Lognormal GOF Test on Detected Observations Only**											
2011					Shapiro Wilk Test Statistic	0.835				**Shapiro Wilk GOF Test**		
2012					5% Shapiro Wilk Critical Value	0.818				Detected Data appear Lognormal at 5% Significance Level		
2013					Lilliefors Test Statistic	0.205				**Lilliefors GOF Test**		
2014					5% Lilliefors Critical Value	0.283				Detected Data appear Lognormal at 5% Significance Level		
2015	**Detected Data appear Lognormal at 5% Significance Level**											
2016												
2017	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2018					Mean in Original Scale	6.838				Mean in Log Scale		0.903
2019					SD in Original Scale	10.47				SD in Log Scale		1.447
2020					95% t UCL (assumes normality of ROS data)	13.33				95% Percentile Bootstrap UCL		12.4
2021					95% BCA Bootstrap UCL	14.67				95% Bootstrap t UCL		56.94
2022					95% H-UCL (Log ROS)	63.58						
2023												
2024	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2025					KM Mean (logged)	0.911				KM Geo Mean		2.487
2026					KM SD (logged)	1.358				95% Critical H Value (KM-Log)		4.083
2027					KM Standard Error of Mean (logged)	0.484				95% H-UCL (KM -Log)		44.36
2028					KM SD (logged)	1.358				95% Critical H Value (KM-Log)		4.083

	A	B	C	D	E	F	G	H	I	J	K	L
2029	KM Standard Error of Mean (logged)					0.484						
2030												
2031	**DL/2 Statistics**											
2032	**DL/2 Normal**						**DL/2 Log-Transformed**					
2033	Mean in Original Scale					6.828	Mean in Log Scale					0.889
2034	SD in Original Scale					10.47	SD in Log Scale					1.461
2035	95% t UCL (Assumes normality)					13.32	95% H-Stat UCL					66.62
2036	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2037												
2038	**Nonparametric Distribution Free UCL Statistics**											
2039	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
2040												
2041	**Suggested UCL to Use**											
2042	95% KM Bootstrap t UCL					56.22	Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)					28.62
2043												
2044	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2045	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2046												
2047	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2048	Recommendations are based upon data size, data distribution, and skewness.											
2049	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2050	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2051												
2052												
2053	**Vanadium (smw16)**											
2054												
2055	**General Statistics**											
2056	Total Number of Observations					9	Number of Distinct Observations					9
2057							Number of Missing Observations					0
2058	Minimum					18.8	Mean					45.77
2059	Maximum					83.5	Median					44.4
2060	SD					19.69	Std. Error of Mean					6.564
2061	Coefficient of Variation					0.43	Skewness					0.758
2062												
2063	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2064	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2065	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2066	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2067												
2068	**Normal GOF Test**											
2069	Shapiro Wilk Test Statistic					0.959	**Shapiro Wilk GOF Test**					
2070	5% Shapiro Wilk Critical Value					0.829	Data appear Normal at 5% Significance Level					
2071	Lilliefors Test Statistic					0.146	**Lilliefors GOF Test**					
2072	5% Lilliefors Critical Value					0.274	Data appear Normal at 5% Significance Level					
2073	**Data appear Normal at 5% Significance Level**											
2074												
2075	**Assuming Normal Distribution**											
2076	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2077	95% Student's-t UCL					57.97	95% Adjusted-CLT UCL (Chen-1995)					58.34
2078							95% Modified-t UCL (Johnson-1978)					58.25
2079												
2080	**Gamma GOF Test**											

	A	B	C	D	E	F	G	H	I	J	K	L
2081					A-D Test Statistic	0.142	**Anderson-Darling Gamma GOF Test**					
2082					5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level					
2083					K-S Test Statistic	0.103	**Kolmogorov-Smirnov Gamma GOF Test**					
2084					5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level					
2085	**Detected data appear Gamma Distributed at 5% Significance Level**											
2086												
2087	**Gamma Statistics**											
2088					k hat (MLE)	6.098				k star (bias corrected MLE)		4.139
2089					Theta hat (MLE)	7.505				Theta star (bias corrected MLE)		11.06
2090					nu hat (MLE)	109.8				nu star (bias corrected)		74.51
2091					MLE Mean (bias corrected)	45.77				MLE Sd (bias corrected)		22.5
2092										Approximate Chi Square Value (0.05)		55.63
2093					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		52.2
2094												
2095	**Assuming Gamma Distribution**											
2096				95% Approximate Gamma UCL (use when n>=50))		61.3				95% Adjusted Gamma UCL (use when n<50)		65.32
2097												
2098	**Lognormal GOF Test**											
2099					Shapiro Wilk Test Statistic	0.987	**Shapiro Wilk Lognormal GOF Test**					
2100					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
2101					Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**					
2102					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
2103	**Data appear Lognormal at 5% Significance Level**											
2104												
2105	**Lognormal Statistics**											
2106					Minimum of Logged Data	2.934				Mean of logged Data		3.739
2107					Maximum of Logged Data	4.425				SD of logged Data		0.444
2108												
2109	**Assuming Lognormal Distribution**											
2110					95% H-UCL	65.33				90% Chebyshev (MVUE) UCL		66.48
2111					95% Chebyshev (MVUE) UCL	75.81				97.5% Chebyshev (MVUE) UCL		88.75
2112					99% Chebyshev (MVUE) UCL	114.2						
2113												
2114	**Nonparametric Distribution Free UCL Statistics**											
2115	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2116												
2117	**Nonparametric Distribution Free UCLs**											
2118					95% CLT UCL	56.56				95% Jackknife UCL		57.97
2119					95% Standard Bootstrap UCL	56.01				95% Bootstrap-t UCL		62.07
2120					95% Hall's Bootstrap UCL	67.29				95% Percentile Bootstrap UCL		55.91
2121					95% BCA Bootstrap UCL	56.83						
2122					90% Chebyshev(Mean, Sd) UCL	65.46				95% Chebyshev(Mean, Sd) UCL		74.38
2123					97.5% Chebyshev(Mean, Sd) UCL	86.76				99% Chebyshev(Mean, Sd) UCL		111.1
2124												
2125	**Suggested UCL to Use**											
2126					95% Student's-t UCL	57.97						
2127												
2128	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2129	Recommendations are based upon data size, data distribution, and skewness.											
2130	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2131	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2132												

	A	B	C	D	E	F	G	H	I	J	K	L
2133	**Vanadium (smw16d)**											
2134												
2135	**General Statistics**											
2136					Total Number of Observations	8			Number of Distinct Observations	6		
2137					Number of Detects	7			Number of Non-Detects	1		
2138					Number of Distinct Detects	5			Number of Distinct Non-Detects	1		
2139					Minimum Detect	1			Minimum Non-Detect	5.3		
2140					Maximum Detect	1.4			Maximum Non-Detect	5.3		
2141					Variance Detects	0.019			Percent Non-Detects	12.5%		
2142					Mean Detects	1.229			SD Detects	0.138		
2143					Median Detects	1.3			CV Detects	0.112		
2144					Skewness Detects	-0.706			Kurtosis Detects	-0.326		
2145					Mean of Logged Detects	0.2			SD of Logged Detects	0.117		
2146												
2147	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2148	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2149	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2150	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2151												
2152	**Normal GOF Test on Detects Only**											
2153					Shapiro Wilk Test Statistic	0.918			**Shapiro Wilk GOF Test**			
2154					5% Shapiro Wilk Critical Value	0.803			Detected Data appear Normal at 5% Significance Level			
2155					Lilliefors Test Statistic	0.269			**Lilliefors GOF Test**			
2156					5% Lilliefors Critical Value	0.304			Detected Data appear Normal at 5% Significance Level			
2157	**Detected Data appear Normal at 5% Significance Level**											
2158												
2159	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2160					KM Mean	1.229			KM Standard Error of Mean	0.0522		
2161					KM SD	0.128			95% KM (BCA) UCL	1.3		
2162					95% KM (t) UCL	1.327			95% KM (Percentile Bootstrap) UCL	1.3		
2163					95% KM (z) UCL	1.314			95% KM Bootstrap t UCL	1.319		
2164					90% KM Chebyshev UCL	1.385			95% KM Chebyshev UCL	1.456		
2165					97.5% KM Chebyshev UCL	1.554			99% KM Chebyshev UCL	1.748		
2166												
2167	**Gamma GOF Tests on Detected Observations Only**											
2168					A-D Test Statistic	0.439			**Anderson-Darling GOF Test**			
2169					5% A-D Critical Value	0.708			Detected data appear Gamma Distributed at 5% Significance Level			
2170					K-S Test Statistic	0.287			**Kolmogorov-Smirnov GOF**			
2171					5% K-S Critical Value	0.311			Detected data appear Gamma Distributed at 5% Significance Level			
2172	**Detected data appear Gamma Distributed at 5% Significance Level**											
2173												
2174	**Gamma Statistics on Detected Data Only**											
2175					k hat (MLE)	88.18			k star (bias corrected MLE)	50.48		
2176					Theta hat (MLE)	0.0139			Theta star (bias corrected MLE)	0.0243		
2177					nu hat (MLE)	1234			nu star (bias corrected)	706.8		
2178					Mean (detects)	1.229						
2179												
2180	**Gamma ROS Statistics using Imputed Non-Detects**											
2181	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2182	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2183	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2184	This is especially true when the sample size is small.											

	A	B	C	D	E	F	G	H	I	J	K	L
2185	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2186					Minimum	1				Mean		1.228
2187					Maximum	1.4				Median		1.263
2188					SD	0.128				CV		0.104
2189					k hat (MLE)	100.7				k star (bias corrected MLE)		63.05
2190					Theta hat (MLE)	0.0122				Theta star (bias corrected MLE)		0.0195
2191					nu hat (MLE)	1612				nu star (bias corrected)		1009
2192					Adjusted Level of Significance (β)	0.0195						
2193					Approximate Chi Square Value (N/A, α)	936				Adjusted Chi Square Value (N/A, β)		918.2
2194					95% Gamma Approximate UCL (use when n>=50)	1.324				95% Gamma Adjusted UCL (use when n<50)		1.349
2195												
2196	**Estimates of Gamma Parameters using KM Estimates**											
2197					Mean (KM)	1.229				SD (KM)		0.128
2198					Variance (KM)	0.0163				SE of Mean (KM)		0.0522
2199					k hat (KM)	92.45				k star (KM)		57.86
2200					nu hat (KM)	1479				nu star (KM)		925.8
2201					theta hat (KM)	0.0133				theta star (KM)		0.0212
2202					80% gamma percentile (KM)	1.362				90% gamma percentile (KM)		1.44
2203					95% gamma percentile (KM)	1.506				99% gamma percentile (KM)		1.635
2204												
2205	**Gamma Kaplan-Meier (KM) Statistics**											
2206					Approximate Chi Square Value (925.83, α)	856.2				Adjusted Chi Square Value (925.83, β)		839.2
2207					95% Gamma Approximate KM-UCL (use when n>=50)	1.328				95% Gamma Adjusted KM-UCL (use when n<50)		1.355
2208												
2209	**Lognormal GOF Test on Detected Observations Only**											
2210					Shapiro Wilk Test Statistic	0.904				**Shapiro Wilk GOF Test**		
2211					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
2212					Lilliefors Test Statistic	0.275				**Lilliefors GOF Test**		
2213					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
2214	**Detected Data appear Lognormal at 5% Significance Level**											
2215												
2216	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2217					Mean in Original Scale	1.228				Mean in Log Scale		0.2
2218					SD in Original Scale	0.128				SD in Log Scale		0.108
2219					95% t UCL (assumes normality of ROS data)	1.313				95% Percentile Bootstrap UCL		1.293
2220					95% BCA Bootstrap UCL	1.288				95% Bootstrap t UCL		1.298
2221					95% H-UCL (Log ROS)	1.325						
2222												
2223	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2224					KM Mean (logged)	0.2				KM Geo Mean		1.222
2225					KM SD (logged)	0.108				95% Critical H Value (KM-Log)		1.856
2226					KM Standard Error of Mean (logged)	0.0441				95% H-UCL (KM -Log)		1.325
2227					KM SD (logged)	0.108				95% Critical H Value (KM-Log)		1.856
2228					KM Standard Error of Mean (logged)	0.0441						
2229												
2230	**DL/2 Statistics**											
2231	**DL/2 Normal**						**DL/2 Log-Transformed**					
2232					Mean in Original Scale	1.406				Mean in Log Scale		0.297
2233					SD in Original Scale	0.519				SD in Log Scale		0.294
2234					95% t UCL (Assumes normality)	1.754				95% H-Stat UCL		1.765
2235	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2236												

	A	B	C	D	E	F	G	H	I	J	K	L
2237	**Nonparametric Distribution Free UCL Statistics**											
2238	**Detected Data appear Normal Distributed at 5% Significance Level**											
2239												
2240	**Suggested UCL to Use**											
2241					95% KM (t) UCL	1.327						
2242												
2243	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2244	Recommendations are based upon data size, data distribution, and skewness.											
2245	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2246	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2247												
2248												
2249	**Vanadium (smw17)**											
2250												
2251	**General Statistics**											
2252					Total Number of Observations	8				Number of Distinct Observations	8	
2253										Number of Missing Observations	0	
2254					Minimum	11.8				Mean	53.29	
2255					Maximum	75.4				Median	58.75	
2256					SD	19.31				Std. Error of Mean	6.827	
2257					Coefficient of Variation	0.362				Skewness	-1.569	
2258												
2259	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2260	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2261	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2262	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2263												
2264	**Normal GOF Test**											
2265					Shapiro Wilk Test Statistic	0.864				**Shapiro Wilk GOF Test**		
2266					5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level		
2267					Lilliefors Test Statistic	0.238				**Lilliefors GOF Test**		
2268					5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level		
2269	**Data appear Normal at 5% Significance Level**											
2270												
2271	**Assuming Normal Distribution**											
2272					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
2273					95% Student's-t UCL	66.22				95% Adjusted-CLT UCL (Chen-1995)	60.47	
2274										95% Modified-t UCL (Johnson-1978)	65.59	
2275												
2276	**Gamma GOF Test**											
2277					A-D Test Statistic	0.975				**Anderson-Darling Gamma GOF Test**		
2278					5% A-D Critical Value	0.719				Data Not Gamma Distributed at 5% Significance Level		
2279					K-S Test Statistic	0.301				**Kolmogorov-Smirnov Gamma GOF Test**		
2280					5% K-S Critical Value	0.295				Data Not Gamma Distributed at 5% Significance Level		
2281	**Data Not Gamma Distributed at 5% Significance Level**											
2282												
2283	**Gamma Statistics**											
2284					k hat (MLE)	4.781				k star (bias corrected MLE)	3.071	
2285					Theta hat (MLE)	11.15				Theta star (bias corrected MLE)	17.35	
2286					nu hat (MLE)	76.49				nu star (bias corrected)	49.14	
2287					MLE Mean (bias corrected)	53.29				MLE Sd (bias corrected)	30.41	
2288										Approximate Chi Square Value (0.05)	34.05	

2289	Adjusted Level of Significance					0.0195	Adjusted Chi Square Value					30.9
2290												
2291	**Assuming Gamma Distribution**											
2292	95% Approximate Gamma UCL (use when n>=50))					76.91	95% Adjusted Gamma UCL (use when n<50)					84.74
2293												
2294	**Lognormal GOF Test**											
2295	Shapiro Wilk Test Statistic					0.684	**Shapiro Wilk Lognormal GOF Test**					
2296	5% Shapiro Wilk Critical Value					0.818	Data Not Lognormal at 5% Significance Level					
2297	Lilliefors Test Statistic					0.315	**Lilliefors Lognormal GOF Test**					
2298	5% Lilliefors Critical Value					0.283	Data Not Lognormal at 5% Significance Level					
2299	**Data Not Lognormal at 5% Significance Level**											
2300												
2301	**Lognormal Statistics**											
2302	Minimum of Logged Data					2.468	Mean of logged Data					3.867
2303	Maximum of Logged Data					4.323	SD of logged Data					0.59
2304												
2305	**Assuming Lognormal Distribution**											
2306	95% H-UCL					99.72	90% Chebyshev (MVUE) UCL					90.76
2307	95% Chebyshev (MVUE) UCL					106.7	97.5% Chebyshev (MVUE) UCL					128.8
2308	99% Chebyshev (MVUE) UCL					172.3						
2309												
2310	**Nonparametric Distribution Free UCL Statistics**											
2311	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
2312												
2313	**Nonparametric Distribution Free UCLs**											
2314	95% CLT UCL					64.52	95% Jackknife UCL					66.22
2315	95% Standard Bootstrap UCL					63.65	95% Bootstrap-t UCL					62.8
2316	95% Hall's Bootstrap UCL					61.78	95% Percentile Bootstrap UCL					63.14
2317	95% BCA Bootstrap UCL					61.34						
2318	90% Chebyshev(Mean, Sd) UCL					73.77	95% Chebyshev(Mean, Sd) UCL					83.05
2319	97.5% Chebyshev(Mean, Sd) UCL					95.92	99% Chebyshev(Mean, Sd) UCL					121.2
2320												
2321	**Suggested UCL to Use**											
2322	95% Student's-t UCL					66.22						
2323												
2324	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2325	Recommendations are based upon data size, data distribution, and skewness.											
2326	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2327	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2328												
2329	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
2330	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
2331												
2332	**Vanadium (smw17d)**											
2333												
2334	**General Statistics**											
2335	Total Number of Observations					8	Number of Distinct Observations					7
2336	Number of Detects					7	Number of Non-Detects					1
2337	Number of Distinct Detects					6	Number of Distinct Non-Detects					1
2338	Minimum Detect					1.6	Minimum Non-Detect					5.3
2339	Maximum Detect					3.7	Maximum Non-Detect					5.3
2340	Variance Detects					0.807	Percent Non-Detects					12.5%

	A	B	C	D	E	F	G	H	I	J	K	L
2341					Mean Detects	2.4					SD Detects	0.898
2342					Median Detects	1.8					CV Detects	0.374
2343					Skewness Detects	0.73					Kurtosis Detects	-1.644
2344					Mean of Logged Detects	0.819					SD of Logged Detects	0.358
2345												
2346					**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2347					**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2348					**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2349					**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2350												
2351					**Normal GOF Test on Detects Only**							
2352					Shapiro Wilk Test Statistic	0.81	**Shapiro Wilk GOF Test**					
2353					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level					
2354					Lilliefors Test Statistic	0.319	**Lilliefors GOF Test**					
2355					5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level					
2356					**Detected Data appear Approximate Normal at 5% Significance Level**							
2357												
2358					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
2359					KM Mean	2.4					KM Standard Error of Mean	0.339
2360					KM SD	0.832					95% KM (BCA) UCL	2.929
2361					95% KM (t) UCL	3.043					95% KM (Percentile Bootstrap) UCL	2.929
2362					95% KM (z) UCL	2.958					95% KM Bootstrap t UCL	3.491
2363					90% KM Chebyshev UCL	3.418					95% KM Chebyshev UCL	3.88
2364					97.5% KM Chebyshev UCL	4.52					99% KM Chebyshev UCL	5.778
2365												
2366					**Gamma GOF Tests on Detected Observations Only**							
2367					A-D Test Statistic	0.686	**Anderson-Darling GOF Test**					
2368					5% A-D Critical Value	0.709	Detected data appear Gamma Distributed at 5% Significance Level					
2369					K-S Test Statistic	0.332	**Kolmogorov-Smirnov GOF**					
2370					5% K-S Critical Value	0.312	Detected Data Not Gamma Distributed at 5% Significance Level					
2371					**Detected data follow Appr. Gamma Distribution at 5% Significance Level**							
2372												
2373					**Gamma Statistics on Detected Data Only**							
2374					k hat (MLE)	8.963					k star (bias corrected MLE)	5.217
2375					Theta hat (MLE)	0.268					Theta star (bias corrected MLE)	0.46
2376					nu hat (MLE)	125.5					nu star (bias corrected)	73.04
2377					Mean (detects)	2.4						
2378												
2379					**Gamma ROS Statistics using Imputed Non-Detects**							
2380					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2381					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2382					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2383					This is especially true when the sample size is small.							
2384					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2385					Minimum	1.6					Mean	2.392
2386					Maximum	3.7					Median	2.068
2387					SD	0.832					CV	0.348
2388					k hat (MLE)	10.21					k star (bias corrected MLE)	6.466
2389					Theta hat (MLE)	0.234					Theta star (bias corrected MLE)	0.37
2390					nu hat (MLE)	163.4					nu star (bias corrected)	103.5
2391					Adjusted Level of Significance (β)	0.0195						
2392					Approximate Chi Square Value (103.46, α)	80.99					Adjusted Chi Square Value (103.46, β)	75.97

	A	B	C	D	E	F	G	H	I	J	K	L
2393	95% Gamma Approximate UCL (use when n>=50)					3.056	95% Gamma Adjusted UCL (use when n<50)					3.257
2394												
2395	**Estimates of Gamma Parameters using KM Estimates**											
2396	Mean (KM)					2.4	SD (KM)					0.832
2397	Variance (KM)					0.691	SE of Mean (KM)					0.339
2398	k hat (KM)					8.331	k star (KM)					5.29
2399	nu hat (KM)					133.3	nu star (KM)					84.64
2400	theta hat (KM)					0.288	theta star (KM)					0.454
2401	80% gamma percentile (KM)					3.206	90% gamma percentile (KM)					3.796
2402	95% gamma percentile (KM)					4.333	99% gamma percentile (KM)					5.465
2403												
2404	**Gamma Kaplan-Meier (KM) Statistics**											
2405	Approximate Chi Square Value (84.64, α)					64.43	Adjusted Chi Square Value (84.64, β)					59.99
2406	95% Gamma Approximate KM-UCL (use when n>=50)					3.153	95% Gamma Adjusted KM-UCL (use when n<50)					3.386
2407												
2408	**Lognormal GOF Test on Detected Observations Only**											
2409	Shapiro Wilk Test Statistic					0.828	**Shapiro Wilk GOF Test**					
2410	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Lognormal at 5% Significance Level					
2411	Lilliefors Test Statistic					0.312	**Lilliefors GOF Test**					
2412	5% Lilliefors Critical Value					0.304	Detected Data Not Lognormal at 5% Significance Level					
2413	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
2414												
2415	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2416	Mean in Original Scale					2.383	Mean in Log Scale					0.819
2417	SD in Original Scale					0.833	SD in Log Scale					0.332
2418	95% t UCL (assumes normality of ROS data)					2.941	95% Percentile Bootstrap UCL					2.863
2419	95% BCA Bootstrap UCL					2.875	95% Bootstrap t UCL					3.407
2420	95% H-UCL (Log ROS)					3.117						
2421												
2422	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2423	KM Mean (logged)					0.819	KM Geo Mean					2.267
2424	KM SD (logged)					0.332	95% Critical H Value (KM-Log)					2.099
2425	KM Standard Error of Mean (logged)					0.135	95% H-UCL (KM -Log)					3.117
2426	KM SD (logged)					0.332	95% Critical H Value (KM-Log)					2.099
2427	KM Standard Error of Mean (logged)					0.135						
2428												
2429	**DL/2 Statistics**											
2430	**DL/2 Normal**						**DL/2 Log-Transformed**					
2431	Mean in Original Scale					2.431	Mean in Log Scale					0.838
2432	SD in Original Scale					0.836	SD in Log Scale					0.336
2433	95% t UCL (Assumes normality)					2.991	95% H-Stat UCL					3.197
2434	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2435												
2436	**Nonparametric Distribution Free UCL Statistics**											
2437	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
2438												
2439	**Suggested UCL to Use**											
2440	95% KM (t) UCL					3.043						
2441												
2442	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
2443	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
2444												

	A	B	C	D	E	F	G	H	I	J	K	L
2445	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2446	Recommendations are based upon data size, data distribution, and skewness.											
2447	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2448	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2449												
2450												
2451	**Vanadium (smw18)**											
2452												
2453	**General Statistics**											
2454						Total Number of Observations	8				Number of Distinct Observations	8
2455											Number of Missing Observations	0
2456						Minimum	8.6				Mean	18.09
2457						Maximum	32.2				Median	18
2458						SD	7.198				Std. Error of Mean	2.545
2459						Coefficient of Variation	0.398				Skewness	0.904
2460												
2461	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2462	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2463	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2464	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2465												
2466	**Normal GOF Test**											
2467						Shapiro Wilk Test Statistic	0.948				**Shapiro Wilk GOF Test**	
2468						5% Shapiro Wilk Critical Value	0.818				Data appear Normal at 5% Significance Level	
2469						Lilliefors Test Statistic	0.194				**Lilliefors GOF Test**	
2470						5% Lilliefors Critical Value	0.283				Data appear Normal at 5% Significance Level	
2471	**Data appear Normal at 5% Significance Level**											
2472												
2473	**Assuming Normal Distribution**											
2474						**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**	
2475						95% Student's-t UCL	22.91				95% Adjusted-CLT UCL (Chen-1995)	23.14
2476											95% Modified-t UCL (Johnson-1978)	23.04
2477												
2478	**Gamma GOF Test**											
2479						A-D Test Statistic	0.173				**Anderson-Darling Gamma GOF Test**	
2480						5% A-D Critical Value	0.717				Detected data appear Gamma Distributed at 5% Significance Level	
2481						K-S Test Statistic	0.143				**Kolmogorov-Smirnov Gamma GOF Test**	
2482						5% K-S Critical Value	0.295				Detected data appear Gamma Distributed at 5% Significance Level	
2483	**Detected data appear Gamma Distributed at 5% Significance Level**											
2484												
2485	**Gamma Statistics**											
2486						k hat (MLE)	7.426				k star (bias corrected MLE)	4.724
2487						Theta hat (MLE)	2.436				Theta star (bias corrected MLE)	3.829
2488						nu hat (MLE)	118.8				nu star (bias corrected)	75.59
2489						MLE Mean (bias corrected)	18.09				MLE Sd (bias corrected)	8.322
2490											Approximate Chi Square Value (0.05)	56.57
2491						Adjusted Level of Significance	0.0195				Adjusted Chi Square Value	52.42
2492												
2493	**Assuming Gamma Distribution**											
2494						95% Approximate Gamma UCL (use when n>=50))	24.17				95% Adjusted Gamma UCL (use when n<50)	26.08
2495												
2496	**Lognormal GOF Test**											

2497				Shapiro Wilk Test Statistic		0.986		**Shapiro Wilk Lognormal GOF Test**				
2498				5% Shapiro Wilk Critical Value		0.818		Data appear Lognormal at 5% Significance Level				
2499				Lilliefors Test Statistic		0.132		**Lilliefors Lognormal GOF Test**				
2500				5% Lilliefors Critical Value		0.283		Data appear Lognormal at 5% Significance Level				
2501				**Data appear Lognormal at 5% Significance Level**								
2502												
2503				**Lognormal Statistics**								
2504				Minimum of Logged Data		2.152		Mean of logged Data				2.826
2505				Maximum of Logged Data		3.472		SD of logged Data				0.401
2506												
2507				**Assuming Lognormal Distribution**								
2508				95% H-UCL		25.52		90% Chebyshev (MVUE) UCL				25.85
2509				95% Chebyshev (MVUE) UCL		29.36		97.5% Chebyshev (MVUE) UCL				34.24
2510				99% Chebyshev (MVUE) UCL		43.81						
2511												
2512				**Nonparametric Distribution Free UCL Statistics**								
2513				**Data appear to follow a Discernible Distribution at 5% Significance Level**								
2514												
2515				**Nonparametric Distribution Free UCLs**								
2516				95% CLT UCL		22.27		95% Jackknife UCL				22.91
2517				95% Standard Bootstrap UCL		22.01		95% Bootstrap-t UCL				23.92
2518				95% Hall's Bootstrap UCL		27.57		95% Percentile Bootstrap UCL				22.34
2519				95% BCA Bootstrap UCL		22.59						
2520				90% Chebyshev(Mean, Sd) UCL		25.72		95% Chebyshev(Mean, Sd) UCL				29.18
2521				97.5% Chebyshev(Mean, Sd) UCL		33.98		99% Chebyshev(Mean, Sd) UCL				43.41
2522												
2523				**Suggested UCL to Use**								
2524				95% Student's-t UCL		22.91						
2525												
2526				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
2527				Recommendations are based upon data size, data distribution, and skewness.								
2528				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
2529				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
2530												
2531												
2532	**Vanadium (smw18d)**											
2533												
2534				**General Statistics**								
2535				Total Number of Observations		8		Number of Distinct Observations				8
2536								Number of Missing Observations				0
2537				Minimum		3.8		Mean				6.038
2538				Maximum		8.4		Median				6.05
2539				SD		1.636		Std. Error of Mean				0.578
2540				Coefficient of Variation		0.271		Skewness				0.11
2541												
2542				**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**								
2543				**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**								
2544				**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**								
2545				**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**								
2546												
2547				**Normal GOF Test**								
2548				Shapiro Wilk Test Statistic		0.96		**Shapiro Wilk GOF Test**				

2549				5% Shapiro Wilk Critical Value		0.818		Data appear Normal at 5% Significance Level				
2550				Lilliefors Test Statistic		0.123		**Lilliefors GOF Test**				
2551				5% Lilliefors Critical Value		0.283		Data appear Normal at 5% Significance Level				
2552				**Data appear Normal at 5% Significance Level**								
2553												
2554				**Assuming Normal Distribution**								
2555				**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**				
2556				95% Student's-t UCL		7.133		95% Adjusted-CLT UCL (Chen-1995)				7.013
2557								95% Modified-t UCL (Johnson-1978)				7.137
2558												
2559				**Gamma GOF Test**								
2560				A-D Test Statistic		0.209		**Anderson-Darling Gamma GOF Test**				
2561				5% A-D Critical Value		0.716		Detected data appear Gamma Distributed at 5% Significance Level				
2562				K-S Test Statistic		0.15		**Kolmogorov-Smirnov Gamma GOF Test**				
2563				5% K-S Critical Value		0.294		Detected data appear Gamma Distributed at 5% Significance Level				
2564				**Detected data appear Gamma Distributed at 5% Significance Level**								
2565												
2566				**Gamma Statistics**								
2567				k hat (MLE)		15.05		k star (bias corrected MLE)				9.487
2568				Theta hat (MLE)		0.401		Theta star (bias corrected MLE)				0.636
2569				nu hat (MLE)		240.7		nu star (bias corrected)				151.8
2570				MLE Mean (bias corrected)		6.038		MLE Sd (bias corrected)				1.96
2571								Approximate Chi Square Value (0.05)				124.3
2572				Adjusted Level of Significance		0.0195		Adjusted Chi Square Value				118
2573												
2574				**Assuming Gamma Distribution**								
2575				95% Approximate Gamma UCL (use when n>=50))		7.372		95% Adjusted Gamma UCL (use when n<50)				7.765
2576												
2577				**Lognormal GOF Test**								
2578				Shapiro Wilk Test Statistic		0.958		**Shapiro Wilk Lognormal GOF Test**				
2579				5% Shapiro Wilk Critical Value		0.818		Data appear Lognormal at 5% Significance Level				
2580				Lilliefors Test Statistic		0.164		**Lilliefors Lognormal GOF Test**				
2581				5% Lilliefors Critical Value		0.283		Data appear Lognormal at 5% Significance Level				
2582				**Data appear Lognormal at 5% Significance Level**								
2583												
2584				**Lognormal Statistics**								
2585				Minimum of Logged Data		1.335		Mean of logged Data				1.764
2586				Maximum of Logged Data		2.128		SD of logged Data				0.281
2587												
2588				**Assuming Lognormal Distribution**								
2589				95% H-UCL		7.536		90% Chebyshev (MVUE) UCL				7.848
2590				95% Chebyshev (MVUE) UCL		8.666		97.5% Chebyshev (MVUE) UCL				9.801
2591				99% Chebyshev (MVUE) UCL		12.03						
2592												
2593				**Nonparametric Distribution Free UCL Statistics**								
2594				**Data appear to follow a Discernible Distribution at 5% Significance Level**								
2595												
2596				**Nonparametric Distribution Free UCLs**								
2597				95% CLT UCL		6.989		95% Jackknife UCL				7.133
2598				95% Standard Bootstrap UCL		6.948		95% Bootstrap-t UCL				7.177
2599				95% Hall's Bootstrap UCL		7.111		95% Percentile Bootstrap UCL				6.963
2600				95% BCA Bootstrap UCL		6.888						

2601				90% Chebyshev(Mean, Sd) UCL		7.773			95% Chebyshev(Mean, Sd) UCL			8.559
2602				97.5% Chebyshev(Mean, Sd) UCL		9.65			99% Chebyshev(Mean, Sd) UCL			11.79
2603												
2604						**Suggested UCL to Use**							
2605				95% Student's-t UCL		7.133						
2606												
2607						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
2608						Recommendations are based upon data size, data distribution, and skewness.							
2609						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
2610						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
2611												
2612	**Vanadium (smw19)**											
2613												
2614						**General Statistics**							
2615				Total Number of Observations		8			Number of Distinct Observations			7
2616				Number of Detects		7			Number of Non-Detects			1
2617				Number of Distinct Detects		6			Number of Distinct Non-Detects			1
2618				Minimum Detect		1.9			Minimum Non-Detect			5.3
2619				Maximum Detect		6.7			Maximum Non-Detect			5.3
2620				Variance Detects		2.835			Percent Non-Detects			12.5%
2621				Mean Detects		3.286			SD Detects			1.684
2622				Median Detects		2.6			CV Detects			0.512
2623				Skewness Detects		1.658			Kurtosis Detects			2.963
2624				Mean of Logged Detects		1.096			SD of Logged Detects			0.449
2625												
2626						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**							
2627						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**							
2628						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**							
2629						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**							
2630												
2631						**Normal GOF Test on Detects Only**							
2632				Shapiro Wilk Test Statistic		0.822			**Shapiro Wilk GOF Test**			
2633				5% Shapiro Wilk Critical Value		0.803			Detected Data appear Normal at 5% Significance Level			
2634				Lilliefors Test Statistic		0.23			**Lilliefors GOF Test**			
2635				5% Lilliefors Critical Value		0.304			Detected Data appear Normal at 5% Significance Level			
2636						**Detected Data appear Normal at 5% Significance Level**							
2637												
2638						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
2639				KM Mean		3.215			KM Standard Error of Mean			0.581
2640				KM SD		1.494			95% KM (BCA) UCL			4.25
2641				95% KM (t) UCL		4.315			95% KM (Percentile Bootstrap) UCL			4.158
2642				95% KM (z) UCL		4.17			95% KM Bootstrap t UCL			5.227
2643				90% KM Chebyshev UCL		4.958			95% KM Chebyshev UCL			5.747
2644				97.5% KM Chebyshev UCL		6.843			99% KM Chebyshev UCL			8.996
2645												
2646						**Gamma GOF Tests on Detected Observations Only**							
2647				A-D Test Statistic		0.396			**Anderson-Darling GOF Test**			
2648				5% A-D Critical Value		0.71			Detected data appear Gamma Distributed at 5% Significance Level			
2649				K-S Test Statistic		0.221			**Kolmogorov-Smirnov GOF**			
2650				5% K-S Critical Value		0.313			Detected data appear Gamma Distributed at 5% Significance Level			
2651						**Detected data appear Gamma Distributed at 5% Significance Level**							
2652												

	A	B	C	D	E	F	G	H	I	J	K	L
2653	**Gamma Statistics on Detected Data Only**											
2654					k hat (MLE)	5.499				k star (bias corrected MLE)		3.237
2655					Theta hat (MLE)	0.598				Theta star (bias corrected MLE)		1.015
2656					nu hat (MLE)	76.98				nu star (bias corrected)		45.32
2657					Mean (detects)	3.286						
2658												
2659	**Gamma ROS Statistics using Imputed Non-Detects**											
2660	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2661	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2662	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2663	This is especially true when the sample size is small.											
2664	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2665					Minimum	1.9				Mean		3.219
2666					Maximum	6.7				Median		2.676
2667					SD	1.57				CV		0.488
2668					k hat (MLE)	6.142				k star (bias corrected MLE)		3.922
2669					Theta hat (MLE)	0.524				Theta star (bias corrected MLE)		0.821
2670					nu hat (MLE)	98.28				nu star (bias corrected)		62.76
2671					Adjusted Level of Significance (β)	0.0195						
2672					Approximate Chi Square Value (62.76, α)	45.53				Adjusted Chi Square Value (62.76, β)		41.85
2673					95% Gamma Approximate UCL (use when n>=50)	4.437				95% Gamma Adjusted UCL (use when n<50)		4.827
2674												
2675	**Estimates of Gamma Parameters using KM Estimates**											
2676					Mean (KM)	3.215				SD (KM)		1.494
2677					Variance (KM)	2.232				SE of Mean (KM)		0.581
2678					k hat (KM)	4.629				k star (KM)		2.976
2679					nu hat (KM)	74.06				nu star (KM)		47.62
2680					theta hat (KM)	0.694				theta star (KM)		1.08
2681					80% gamma percentile (KM)	4.589				90% gamma percentile (KM)		5.713
2682					95% gamma percentile (KM)	6.762				99% gamma percentile (KM)		9.036
2683												
2684	**Gamma Kaplan-Meier (KM) Statistics**											
2685					Approximate Chi Square Value (47.62, α)	32.78				Adjusted Chi Square Value (47.62, β)		29.7
2686					95% Gamma Approximate KM-UCL (use when n>=50)	4.67				95% Gamma Adjusted KM-UCL (use when n<50)		5.154
2687												
2688	**Lognormal GOF Test on Detected Observations Only**											
2689					Shapiro Wilk Test Statistic	0.913				**Shapiro Wilk GOF Test**		
2690					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
2691					Lilliefors Test Statistic	0.194				**Lilliefors GOF Test**		
2692					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
2693	**Detected Data appear Lognormal at 5% Significance Level**											
2694												
2695	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2696					Mean in Original Scale	3.212				Mean in Log Scale		1.083
2697					SD in Original Scale	1.573				SD in Log Scale		0.417
2698					95% t UCL (assumes normality of ROS data)	4.265				95% Percentile Bootstrap UCL		4.199
2699					95% BCA Bootstrap UCL	4.449				95% Bootstrap t UCL		5.262
2700					95% H-UCL (Log ROS)	4.573						
2701												
2702	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2703					KM Mean (logged)	1.079				KM Geo Mean		2.942
2704					KM SD (logged)	0.403				95% Critical H Value (KM-Log)		2.2

2705			KM Standard Error of Mean (logged)			0.159				95% H-UCL (KM -Log)		4.462
2706			KM SD (logged)			0.403				95% Critical H Value (KM-Log)		2.2
2707			KM Standard Error of Mean (logged)			0.159						
2708												
2709						**DL/2 Statistics**						
2710			**DL/2 Normal**						**DL/2 Log-Transformed**			
2711			Mean in Original Scale			3.206			Mean in Log Scale			1.081
2712			SD in Original Scale			1.575			SD in Log Scale			0.418
2713			95% t UCL (Assumes normality)			4.261			95% H-Stat UCL			4.567
2714						**DL/2 is not a recommended method, provided for comparisons and historical reasons**						
2715												
2716						**Nonparametric Distribution Free UCL Statistics**						
2717						**Detected Data appear Normal Distributed at 5% Significance Level**						
2718												
2719						**Suggested UCL to Use**						
2720			95% KM (t) UCL			4.315						
2721												
2722						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
2723						Recommendations are based upon data size, data distribution, and skewness.						
2724						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
2725						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
2726												
2727	**Vanadium (smw7)**											
2728												
2729						**General Statistics**						
2730			Total Number of Observations			8			Number of Distinct Observations			8
2731			Number of Detects			7			Number of Non-Detects			1
2732			Number of Distinct Detects			7			Number of Distinct Non-Detects			1
2733			Minimum Detect			1.1			Minimum Non-Detect			5.3
2734			Maximum Detect			2.7			Maximum Non-Detect			5.3
2735			Variance Detects			0.306			Percent Non-Detects			12.5%
2736			Mean Detects			1.843			SD Detects			0.553
2737			Median Detects			1.7			CV Detects			0.3
2738			Skewness Detects			0.314			Kurtosis Detects			-0.747
2739			Mean of Logged Detects			0.572			SD of Logged Detects			0.308
2740												
2741						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
2742						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
2743						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
2744						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
2745												
2746						**Normal GOF Test on Detects Only**						
2747			Shapiro Wilk Test Statistic			0.978			**Shapiro Wilk GOF Test**			
2748			5% Shapiro Wilk Critical Value			0.803			Detected Data appear Normal at 5% Significance Level			
2749			Lilliefors Test Statistic			0.173			**Lilliefors GOF Test**			
2750			5% Lilliefors Critical Value			0.304			Detected Data appear Normal at 5% Significance Level			
2751						**Detected Data appear Normal at 5% Significance Level**						
2752												
2753						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
2754			KM Mean			1.843			KM Standard Error of Mean			0.209
2755			KM SD			0.512			95% KM (BCA) UCL			2.171
2756			95% KM (t) UCL			2.239			95% KM (Percentile Bootstrap) UCL			2.171

2757					95% KM (z) UCL	2.187				95% KM Bootstrap t UCL		2.29
2758					90% KM Chebyshev UCL	2.47				95% KM Chebyshev UCL		2.754
2759					97.5% KM Chebyshev UCL	3.149				99% KM Chebyshev UCL		3.924
2760												
2761					**Gamma GOF Tests on Detected Observations Only**							
2762					A-D Test Statistic	0.164	**Anderson-Darling GOF Test**					
2763					5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level					
2764					K-S Test Statistic	0.147	**Kolmogorov-Smirnov GOF**					
2765					5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level					
2766					**Detected data appear Gamma Distributed at 5% Significance Level**							
2767												
2768					**Gamma Statistics on Detected Data Only**							
2769					k hat (MLE)	12.72				k star (bias corrected MLE)		7.365
2770					Theta hat (MLE)	0.145				Theta star (bias corrected MLE)		0.25
2771					nu hat (MLE)	178.1				nu star (bias corrected)		103.1
2772					Mean (detects)	1.843						
2773												
2774					**Gamma ROS Statistics using Imputed Non-Detects**							
2775					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
2776					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
2777					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
2778					This is especially true when the sample size is small.							
2779					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
2780					Minimum	1.1				Mean		1.838
2781					Maximum	2.7				Median		1.754
2782					SD	0.512				CV		0.279
2783					k hat (MLE)	14.51				k star (bias corrected MLE)		9.151
2784					Theta hat (MLE)	0.127				Theta star (bias corrected MLE)		0.201
2785					nu hat (MLE)	232.1				nu star (bias corrected)		146.4
2786					Adjusted Level of Significance (β)	0.0195						
2787					Approximate Chi Square Value (146.42, α)	119.5				Adjusted Chi Square Value (146.42, β)		113.3
2788					95% Gamma Approximate UCL (use when n>=50)	2.253				95% Gamma Adjusted UCL (use when n<50)		2.376
2789												
2790					**Estimates of Gamma Parameters using KM Estimates**							
2791					Mean (KM)	1.843				SD (KM)		0.512
2792					Variance (KM)	0.262				SE of Mean (KM)		0.209
2793					k hat (KM)	12.94				k star (KM)		8.171
2794					nu hat (KM)	207				nu star (KM)		130.7
2795					theta hat (KM)	0.142				theta star (KM)		0.226
2796					80% gamma percentile (KM)	2.352				90% gamma percentile (KM)		2.702
2797					95% gamma percentile (KM)	3.015				99% gamma percentile (KM)		3.663
2798												
2799					**Gamma Kaplan-Meier (KM) Statistics**							
2800					Approximate Chi Square Value (130.73, α)	105.3				Adjusted Chi Square Value (130.73, β)		99.56
2801					95% Gamma Approximate KM-UCL (use when n>=50)	2.288				95% Gamma Adjusted KM-UCL (use when n<50)		2.42
2802												
2803					**Lognormal GOF Test on Detected Observations Only**							
2804					Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk GOF Test**					
2805					5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level					
2806					Lilliefors Test Statistic	0.139	**Lilliefors GOF Test**					
2807					5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level					
2808					**Detected Data appear Lognormal at 5% Significance Level**							

2809												
2810	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2811					Mean in Original Scale	1.834				Mean in Log Scale	0.572	
2812					SD in Original Scale	0.513				SD in Log Scale	0.285	
2813					95% t UCL (assumes normality of ROS data)	2.177				95% Percentile Bootstrap UCL	2.114	
2814					95% BCA Bootstrap UCL	2.121				95% Bootstrap t UCL	2.249	
2815					95% H-UCL (Log ROS)	2.298						
2816												
2817	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2818					KM Mean (logged)	0.572				KM Geo Mean	1.771	
2819					KM SD (logged)	0.285				95% Critical H Value (KM-Log)	2.04	
2820					KM Standard Error of Mean (logged)	0.116				95% H-UCL (KM -Log)	2.298	
2821					KM SD (logged)	0.285				95% Critical H Value (KM-Log)	2.04	
2822					KM Standard Error of Mean (logged)	0.116						
2823												
2824	**DL/2 Statistics**											
2825					**DL/2 Normal**					**DL/2 Log-Transformed**		
2826					Mean in Original Scale	1.944				Mean in Log Scale	0.622	
2827					SD in Original Scale	0.586				SD in Log Scale	0.319	
2828					95% t UCL (Assumes normality)	2.337				95% H-Stat UCL	2.518	
2829	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2830												
2831	**Nonparametric Distribution Free UCL Statistics**											
2832	**Detected Data appear Normal Distributed at 5% Significance Level**											
2833												
2834	**Suggested UCL to Use**											
2835					95% KM (t) UCL	2.239						
2836												
2837	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2838	Recommendations are based upon data size, data distribution, and skewness.											
2839	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2840	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2841												
2842	**Vanadium (smw8)**											
2843												
2844	**General Statistics**											
2845					Total Number of Observations	8				Number of Distinct Observations	8	
2846					Number of Detects	6				Number of Non-Detects	2	
2847					Number of Distinct Detects	6				Number of Distinct Non-Detects	2	
2848					Minimum Detect	0.38				Minimum Non-Detect	0.27	
2849					Maximum Detect	0.62				Maximum Non-Detect	5.3	
2850					Variance Detects	0.012				Percent Non-Detects	25%	
2851					Mean Detects	0.49				SD Detects	0.11	
2852					Median Detects	0.475				CV Detects	0.224	
2853					Skewness Detects	0.185				Kurtosis Detects	-2.723	
2854					Mean of Logged Detects	-0.734				SD of Logged Detects	0.224	
2855												
2856	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2857	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2858	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2859	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2860												

	A	B	C	D	E	F	G	H	I	J	K	L
2861	**Normal GOF Test on Detects Only**											
2862					Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk GOF Test**					
2863					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level					
2864					Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**					
2865					5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level					
2866	**Detected Data appear Normal at 5% Significance Level**											
2867												
2868	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
2869					KM Mean	0.459	KM Standard Error of Mean	0.0499				
2870					KM SD	0.12	95% KM (BCA) UCL	0.537				
2871					95% KM (t) UCL	0.553	95% KM (Percentile Bootstrap) UCL	0.534				
2872					95% KM (z) UCL	0.541	95% KM Bootstrap t UCL	0.555				
2873					90% KM Chebyshev UCL	0.608	95% KM Chebyshev UCL	0.676				
2874					97.5% KM Chebyshev UCL	0.77	99% KM Chebyshev UCL	0.955				
2875												
2876	**Gamma GOF Tests on Detected Observations Only**											
2877					A-D Test Statistic	0.558	**Anderson-Darling GOF Test**					
2878					5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level					
2879					K-S Test Statistic	0.282	**Kolmogorov-Smirnov GOF**					
2880					5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level					
2881	**Detected data appear Gamma Distributed at 5% Significance Level**											
2882												
2883	**Gamma Statistics on Detected Data Only**											
2884					k hat (MLE)	24.02	k star (bias corrected MLE)	12.12				
2885					Theta hat (MLE)	0.0204	Theta star (bias corrected MLE)	0.0404				
2886					nu hat (MLE)	288.3	nu star (bias corrected)	145.5				
2887					Mean (detects)	0.49						
2888												
2889	**Gamma ROS Statistics using Imputed Non-Detects**											
2890	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
2891	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
2892	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
2893	This is especially true when the sample size is small.											
2894	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
2895					Minimum	0.25	Mean	0.455				
2896					Maximum	0.62	Median	0.431				
2897					SD	0.125	CV	0.274				
2898					k hat (MLE)	13.92	k star (bias corrected MLE)	8.784				
2899					Theta hat (MLE)	0.0327	Theta star (bias corrected MLE)	0.0518				
2900					nu hat (MLE)	222.7	nu star (bias corrected)	140.5				
2901					Adjusted Level of Significance (β)	0.0195						
2902					Approximate Chi Square Value (140.54, α)	114.1	Adjusted Chi Square Value (140.54, β)	108.1				
2903					95% Gamma Approximate UCL (use when n>=50)	0.561	95% Gamma Adjusted UCL (use when n<50)	0.592				
2904												
2905	**Estimates of Gamma Parameters using KM Estimates**											
2906					Mean (KM)	0.459	SD (KM)	0.12				
2907					Variance (KM)	0.0145	SE of Mean (KM)	0.0499				
2908					k hat (KM)	14.5	k star (KM)	9.149				
2909					nu hat (KM)	232.1	nu star (KM)	146.4				
2910					theta hat (KM)	0.0316	theta star (KM)	0.0501				
2911					80% gamma percentile (KM)	0.579	90% gamma percentile (KM)	0.66				
2912					95% gamma percentile (KM)	0.733	99% gamma percentile (KM)	0.883				

2913												
2914	**Gamma Kaplan-Meier (KM) Statistics**											
2915	Approximate Chi Square Value (146.38, α)					119.4	Adjusted Chi Square Value (146.38, β)					113.3
2916	95% Gamma Approximate KM-UCL (use when n>=50)					0.562	95% Gamma Adjusted KM-UCL (use when n<50)					0.593
2917												
2918	**Lognormal GOF Test on Detected Observations Only**											
2919	Shapiro Wilk Test Statistic					0.84	**Shapiro Wilk GOF Test**					
2920	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Lognormal at 5% Significance Level					
2921	Lilliefors Test Statistic					0.258	**Lilliefors GOF Test**					
2922	5% Lilliefors Critical Value					0.325	Detected Data appear Lognormal at 5% Significance Level					
2923	**Detected Data appear Lognormal at 5% Significance Level**											
2924												
2925	**Lognormal ROS Statistics Using Imputed Non-Detects**											
2926	Mean in Original Scale					0.458	Mean in Log Scale					-0.811
2927	SD in Original Scale					0.119	SD in Log Scale					0.269
2928	95% t UCL (assumes normality of ROS data)					0.538	95% Percentile Bootstrap UCL					0.523
2929	95% BCA Bootstrap UCL					0.526	95% Bootstrap t UCL					0.545
2930	95% H-UCL (Log ROS)					0.566						
2931												
2932	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
2933	KM Mean (logged)					-0.816	KM Geo Mean					0.442
2934	KM SD (logged)					0.276	95% Critical H Value (KM-Log)					2.029
2935	KM Standard Error of Mean (logged)					0.114	95% H-UCL (KM -Log)					0.568
2936	KM SD (logged)					0.276	95% Critical H Value (KM-Log)					2.029
2937	KM Standard Error of Mean (logged)					0.114						
2938												
2939	**DL/2 Statistics**											
2940	**DL/2 Normal**						**DL/2 Log-Transformed**					
2941	Mean in Original Scale					0.716	Mean in Log Scale					-0.679
2942	SD in Original Scale					0.797	SD in Log Scale					0.824
2943	95% t UCL (Assumes normality)					1.249	95% H-Stat UCL					1.817
2944	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
2945												
2946	**Nonparametric Distribution Free UCL Statistics**											
2947	**Detected Data appear Normal Distributed at 5% Significance Level**											
2948												
2949	**Suggested UCL to Use**											
2950	95% KM (t) UCL					0.553						
2951												
2952	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
2953	Recommendations are based upon data size, data distribution, and skewness.											
2954	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
2955	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
2956												
2957												
2958	**Vanadium (smw9)**											
2959												
2960	**General Statistics**											
2961	Total Number of Observations					9	Number of Distinct Observations					7
2962							Number of Missing Observations					0
2963	Minimum					4.6	Mean					6.467
2964	Maximum					10.8	Median					6.3

2965					SD	1.859					Std. Error of Mean	0.62
2966					Coefficient of Variation	0.287					Skewness	1.742
2967												
2968	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
2969	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
2970	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
2971	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
2972												
2973	**Normal GOF Test**											
2974					Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**					
2975					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
2976					Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**					
2977					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
2978	**Data appear Approximate Normal at 5% Significance Level**											
2979												
2980	**Assuming Normal Distribution**											
2981	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
2982					95% Student's-t UCL	7.619					95% Adjusted-CLT UCL (Chen-1995)	7.87
2983											95% Modified-t UCL (Johnson-1978)	7.679
2984												
2985	**Gamma GOF Test**											
2986					A-D Test Statistic	0.49	**Anderson-Darling Gamma GOF Test**					
2987					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
2988					K-S Test Statistic	0.199	**Kolmogorov-Smirnov Gamma GOF Test**					
2989					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
2990	**Detected data appear Gamma Distributed at 5% Significance Level**											
2991												
2992	**Gamma Statistics**											
2993					k hat (MLE)	16.17					k star (bias corrected MLE)	10.85
2994					Theta hat (MLE)	0.4					Theta star (bias corrected MLE)	0.596
2995					nu hat (MLE)	291					nu star (bias corrected)	195.3
2996					MLE Mean (bias corrected)	6.467					MLE Sd (bias corrected)	1.963
2997											Approximate Chi Square Value (0.05)	164
2998					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	157.9
2999												
3000	**Assuming Gamma Distribution**											
3001					95% Approximate Gamma UCL (use when n>=50))	7.702					95% Adjusted Gamma UCL (use when n<50)	7.998
3002												
3003	**Lognormal GOF Test**											
3004					Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk Lognormal GOF Test**					
3005					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
3006					Lilliefors Test Statistic	0.188	**Lilliefors Lognormal GOF Test**					
3007					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
3008	**Data appear Lognormal at 5% Significance Level**											
3009												
3010	**Lognormal Statistics**											
3011					Minimum of Logged Data	1.526					Mean of logged Data	1.835
3012					Maximum of Logged Data	2.38					SD of logged Data	0.256
3013												
3014	**Assuming Lognormal Distribution**											
3015					95% H-UCL	7.734					90% Chebyshev (MVUE) UCL	8.109
3016					95% Chebyshev (MVUE) UCL	8.859					97.5% Chebyshev (MVUE) UCL	9.901

3017				99% Chebyshev (MVUE) UCL		11.95						
3018												
3019						**Nonparametric Distribution Free UCL Statistics**							
3020						**Data appear to follow a Discernible Distribution at 5% Significance Level**						
3021												
3022						**Nonparametric Distribution Free UCLs**							
3023				95% CLT UCL		7.486		95% Jackknife UCL		7.619		
3024				95% Standard Bootstrap UCL		7.43		95% Bootstrap-t UCL		8.242		
3025				95% Hall's Bootstrap UCL		11.97		95% Percentile Bootstrap UCL		7.444		
3026				95% BCA Bootstrap UCL		7.811						
3027				90% Chebyshev(Mean, Sd) UCL		8.325		95% Chebyshev(Mean, Sd) UCL		9.167		
3028				97.5% Chebyshev(Mean, Sd) UCL		10.34		99% Chebyshev(Mean, Sd) UCL		12.63		
3029												
3030						**Suggested UCL to Use**							
3031				95% Student's-t UCL		7.619						
3032												
3033						When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test						
3034						When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL						
3035												
3036						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
3037						Recommendations are based upon data size, data distribution, and skewness.						
3038						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
3039						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
3040												
3041	**Vanadium (tw2r)**											
3042												
3043						**General Statistics**						
3044				Total Number of Observations		9		Number of Distinct Observations		8		
3045				Number of Detects		6		Number of Non-Detects		3		
3046				Number of Distinct Detects		6		Number of Distinct Non-Detects		2		
3047				Minimum Detect		0.31		Minimum Non-Detect		0.27		
3048				Maximum Detect		14.3		Maximum Non-Detect		1.3		
3049				Variance Detects		29.38		Percent Non-Detects		33.33%		
3050				Mean Detects		3.325		SD Detects		5.421		
3051				Median Detects		1.2		CV Detects		1.63		
3052				Skewness Detects		2.363		Kurtosis Detects		5.659		
3053				Mean of Logged Detects		0.369		SD of Logged Detects		1.314		
3054												
3055						**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**						
3056						**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**						
3057						**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**						
3058						**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**						
3059												
3060						**Normal GOF Test on Detects Only**							
3061				Shapiro Wilk Test Statistic		0.614		**Shapiro Wilk GOF Test**				
3062				5% Shapiro Wilk Critical Value		0.788		Detected Data Not Normal at 5% Significance Level				
3063				Lilliefors Test Statistic		0.408		**Lilliefors GOF Test**				
3064				5% Lilliefors Critical Value		0.325		Detected Data Not Normal at 5% Significance Level				
3065						**Detected Data Not Normal at 5% Significance Level**							
3066												
3067						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
3068				KM Mean		2.37		KM Standard Error of Mean		1.558		

3069					KM SD	4.263				95% KM (BCA) UCL		5.316
3070					95% KM (t) UCL	5.267				95% KM (Percentile Bootstrap) UCL		5.324
3071					95% KM (z) UCL	4.932				95% KM Bootstrap t UCL		18.06
3072					90% KM Chebyshev UCL	7.044				95% KM Chebyshev UCL		9.161
3073					97.5% KM Chebyshev UCL	12.1				99% KM Chebyshev UCL		17.87
3074												
3075					**Gamma GOF Tests on Detected Observations Only**							
3076					A-D Test Statistic	0.582				**Anderson-Darling GOF Test**		
3077					5% A-D Critical Value	0.723				Detected data appear Gamma Distributed at 5% Significance Level		
3078					K-S Test Statistic	0.289				**Kolmogorov-Smirnov GOF**		
3079					5% K-S Critical Value	0.344				Detected data appear Gamma Distributed at 5% Significance Level		
3080					**Detected data appear Gamma Distributed at 5% Significance Level**							
3081												
3082					**Gamma Statistics on Detected Data Only**							
3083					k hat (MLE)	0.723				k star (bias corrected MLE)		0.472
3084					Theta hat (MLE)	4.602				Theta star (bias corrected MLE)		7.039
3085					nu hat (MLE)	8.67				nu star (bias corrected)		5.668
3086					Mean (detects)	3.325						
3087												
3088					**Gamma ROS Statistics using Imputed Non-Detects**							
3089					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
3090					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
3091					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
3092					This is especially true when the sample size is small.							
3093					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
3094					Minimum	0.01				Mean		2.22
3095					Maximum	14.3				Median		0.64
3096					SD	4.595				CV		2.07
3097					k hat (MLE)	0.326				k star (bias corrected MLE)		0.291
3098					Theta hat (MLE)	6.81				Theta star (bias corrected MLE)		7.618
3099					nu hat (MLE)	5.868				nu star (bias corrected)		5.245
3100					Adjusted Level of Significance (β)	0.0231						
3101					Approximate Chi Square Value (5.25, α)	1.267				Adjusted Chi Square Value (5.25, β)		0.904
3102					95% Gamma Approximate UCL (use when n>=50)	9.189				95% Gamma Adjusted UCL (use when n<50)		12.87
3103												
3104					**Estimates of Gamma Parameters using KM Estimates**							
3105					Mean (KM)	2.37				SD (KM)		4.263
3106					Variance (KM)	18.17				SE of Mean (KM)		1.558
3107					k hat (KM)	0.309				k star (KM)		0.28
3108					nu hat (KM)	5.563				nu star (KM)		5.042
3109					theta hat (KM)	7.668				theta star (KM)		8.46
3110					80% gamma percentile (KM)	3.569				90% gamma percentile (KM)		7.044
3111					95% gamma percentile (KM)	11.08				99% gamma percentile (KM)		21.66
3112												
3113					**Gamma Kaplan-Meier (KM) Statistics**							
3114					Approximate Chi Square Value (5.04, α)	1.172				Adjusted Chi Square Value (5.04, β)		0.828
3115					95% Gamma Approximate KM-UCL (use when n>=50)	10.2				95% Gamma Adjusted KM-UCL (use when n<50)		14.42
3116												
3117					**Lognormal GOF Test on Detected Observations Only**							
3118					Shapiro Wilk Test Statistic	0.942				**Shapiro Wilk GOF Test**		
3119					5% Shapiro Wilk Critical Value	0.788				Detected Data appear Lognormal at 5% Significance Level		
3120					Lilliefors Test Statistic	0.195				**Lilliefors GOF Test**		

3121	5% Lilliefors Critical Value					0.325	Detected Data appear Lognormal at 5% Significance Level					
3122	**Detected Data appear Lognormal at 5% Significance Level**											
3123												
3124	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3125	Mean in Original Scale					2.313	Mean in Log Scale					-0.279
3126	SD in Original Scale					4.548	SD in Log Scale					1.516
3127	95% t UCL (assumes normality of ROS data)					5.132	95% Percentile Bootstrap UCL					5.207
3128	95% BCA Bootstrap UCL					6.854	95% Bootstrap t UCL					20.07
3129	95% H-UCL (Log ROS)					26.36						
3130												
3131	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3132	KM Mean (logged)					-0.0623	KM Geo Mean					0.94
3133	KM SD (logged)					1.191	95% Critical H Value (KM-Log)					3.679
3134	KM Standard Error of Mean (logged)					0.449	95% H-UCL (KM -Log)					9.003
3135	KM SD (logged)					1.191	95% Critical H Value (KM-Log)					3.679
3136	KM Standard Error of Mean (logged)					0.449						
3137												
3138	**DL/2 Statistics**											
3139	**DL/2 Normal**						**DL/2 Log-Transformed**					
3140	Mean in Original Scale					2.376	Mean in Log Scale					-0.0724
3141	SD in Original Scale					4.518	SD in Log Scale					1.313
3142	95% t UCL (Assumes normality)					5.177	95% H-Stat UCL					13.92
3143	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3144												
3145	**Nonparametric Distribution Free UCL Statistics**											
3146	**Detected Data appear Gamma Distributed at 5% Significance Level**											
3147												
3148	**Suggested UCL to Use**											
3149	95% KM Bootstrap t UCL					18.06	a Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)					14.42
3150												
3151	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3152	Recommendations are based upon data size, data distribution, and skewness.											
3153	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3154	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3155												
3156	**Vanadium (tw5r)**											
3157												
3158	**General Statistics**											
3159	Total Number of Observations					8	Number of Distinct Observations					7
3160	Number of Detects					6	Number of Non-Detects					2
3161	Number of Distinct Detects					5	Number of Distinct Non-Detects					2
3162	Minimum Detect					0.44	Minimum Non-Detect					0.27
3163	Maximum Detect					3	Maximum Non-Detect					5.3
3164	Variance Detects					0.894	Percent Non-Detects					25%
3165	Mean Detects					1.112	SD Detects					0.946
3166	Median Detects					0.85	CV Detects					0.851
3167	Skewness Detects					2.212	Kurtosis Detects					5.147
3168	Mean of Logged Detects					-0.108	SD of Logged Detects					0.66
3169												
3170	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
3171	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
3172	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											

3173	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
3174												
3175	**Normal GOF Test on Detects Only**											
3176					Shapiro Wilk Test Statistic	0.69	**Shapiro Wilk GOF Test**					
3177					5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level					
3178					Lilliefors Test Statistic	0.397	**Lilliefors GOF Test**					
3179					5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level					
3180	**Detected Data Not Normal at 5% Significance Level**											
3181												
3182	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
3183					KM Mean	0.991	KM Standard Error of Mean	0.353				
3184					KM SD	0.852	95% KM (BCA) UCL	1.672				
3185					95% KM (t) UCL	1.66	95% KM (Percentile Bootstrap) UCL	1.566				
3186					95% KM (z) UCL	1.571	95% KM Bootstrap t UCL	2.63				
3187					90% KM Chebyshev UCL	2.049	95% KM Chebyshev UCL	2.528				
3188					97.5% KM Chebyshev UCL	3.194	99% KM Chebyshev UCL	4.5				
3189												
3190	**Gamma GOF Tests on Detected Observations Only**											
3191					A-D Test Statistic	0.645	**Anderson-Darling GOF Test**					
3192					5% A-D Critical Value	0.703	Detected data appear Gamma Distributed at 5% Significance Level					
3193					K-S Test Statistic	0.338	**Kolmogorov-Smirnov GOF**					
3194					5% K-S Critical Value	0.335	Detected Data Not Gamma Distributed at 5% Significance Level					
3195	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
3196												
3197	**Gamma Statistics on Detected Data Only**											
3198					k hat (MLE)	2.488	k star (bias corrected MLE)	1.355				
3199					Theta hat (MLE)	0.447	Theta star (bias corrected MLE)	0.82				
3200					nu hat (MLE)	29.85	nu star (bias corrected)	16.26				
3201					Mean (detects)	1.112						
3202												
3203	**Gamma ROS Statistics using Imputed Non-Detects**											
3204	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
3205	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
3206	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
3207	This is especially true when the sample size is small.											
3208	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
3209					Minimum	0.01	Mean	0.93				
3210					Maximum	3	Median	0.807				
3211					SD	0.89	CV	0.956				
3212					k hat (MLE)	0.94	k star (bias corrected MLE)	0.671				
3213					Theta hat (MLE)	0.99	Theta star (bias corrected MLE)	1.387				
3214					nu hat (MLE)	15.04	nu star (bias corrected)	10.73				
3215					Adjusted Level of Significance (β)	0.0195						
3216					Approximate Chi Square Value (10.73, α)	4.405	Adjusted Chi Square Value (10.73, β)	3.439				
3217					95% Gamma Approximate UCL (use when n>=50)	2.267	95% Gamma Adjusted UCL (use when n<50)	2.904				
3218												
3219	**Estimates of Gamma Parameters using KM Estimates**											
3220					Mean (KM)	0.991	SD (KM)	0.852				
3221					Variance (KM)	0.725	SE of Mean (KM)	0.353				
3222					k hat (KM)	1.355	k star (KM)	0.93				
3223					nu hat (KM)	21.68	nu star (KM)	14.88				
3224					theta hat (KM)	0.732	theta star (KM)	1.066				

3225					80% gamma percentile (KM)	1.605					90% gamma percentile (KM)	2.324
3226					95% gamma percentile (KM)	3.047					99% gamma percentile (KM)	4.736
3227												
3228	**Gamma Kaplan-Meier (KM) Statistics**											
3229					Approximate Chi Square Value (14.88, α)	7.181					Adjusted Chi Square Value (14.88, β)	5.882
3230					95% Gamma Approximate KM-UCL (use when n>=50)	2.055					95% Gamma Adjusted KM-UCL (use when n<50)	2.509
3231												
3232	**Lognormal GOF Test on Detected Observations Only**											
3233					Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**					
3234					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level					
3235					Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**					
3236					5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level					
3237	**Detected Data appear Lognormal at 5% Significance Level**											
3238												
3239	**Lognormal ROS Statistics Using Imputed Non-Detects**											
3240					Mean in Original Scale	0.948	Mean in Log Scale	-0.332				
3241					SD in Original Scale	0.867	SD in Log Scale	0.786				
3242					95% t UCL (assumes normality of ROS data)	1.529	95% Percentile Bootstrap UCL	1.473				
3243					95% BCA Bootstrap UCL	1.67	95% Bootstrap t UCL	2.356				
3244					95% H-UCL (Log ROS)	2.328						
3245												
3246	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
3247					KM Mean (logged)	-0.28	KM Geo Mean	0.756				
3248					KM SD (logged)	0.699	95% Critical H Value (KM-Log)	2.732				
3249					KM Standard Error of Mean (logged)	0.289	95% H-UCL (KM -Log)	1.985				
3250					KM SD (logged)	0.699	95% Critical H Value (KM-Log)	2.732				
3251					KM Standard Error of Mean (logged)	0.289						
3252												
3253	**DL/2 Statistics**											
3254					**DL/2 Normal**		**DL/2 Log-Transformed**					
3255					Mean in Original Scale	1.182	Mean in Log Scale	-0.21				
3256					SD in Original Scale	1.052	SD in Log Scale	0.99				
3257					95% t UCL (Assumes normality)	1.887	95% H-Stat UCL	4.724				
3258	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
3259												
3260	**Nonparametric Distribution Free UCL Statistics**											
3261	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
3262												
3263	**Suggested UCL to Use**											
3264					95% KM Adjusted Gamma UCL	2.509	95% GROS Adjusted Gamma UCL	2.904				
3265												
3266	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
3267	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
3268												
3269	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
3270	Recommendations are based upon data size, data distribution, and skewness.											
3271	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
3272	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
3273												
3274												
3275	**Vanadium (waste water clarifier well)**											
3276												

	A	B	C	D	E	F	G	H	I	J	K	L
3277	**General Statistics**											
3278					Total Number of Observations	1				Number of Distinct Observations		1
3279										Number of Missing Observations		0
3280					Minimum	15.8				Mean		15.8
3281					Maximum	15.8				Median		15.8
3282												
3283	**Warning: This data set only has 1 observations!**											
3284	**Data set is too small to compute reliable and meaningful statistics and estimates!**											
3285	**The data set for variable Vanadium (waste water clarifier well) was not processed!**											
3286												
3287	**It is suggested to collect at least 8 to 10 observations before using these statistical methods!**											
3288	**If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.**											
3289												

APPENDIX D

DETAILED RISK CALCULATIONS

OU3 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment

Appendix D Notes

CFR	Clark Fork River
COPC	Contaminant of Potential Concern
CTE	Central Tendency Estimate
DI	Daily Intake
DL	Detection Limit
EPC	Exposure Point Concentration
HQ	Hazard Quotient
IR	Ingestion Rate
ND	Non-detect
oSF	Oral Slope Factor
PCB	Polychlorinated Biphenyl
RfD	Reference Dose
RME	Reasonable Maximum Exposure
TEQ	Toxicity Equivalent
$TEQ_{D/F}$	Toxicity Equivalent for Dioxins and Furans
TEQ_{PCB}	Toxicity Equivalent for Dioxin-Like Polychlorinated Biphenyls
$TEQ_{D/F/PCB}$	Toxicity Equivalent for Dioxins, Furans, and Dioxin-like Polychlorinated Biphenyls

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04.

Blue highlight flags cancer risks ≥ 1E-05.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME		MMOA HIFs	
				CTE	RME
Noncancer	4.68E-06	1.28E-05	*Based on Child HIFs*		
Cancer	2.57E-07	1.44E-06	*Based on TWA HIFs*	3.45E-06	9.44E-06

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-06	1.00	1.7E-11	4.7E-11	7.0E-10	2E-02	7E-02	1E-12	5E-12	1E+05	1E-07	7E-07
		Aluminum	1.9E+04	1.00	8.8E-02	2.4E-01	1.0E+00	9E-02	2E-01	5E-03	3E-02			
		Antimony	1.5E+00	1.00	7.0E-06	1.9E-05	4.0E-04	2E-02	5E-02	4E-07	2E-06			
		Arsenic	9.3E+00	0.60	2.6E-05	7.1E-05	3.0E-04	9E-02	2E-01	1E-06	8E-06	2E+00	2E-06	1E-05
		Barium	1.0E+03	1.00	4.9E-03	1.3E-02	2.0E-01	2E-02	7E-02	3E-04	1E-03			
		Cadmium	7.0E-01	1.00	3.3E-06	8.9E-06	1.0E-03	3E-03	9E-03	2E-07	1E-06			
		Chromium	2.0E+01	1.00	9.4E-05	2.6E-04	3.0E-03	3E-02	9E-02	7E-05	2E-04	5E-01	3E-05	9E-05
		Cobalt	5.3E+00	1.00	2.5E-05	6.8E-05	3.0E-04	8E-02	2E-01	1E-06	8E-06			
		Iron	1.7E+04	1.00	8.1E-02	2.2E-01	7.0E-01	1E-01	3E-01	4E-03	2E-02			
		Manganese	4.8E+02	1.00	2.3E-03	6.2E-03	2.4E-02	9E-02	3E-01	1E-04	7E-04			
		Mercury	1.4E-01	1.00	6.5E-07	1.8E-06	3.0E-04	2E-03	6E-03	4E-08	2E-07			
		Thallium	2.1E-01	1.00	9.8E-07	2.7E-06	1.0E-05	1E-01	3E-01	5E-08	3E-07			
		Vanadium	4.2E+01	1.00	1.9E-04	5.3E-04	5.0E-03	4E-02	1E-01	1E-05	6E-05			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	1.00	1.2E-11	3.2E-11	7.0E-10	2E-02	5E-02	6E-13	4E-12	1E+05	8E-08	5E-07
		Aluminum	6.7E+03	1.00	3.1E-02	8.6E-02	1.0E+00	3E-02	9E-02	2E-03	1E-02			
		Antimony	9.0E-02	1.00	4.2E-07	1.2E-06	4.0E-04	1E-03	3E-03	2E-08	1E-07			
		Arsenic	1.0E+00	0.60	2.8E-06	7.7E-06	3.0E-04	9E-03	3E-02	2E-07	9E-07	2E+00	2E-07	1E-06
		Barium	2.0E+02	1.00	9.4E-04	2.6E-03	2.0E-01	5E-03	1E-02	5E-05	3E-04			
		Cadmium	6.4E-02	1.00	3.0E-07	8.2E-07	1.0E-03	3E-04	8E-04	2E-08	9E-08			
		Chromium	8.7E+00	1.00	4.1E-05	1.1E-04	3.0E-03	1E-02	4E-02	3E-05	8E-05	5E-01	2E-05	4E-05
		Cobalt	2.6E+00	1.00	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06			
		Iron	8.1E+03	1.00	3.8E-02	1.0E-01	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	1.1E+02	1.00	5.1E-04	1.4E-03	2.4E-02	2E-02	6E-02	3E-05	2E-04			
		Mercury	1.2E-02	1.00	5.6E-08	1.5E-07	3.0E-04	2E-04	5E-04	3E-09	2E-08			
		Thallium	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	9.4E+00	1.00	4.4E-05	1.2E-04	5.0E-03	9E-03	2E-02	2E-06	1E-05			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	1.00	3.1E-12	8.4E-12	7.0E-10	4E-03	1E-02	2E-13	9E-13	1E+05	2E-08	1E-07
		Aluminum	6.4E+03	1.00	3.0E-02	8.1E-02	1.0E+00	3E-02	8E-02	2E-03	9E-03			
		Antimony	9.0E-02	1.00	4.2E-07	1.2E-06	4.0E-04	1E-03	3E-03	2E-08	1E-07			
		Arsenic	9.5E-01	0.60	2.7E-06	7.3E-06	3.0E-04	9E-03	2E-02	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	2.0E+02	1.00	9.4E-04	2.6E-03	2.0E-01	5E-03	1E-02	5E-05	3E-04			
		Cadmium	7.3E-02	1.00	3.4E-07	9.3E-07	1.0E-03	3E-04	9E-04	2E-08	1E-07			
		Chromium	7.2E+00	1.00	3.4E-05	9.2E-05	3.0E-03	1E-02	3E-02	2E-05	7E-05	5E-01	1E-05	3E-05
		Cobalt	2.4E+00	1.00	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	6E-07	3E-06			
		Iron	7.5E+03	1.00	3.5E-02	9.5E-02	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	8.4E+01	1.00	3.9E-04	1.1E-03	2.4E-02	2E-02	4E-02	2E-05	1E-04			
		Mercury	1.6E-02	1.00	7.5E-08	2.0E-07	3.0E-04	2E-04	7E-04	4E-09	2E-08			
		Thallium	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	8.7E+00	1.00	4.1E-05	1.1E-04	5.0E-03	8E-03	2E-02	2E-06	1E-05			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	1.00	1.4E-11	3.7E-11	7.0E-10	2E-02	5E-02	8E-13	4E-12	1E+05	1E-07	5E-07
		Aluminum	7.6E+03	1.00	3.5E-02	9.7E-02	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	1.9E-01	1.00	8.9E-07	2.4E-06	4.0E-04	2E-03	6E-03	5E-08	3E-07			
		Arsenic	1.7E+00	0.60	4.8E-06	1.3E-05	3.0E-04	2E-02	4E-02	3E-07	1E-06	2E+00	4E-07	2E-06
		Barium	1.9E+02	1.00	8.9E-04	2.4E-03	2.0E-01	4E-03	1E-02	5E-05	3E-04			
		Cadmium	1.4E-01	1.00	6.5E-07	1.8E-06	1.0E-03	7E-04	2E-03	4E-08	2E-07			
		Chromium	1.1E+01	1.00	5.0E-05	1.4E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	5E-05
		Cobalt	3.1E+00	1.00	1.4E-05	4.0E-05	3.0E-04	5E-02	1E-01	8E-07	4E-06			
		Iron	8.5E+03	1.00	4.0E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.5E+02	1.00	7.2E-04	2.0E-03	2.4E-02	3E-02	8E-02	4E-05	2E-04			
		Mercury	3.3E-02	1.00	1.5E-07	4.2E-07	3.0E-04	5E-04	1E-03	8E-09	5E-08			
		Thallium	1.1E-01	1.00	5.1E-07	1.4E-06	1.0E-05	5E-02	1E-01	3E-08	2E-07			
		Vanadium	1.9E+01	1.00	8.8E-05	2.4E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	1.00	8.0E-12	2.2E-11	7.0E-10	1E-02	3E-02	4E-13	2E-12	1E+05	6E-08	3E-07
		Aluminum	8.2E+03	1.00	3.8E-02	1.0E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	2.0E-01	1.00	9.4E-07	2.6E-06	4.0E-04	2E-03	6E-03	5E-08	3E-07			
		Arsenic	1.2E+00	0.60	3.4E-06	9.2E-06	3.0E-04	1E-02	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	3.6E+02	1.00	1.7E-03	4.6E-03	2.0E-01	8E-03	2E-02	9E-05	5E-04			
		Cadmium	1.3E-01	1.00	6.1E-07	1.7E-06	1.0E-03	6E-04	2E-03	3E-08	2E-07			
		Chromium	1.0E+01	1.00	4.7E-05	1.3E-04	3.0E-03	2E-02	4E-02	3E-05	9E-05	5E-01	2E-05	5E-05
		Cobalt	2.6E+00	1.00	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06			
		Iron	8.7E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.1E+02	1.00	5.1E-04	1.4E-03	2.4E-02	2E-02	6E-02	3E-05	2E-04			
		Mercury	2.4E-02	1.00	1.1E-07	3.1E-07	3.0E-04	4E-04	1E-03	6E-09	3E-08			
		Thallium	1.2E-01	1.00	5.6E-07	1.5E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	1.2E+01	1.00	5.5E-05	1.5E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	7.1E-07	1.00	3.3E-12	9.1E-12	7.0E-10	5E-03	1E-02	2E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	6.6E+03	1.00	3.1E-02	8.5E-02	1.0E+00	3E-02	8E-02	2E-03	1E-02			
		Antimony	4.1E-02	1.00	1.9E-07	5.2E-07	4.0E-04	5E-04	1E-03	1E-08	6E-08			
		Arsenic	1.9E+00	0.60	5.2E-06	1.4E-05	3.0E-04	2E-02	5E-02	3E-07	2E-06	2E+00	4E-07	2E-06
		Barium	8.5E+01	1.00	4.0E-04	1.1E-03	2.0E-01	2E-03	5E-03	2E-05	1E-04			
		Cadmium	4.4E-02	1.00	2.1E-07	5.6E-07	1.0E-03	2E-04	6E-04	1E-08	6E-08			
Upland	31	Chromium	1.0E+01	1.00	4.8E-05	1.3E-04	3.0E-03	2E-02	4E-02	4E-05	1E-04	5E-01	2E-05	5E-05
		Cobalt	2.9E+00	1.00	1.3E-05	3.6E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06			
		Iron	7.9E+03	1.00	3.7E-02	1.0E-01	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	1.3E+02	1.00	5.9E-04	1.6E-03	2.4E-02	2E-02	7E-02	3E-05	2E-04			
		Mercury	3.4E-03	1.00	1.6E-08	4.4E-08	3.0E-04	5E-05	1E-04	9E-10	5E-09			
		Thallium	1.1E-01	1.00	4.9E-07	1.3E-06	1.0E-05	5E-02	1E-01	3E-08	2E-07			
		Vanadium	9.4E+00	1.00	4.4E-05	1.2E-04	5.0E-03	9E-03	2E-02	2E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	1.00	2.5E-12	6.8E-12	7.0E-10	4E-03	1E-02	1E-13	8E-13	1E+05	2E-08	1E-07
		Aluminum	4.8E+03	1.00	2.3E-02	6.2E-02	1.0E+00	2E-02	6E-02	1E-03	7E-03			
		Antimony	1.5E-01	1.00	7.0E-07	1.9E-06	4.0E-04	2E-03	5E-03	4E-08	2E-07			
		Arsenic	1.1E+00	0.60	3.1E-06	8.4E-06	3.0E-04	1E-02	3E-02	2E-07	9E-07	2E+00	3E-07	1E-06
		Barium	1.2E+02	1.00	5.7E-04	1.5E-03	2.0E-01	3E-03	8E-03	3E-05	2E-04			
		Cadmium	4.6E-02	1.00	2.2E-07	5.9E-07	1.0E-03	2E-04	6E-04	1E-08	7E-08			
Upland	32	Chromium	6.3E+00	1.00	2.9E-05	8.1E-05	3.0E-03	1E-02	3E-02	2E-05	6E-05	5E-01	1E-05	3E-05
		Cobalt	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	6E-07	3E-06			
		Iron	7.6E+03	1.00	3.5E-02	9.7E-02	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	9.1E+01	1.00	4.2E-04	1.2E-03	2.4E-02	2E-02	5E-02	2E-05	1E-04			
		Mercury	3.1E-03	1.00	1.4E-08	4.0E-08	3.0E-04	5E-05	1E-04	8E-10	4E-09			
		Thallium	6.9E-02	1.00	3.2E-07	8.8E-07	1.0E-05	3E-02	9E-02	2E-08	1E-07			
		Vanadium	8.3E+00	1.00	3.9E-05	1.1E-04	5.0E-03	8E-03	2E-02	2E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.0E-06	1.00	4.8E-12	1.3E-11	7.0E-10	7E-03	2E-02	3E-13	1E-12	1E+05	3E-08	2E-07
		Aluminum	8.8E+03	1.00	4.1E-02	1.1E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	9.0E-02	1.00	4.2E-07	1.2E-06	4.0E-04	1E-03	3E-03	2E-08	1E-07			
		Arsenic	4.0E+00	0.60	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	6E-07	3E-06	2E+00	9E-07	5E-06
		Barium	2.3E+02	1.00	1.1E-03	2.9E-03	2.0E-01	5E-03	1E-02	6E-05	3E-04			
		Cadmium	1.3E-01	1.00	6.1E-07	1.7E-06	1.0E-03	6E-04	2E-03	3E-08	2E-07			
Upland	33	Chromium	1.1E+01	1.00	5.0E-05	1.4E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	5E-05
		Cobalt	4.2E+00	1.00	2.0E-05	5.4E-05	3.0E-04	7E-02	2E-01	1E-06	6E-06			
		Iron	1.2E+04	1.00	5.4E-02	1.5E-01	7.0E-01	8E-02	2E-01	3E-03	2E-02			
		Manganese	3.9E+02	1.00	1.8E-03	5.0E-03	2.4E-02	8E-02	2E-01	1E-04	6E-04			
		Mercury	1.7E-02	1.00	7.9E-08	2.2E-07	3.0E-04	3E-04	7E-04	4E-09	2E-08			
		Thallium	1.3E-01	1.00	6.1E-07	1.7E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	1.7E+01	1.00	7.7E-05	2.1E-04	5.0E-03	2E-02	4E-02	4E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	1.00	3.9E-12	1.1E-11	7.0E-10	6E-03	2E-02	2E-13	1E-12	1E+05	3E-08	2E-07
		Aluminum	7.2E+03	1.00	3.4E-02	9.2E-02	1.0E+00	3E-02	9E-02	2E-03	1E-02			
		Antimony	8.5E-02	1.00	4.0E-07	1.1E-06	4.0E-04	1E-03	3E-03	2E-08	1E-07			
		Arsenic	1.6E+00	0.60	4.5E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-07	1E-06	2E+00	4E-07	2E-06
		Barium	2.0E+02	1.00	9.3E-04	2.5E-03	2.0E-01	5E-03	1E-02	5E-05	3E-04			
		Cadmium	9.3E-02	1.00	4.3E-07	1.2E-06	1.0E-03	4E-04	1E-03	2E-08	1E-07			
Upland	34	Chromium	8.2E+00	1.00	3.8E-05	1.0E-04	3.0E-03	1E-02	3E-02	3E-05	8E-05	5E-01	1E-05	4E-05
		Cobalt	3.2E+00	1.00	1.5E-05	4.1E-05	3.0E-04	5E-02	1E-01	8E-07	5E-06			
		Iron	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.6E+02	1.00	7.3E-04	2.0E-03	2.4E-02	3E-02	8E-02	4E-05	2E-04			
		Mercury	1.3E-02	1.00	6.1E-08	1.7E-07	3.0E-04	2E-04	6E-04	3E-09	2E-08			
		Thallium	9.9E-02	1.00	4.6E-07	1.3E-06	1.0E-05	5E-02	1E-01	3E-08	1E-07			
		Vanadium	1.1E+01	1.00	5.0E-05	1.4E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	1.00	3.4E-12	9.3E-12	7.0E-10	5E-03	1E-02	2E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	9.5E+03	1.00	4.5E-02	1.2E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	2.3E-01	1.00	1.1E-06	2.9E-06	4.0E-04	3E-03	7E-03	6E-08	3E-07			
		Arsenic	2.1E+00	0.60	5.9E-06	1.6E-05	3.0E-04	2E-02	5E-02	3E-07	2E-06	2E+00	5E-07	3E-06
		Barium	2.3E+02	1.00	1.1E-03	2.9E-03	2.0E-01	5E-03	1E-02	6E-05	3E-04			
		Cadmium	1.9E-01	1.00	8.9E-07	2.4E-06	1.0E-03	9E-04	2E-03	5E-08	3E-07			
Upland	35	Chromium	8.9E+00	1.00	4.2E-05	1.1E-04	3.0E-03	1E-02	4E-02	3E-05	8E-05	5E-01	2E-05	4E-05
		Cobalt	4.5E+00	1.00	2.1E-05	5.8E-05	3.0E-04	7E-02	2E-01	1E-06	6E-06			
		Iron	1.1E+04	1.00	5.3E-02	1.4E-01	7.0E-01	8E-02	2E-01	3E-03	2E-02			
		Manganese	4.9E+02	1.00	2.3E-03	6.2E-03	2.4E-02	9E-02	3E-01	1E-04	7E-04			
		Mercury	1.8E-02	1.00	8.4E-08	2.3E-07	3.0E-04	3E-04	8E-04	5E-09	3E-08			
		Thallium	1.2E-01	1.00	5.6E-07	1.5E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	1.2E+01	1.00	5.4E-05	1.5E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	1.00	4.3E-11	1.2E-10	7.0E-10	6E-02	2E-01	2E-12	1E-11	1E+05	3E-07	2E-06
		Aluminum	1.3E+04	1.00	5.8E-02	1.6E-01	1.0E+00	6E-02	2E-01	3E-03	2E-02			
		Antimony	8.0E-01	1.00	3.7E-06	1.0E-05	4.0E-04	9E-03	3E-02	2E-07	1E-06			
		Arsenic	5.1E+00	0.60	1.4E-05	3.9E-05	3.0E-04	5E-02	1E-01	8E-07	4E-06	2E+00	1E-06	7E-06
		Barium	4.9E+02	1.00	2.3E-03	6.3E-03	2.0E-01	1E-02	3E-02	1E-04	7E-04			
		Cadmium	8.5E-01	1.00	4.0E-06	1.1E-05	1.0E-03	4E-03	1E-02	2E-07	1E-06			
Upland	36	Chromium	1.8E+01	1.00	8.2E-05	2.3E-04	3.0E-03	3E-02	8E-02	6E-05	2E-04	5E-01	3E-05	8E-05
		Cobalt	4.9E+00	1.00	2.3E-05	6.3E-05	3.0E-04	8E-02	2E-01	1E-06	7E-06			
		Iron	1.3E+04	1.00	6.0E-02	1.6E-01	7.0E-01	9E-02	2E-01	3E-03	2E-02			
		Manganese	4.1E+02	1.00	1.9E-03	5.2E-03	2.4E-02	8E-02	2E-01	1E-04	6E-04			
		Mercury	2.7E-01	1.00	1.3E-06	3.5E-06	3.0E-04	4E-03	1E-02	7E-08	4E-07			
		Thallium	1.4E-01	1.00	6.5E-07	1.8E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	3.1E+01	1.00	1.4E-04	4.0E-04	5.0E-03	3E-02	8E-02	8E-06	4E-05			
		TEQD/F (ND=1/2 DL)	1.5E-06	1.00	7.2E-12	2.0E-11	7.0E-10	1E-02	3E-02	4E-13	2E-12	1E+05	5E-08	3E-07
		Aluminum	7.9E+03	1.00	3.7E-02	1.0E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	3.3E-01	1.00	1.5E-06	4.2E-06	4.0E-04	4E-03	1E-02	8E-08	5E-07			
		Arsenic	2.5E+00	0.60	7.1E-06	1.9E-05	3.0E-04	2E-02	6E-02	4E-07	2E-06	2E+00	6E-07	3E-06
		Barium	2.0E+02	1.00	9.5E-04	2.6E-03	2.0E-01	5E-03	1E-02	5E-05	3E-04			
		Cadmium	2.6E-01	1.00	1.2E-06	3.3E-06	1.0E-03	1E-03	3E-03	7E-08	4E-07			
Upland	37	Chromium	1.0E+01	1.00	4.7E-05	1.3E-04	3.0E-03	2E-02	4E-02	3E-05	9E-05	5E-01	2E-05	5E-05
		Cobalt	3.5E+00	1.00	1.6E-05	4.5E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06			
		Iron	9.9E+03	1.00	4.6E-02	1.3E-01	7.0E-01	7E-02	2E-01	3E-03	1E-02			
		Manganese	2.6E+02	1.00	1.2E-03	3.4E-03	2.4E-02	5E-02	1E-01	7E-05	4E-04			
		Mercury	4.0E-02	1.00	1.9E-07	5.1E-07	3.0E-04	6E-04	2E-03	1E-08	6E-08			
		Thallium	8.7E-02	1.00	4.1E-07	1.1E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	1.1E+01	1.00	5.4E-05	1.5E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	1.00	9.8E-12	2.7E-11	7.0E-10	1E-02	4E-02	5E-13	3E-12	1E+05	7E-08	4E-07
		Aluminum	2.7E+03	1.00	1.3E-02	3.5E-02	1.0E+00	1E-02	3E-02	7E-04	4E-03			
		Antimony	8.5E-02	1.00	4.0E-07	1.1E-06	4.0E-04	1E-03	3E-03	2E-08	1E-07			
		Arsenic	1.0E+00	0.60	2.8E-06	7.7E-06	3.0E-04	9E-03	3E-02	2E-07	9E-07	2E+00	2E-07	1E-06
		Barium	4.4E+01	1.00	2.1E-04	5.6E-04	2.0E-01	1E-03	3E-03	1E-05	6E-05			
		Cadmium	1.6E-02	1.00	7.5E-08	2.0E-07	1.0E-03	7E-05	2E-04	4E-09	2E-08			
Upland	38[a]	Chromium	3.8E+00	1.00	1.8E-05	4.9E-05	3.0E-03	6E-03	2E-02	1E-05	4E-05	5E-01	7E-06	2E-05
		Cobalt	1.5E+00	1.00	7.0E-06	1.9E-05	3.0E-04	2E-02	6E-02	4E-07	2E-06			
		Iron	5.2E+03	1.00	2.4E-02	6.7E-02	7.0E-01	3E-02	1E-01	1E-03	7E-03			
		Manganese	3.9E+01	1.00	1.8E-04	4.9E-04	2.4E-02	8E-03	2E-02	1E-05	6E-05			
		Mercury	4.6E-03	1.00	2.2E-08	5.9E-08	3.0E-04	7E-05	2E-04	1E-09	7E-09			
		Thallium	1.7E-02	1.00	7.7E-08	2.1E-07	1.0E-05	8E-03	2E-02	4E-09	2E-08			
		Vanadium	5.3E+00	1.00	2.5E-05	6.8E-05	5.0E-03	5E-03	1E-02	1E-06	8E-06			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	1.3E-11	3.6E-11	7.0E-10	2E-02	5E-02	7E-13	4E-12	1E+05	9E-08	5E-07
		Aluminum	9.7E+03	1.00	4.5E-02	1.2E-01	1.0E+00	5E-02	1E-01	2E-03	1E-02			
		Antimony	4.3E-01	1.00	2.0E-06	5.4E-06	4.0E-04	5E-03	1E-02	1E-07	6E-07			
		Arsenic	2.2E+00	0.60	6.1E-06	1.7E-05	3.0E-04	2E-02	6E-02	3E-07	2E-06	2E+00	5E-07	3E-06
		Barium	4.3E+02	1.00	2.0E-03	5.4E-03	2.0E-01	1E-02	3E-02	1E-04	6E-04			
		Cadmium	3.3E-01	1.00	1.6E-06	4.2E-06	1.0E-03	2E-03	4E-03	9E-08	5E-07			
Upland	39	Chromium	1.2E+01	1.00	5.6E-05	1.5E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	6E-05
		Cobalt	3.3E+00	1.00	1.5E-05	4.2E-05	3.0E-04	5E-02	1E-01	8E-07	5E-06			
		Iron	9.9E+03	1.00	4.6E-02	1.3E-01	7.0E-01	7E-02	2E-01	3E-03	1E-02			
		Manganese	1.3E+02	1.00	6.2E-04	1.7E-03	2.4E-02	3E-02	7E-02	3E-05	2E-04			
		Mercury	7.4E-02	1.00	3.5E-07	9.5E-07	3.0E-04	1E-03	3E-03	2E-08	1E-07			
		Thallium	1.3E-01	1.00	6.3E-07	1.7E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	1.8E+01	1.00	8.4E-05	2.3E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	1.00	1.7E-11	4.5E-11	7.0E-10	2E-02	6E-02	9E-13	5E-12	1E+05	1E-07	7E-07
		Aluminum	6.0E+03	1.00	2.8E-02	7.6E-02	1.0E+00	3E-02	8E-02	2E-03	9E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.4E+00	0.60	3.9E-06	1.1E-05	3.0E-04	1E-02	4E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	2.1E+02	1.00	9.6E-04	2.6E-03	2.0E-01	5E-03	1E-02	5E-05	3E-04			
		Cadmium	2.8E-01	1.00	1.3E-06	3.6E-06	1.0E-03	1E-03	4E-03	7E-08	4E-07			
Upland	40	Chromium	1.1E+01	1.00	5.2E-05	1.4E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	5E-05
		Cobalt	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	6E-07	3E-06			
		Iron	6.3E+03	1.00	2.9E-02	8.0E-02	7.0E-01	4E-02	1E-01	2E-03	9E-03			
		Manganese	9.2E+01	1.00	4.3E-04	1.2E-03	2.4E-02	2E-02	5E-02	2E-05	1E-04			
		Mercury	4.0E-02	1.00	1.9E-07	5.1E-07	3.0E-04	6E-04	2E-03	1E-08	6E-08			
		Thallium	6.8E-02	1.00	3.2E-07	8.7E-07	1.0E-05	3E-02	9E-02	2E-08	1E-07			
		Vanadium	7.6E+00	1.00	3.6E-05	9.7E-05	5.0E-03	7E-03	2E-02	2E-06	1E-05			

Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	1.8E-11	5.0E-11	7.0E-10	3E-02	7E-02	1E-12	6E-12	1E+05	1E-07	7E-07
		Aluminum	5.7E+03	1.00	2.7E-02	7.3E-02	1.0E+00	3E-02	7E-02	1E-03	8E-03			
		Antimony	4.2E-02	1.00	2.0E-07	5.4E-07	4.0E-04	5E-04	1E-03	1E-08	6E-08			
		Arsenic	1.3E+00	0.60	3.6E-06	1.0E-05	3.0E-04	1E-02	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	3.2E+02	1.00	1.5E-03	4.1E-03	2.0E-01	7E-03	2E-02	8E-05	5E-04			
		Cadmium	2.8E-01	1.00	1.3E-06	3.6E-06	1.0E-03	1E-03	4E-03	7E-08	4E-07			
		Chromium	8.3E+00	1.00	3.9E-05	1.1E-04	3.0E-03	1E-02	4E-02	3E-05	8E-05	5E-01	1E-05	4E-05
		Cobalt	1.6E+00	1.00	7.5E-06	2.0E-05	3.0E-04	2E-02	7E-02	4E-07	2E-06			
		Iron	4.7E+03	1.00	2.2E-02	6.1E-02	7.0E-01	3E-02	9E-02	1E-03	7E-03			
		Manganese	1.3E+02	1.00	5.9E-04	1.6E-03	2.4E-02	2E-02	7E-02	3E-05	2E-04			
		Mercury	5.7E-02	1.00	2.7E-07	7.3E-07	3.0E-04	9E-04	2E-03	1E-08	8E-08			
		Thallium	6.5E-03	1.00	3.0E-08	8.3E-08	1.0E-05	3E-03	8E-03	2E-09	9E-09			
		Vanadium	5.3E+00	1.00	2.5E-05	6.8E-05	5.0E-03	5E-03	1E-02	1E-06	8E-06			
Upland	42	TEQD/F (ND=1/2 DL)	7.5E-06	1.00	3.5E-11	9.6E-11	7.0E-10	5E-02	1E-01	2E-12	1E-11	1E+05	2E-07	1E-06
		Aluminum	1.3E+04	1.00	6.0E-02	1.6E-01	1.0E+00	6E-02	2E-01	3E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.1E+00	0.60	8.7E-06	2.4E-05	3.0E-04	3E-02	8E-02	5E-07	3E-06	2E+00	7E-07	4E-06
		Barium	3.0E+02	1.00	1.4E-03	3.8E-03	2.0E-01	7E-03	2E-02	8E-05	4E-04			
		Cadmium	3.2E-01	1.00	1.5E-06	4.1E-06	1.0E-03	1E-03	4E-03	8E-08	5E-07			
		Chromium	2.1E+01	1.00	9.6E-05	2.6E-04	3.0E-03	3E-02	9E-02	7E-05	2E-04	5E-01	4E-05	1E-04
		Cobalt	4.9E+00	1.00	2.3E-05	6.3E-05	3.0E-04	8E-02	2E-01	1E-06	7E-06			
		Iron	1.6E+04	1.00	7.5E-02	2.0E-01	7.0E-01	1E-01	3E-01	4E-03	2E-02			
		Manganese	3.0E+02	1.00	1.4E-03	3.8E-03	2.4E-02	6E-02	2E-01	8E-05	4E-04			
		Mercury	1.6E-01	1.00	7.5E-07	2.0E-06	3.0E-04	2E-03	7E-03	4E-08	2E-07			
		Thallium	1.7E-01	1.00	7.9E-07	2.2E-06	1.0E-05	8E-02	2E-01	4E-08	2E-07			
		Vanadium	1.8E+01	1.00	8.5E-05	2.3E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	1.8E-11	5.0E-11	7.0E-10	3E-02	7E-02	1E-12	6E-12	1E+05	1E-07	7E-07
		Aluminum	9.1E+03	1.00	4.3E-02	1.2E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	7.6E-01	1.00	3.6E-06	9.7E-06	4.0E-04	9E-03	2E-02	2E-07	1E-06			
		Arsenic	2.8E+00	0.60	7.9E-06	2.1E-05	3.0E-04	3E-02	7E-02	4E-07	2E-06	2E+00	6E-07	4E-06
		Barium	5.8E+02	1.00	2.7E-03	7.4E-03	2.0E-01	1E-02	4E-02	1E-04	8E-04			
		Cadmium	4.7E-01	1.00	2.2E-06	6.0E-06	1.0E-03	2E-03	6E-03	1E-07	7E-07			
		Chromium	1.3E+01	1.00	6.2E-05	1.7E-04	3.0E-03	2E-02	6E-02	5E-05	1E-04	5E-01	2E-05	6E-05
		Cobalt	2.8E+00	1.00	1.3E-05	3.6E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06			
		Iron	7.8E+03	1.00	3.6E-02	1.0E-01	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	1.5E+02	1.00	6.9E-04	1.9E-03	2.4E-02	3E-02	8E-02	4E-05	2E-04			
		Mercury	1.2E-01	1.00	5.6E-07	1.5E-06	3.0E-04	2E-03	5E-03	3E-08	2E-07			
		Thallium	9.6E-02	1.00	4.5E-07	1.2E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	2.7E+01	1.00	1.3E-04	3.4E-04	5.0E-03	3E-02	7E-02	7E-06	4E-05			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	1.0E-11	2.8E-11	7.0E-10	1E-02	4E-02	6E-13	3E-12	1E+05	7E-08	4E-07
		Aluminum	9.9E+03	1.00	4.6E-02	1.3E-01	1.0E+00	5E-02	1E-01	3E-03	1E-02			
		Antimony	1.2E+00	1.00	5.4E-06	1.5E-05	4.0E-04	1E-02	4E-02	3E-07	2E-06			
		Arsenic	4.4E+00	0.60	1.2E-05	3.4E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	2.9E+02	1.00	1.4E-03	3.7E-03	2.0E-01	7E-03	2E-02	7E-05	4E-04			
		Cadmium	8.0E-01	1.00	3.7E-06	1.0E-05	1.0E-03	4E-03	1E-02	2E-07	1E-06			
		Chromium	1.2E+01	1.00	5.6E-05	1.5E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	6E-05
		Cobalt	3.0E+00	1.00	1.4E-05	3.9E-05	3.0E-04	5E-02	1E-01	8E-07	4E-06			
		Iron	8.1E+03	1.00	3.8E-02	1.0E-01	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	3.3E+02	1.00	1.6E-03	4.3E-03	2.4E-02	7E-02	2E-01	9E-05	5E-04			
		Mercury	1.6E-01	1.00	7.3E-07	2.0E-06	3.0E-04	2E-03	7E-03	4E-08	2E-07			
		Thallium	9.5E-02	1.00	4.4E-07	1.2E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	3.4E+01	1.00	1.6E-04	4.4E-04	5.0E-03	3E-02	9E-02	9E-06	5E-05			
Upland	45[a]	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	1.00	1.7E-12	4.7E-12	7.0E-10	2E-03	7E-03	9E-14	5E-13	1E+05	1E-08	7E-08
		Aluminum	2.1E+04	1.00	9.8E-02	2.7E-01	1.0E+00	1E-01	3E-01	5E-03	3E-02			
		Antimony	2.3E-01	1.00	1.1E-06	2.9E-06	4.0E-04	3E-03	7E-03	6E-08	3E-07			
		Arsenic	3.1E+00	0.60	8.7E-06	2.4E-05	3.0E-04	3E-02	8E-02	5E-07	3E-06	2E+00	7E-07	4E-06
		Barium	3.1E+02	1.00	1.5E-03	4.0E-03	2.0E-01	7E-03	2E-02	8E-05	4E-04			
		Cadmium	8.0E-02	1.00	3.7E-07	1.0E-06	1.0E-03	4E-04	1E-03	2E-08	1E-07			
		Chromium	1.8E+01	1.00	8.6E-05	2.4E-04	3.0E-03	3E-02	8E-02	6E-05	2E-04	5E-01	3E-05	9E-05
		Cobalt	6.9E+00	1.00	3.2E-05	8.8E-05	3.0E-04	1E-01	3E-01	2E-06	1E-05			
		Iron	2.0E+04	1.00	9.5E-02	2.6E-01	7.0E-01	1E-01	4E-01	5E-03	3E-02			
		Manganese	1.8E+02	1.00	8.2E-04	2.3E-03	2.4E-02	3E-02	9E-02	5E-05	3E-04			
		Mercury	1.9E-02	1.00	8.9E-08	2.4E-07	3.0E-04	3E-04	8E-04	5E-09	3E-08			
		Thallium	2.1E-01	1.00	9.8E-07	2.7E-06	1.0E-05	1E-01	3E-01	5E-08	3E-07			
		Vanadium	1.9E+01	1.00	8.8E-05	2.4E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-06	1.00	1.4E-11	3.9E-11	7.0E-10	2E-02	6E-02	8E-13	4E-12	1E+05	1E-07	6E-07
		Aluminum	1.2E+04	1.00	5.5E-02	1.5E-01	1.0E+00	5E-02	1E-01	3E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.3E+00	0.60	6.5E-06	1.8E-05	3.0E-04	2E-02	6E-02	4E-07	2E-06	2E+00	5E-07	3E-06
		Barium	4.2E+02	1.00	2.0E-03	5.3E-03	2.0E-01	1E-02	3E-02	1E-04	6E-04			
		Cadmium	2.4E-01	1.00	1.1E-06	3.1E-06	1.0E-03	1E-03	3E-03	6E-08	3E-07			
Upland	46	Chromium	1.7E+01	1.00	8.1E-05	2.2E-04	3.0E-03	3E-02	7E-02	6E-05	2E-04	5E-01	3E-05	8E-05
		Cobalt	4.9E+00	1.00	2.3E-05	6.3E-05	3.0E-04	8E-02	2E-01	1E-06	7E-06			
		Iron	1.4E+04	1.00	6.5E-02	1.8E-01	7.0E-01	9E-02	3E-01	4E-03	2E-02			
		Manganese	2.4E+02	1.00	1.1E-03	3.0E-03	2.4E-02	5E-02	1E-01	6E-05	3E-04			
		Mercury	4.1E-02	1.00	1.9E-07	5.2E-07	3.0E-04	6E-04	2E-03	1E-08	6E-08			
		Thallium	1.6E-01	1.00	7.5E-07	2.0E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	1.8E+01	1.00	8.3E-05	2.3E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	7.6E-11	2.1E-10	7.0E-10	1E-01	3E-01	4E-12	2E-11	1E+05	5E-07	3E-06
		Aluminum	1.8E+04	1.00	8.2E-02	2.3E-01	1.0E+00	8E-02	2E-01	5E-03	3E-02			
		Antimony	1.6E+00	1.00	7.5E-06	2.0E-05	4.0E-04	2E-02	5E-02	4E-07	2E-06			
		Arsenic	1.3E+01	0.60	3.6E-05	9.8E-05	3.0E-04	1E-01	3E-01	2E-06	1E-05	2E+00	3E-06	2E-05
		Barium	5.6E+02	1.00	2.6E-03	7.2E-03	2.0E-01	1E-02	4E-02	1E-04	8E-04			
		Cadmium	5.2E+00	1.00	2.4E-05	6.6E-05	1.0E-03	2E-02	7E-02	1E-06	7E-06			
Upland	47	Chromium	2.2E+01	1.00	1.0E-04	2.8E-04	3.0E-03	3E-02	9E-02	8E-05	2E-04	5E-01	4E-05	1E-04
		Cobalt	2.0E+00	1.00	9.4E-06	2.6E-05	3.0E-04	3E-02	9E-02	5E-07	3E-06			
		Iron	2.9E+03	1.00	1.4E-02	3.7E-02	7.0E-01	2E-02	5E-02	8E-04	4E-03			
		Manganese	1.1E+03	1.00	5.3E-03	1.5E-02	2.4E-02	2E-01	6E-01	3E-04	2E-03			
		Mercury	8.1E-01	1.00	3.8E-06	1.0E-05	3.0E-04	1E-02	3E-02	2E-07	1E-06			
		Thallium	2.1E-01	1.00	9.8E-07	2.7E-06	1.0E-05	1E-01	3E-01	5E-08	3E-07			
		Vanadium	5.1E+01	1.00	2.4E-04	6.5E-04	5.0E-03	5E-02	1E-01	1E-05	7E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	1.00	2.3E-10	6.3E-10	7.0E-10	3E-01	9E-01	1E-11	7E-11	1E+05	2E-06	9E-06
		Aluminum	1.9E+04	1.00	8.7E-02	2.4E-01	1.0E+00	9E-02	2E-01	5E-03	3E-02			
		Antimony	2.4E+00	1.00	1.1E-05	3.1E-05	4.0E-04	3E-02	8E-02	6E-07	3E-06			
		Arsenic	1.4E+01	0.60	4.0E-05	1.1E-04	3.0E-04	1E-01	4E-01	2E-06	1E-05	2E+00	3E-06	2E-05
		Barium	8.0E+02	1.00	3.7E-03	1.0E-02	2.0E-01	2E-02	5E-02	2E-04	1E-03			
		Cadmium	8.3E+00	1.00	3.9E-05	1.1E-04	1.0E-03	4E-02	1E-01	2E-06	1E-05			
Upland	48	Chromium	5.8E+01	1.00	2.7E-04	7.4E-04	3.0E-03	9E-02	2E-01	2E-04	5E-04	5E-01	1E-04	3E-04
		Cobalt	2.0E+00	1.00	9.4E-06	2.6E-05	3.0E-04	3E-02	9E-02	5E-07	3E-06			
		Iron	3.6E+03	1.00	1.7E-02	4.6E-02	7.0E-01	2E-02	7E-02	9E-04	5E-03			
		Manganese	1.7E+03	1.00	7.7E-03	2.1E-02	2.4E-02	3E-01	9E-01	4E-04	2E-03			
		Mercury	2.5E+00	1.00	1.2E-05	3.2E-05	3.0E-04	4E-02	1E-01	6E-07	4E-06			
		Thallium	3.3E-01	1.00	1.5E-06	4.2E-06	1.0E-05	2E-01	4E-01	8E-08	5E-07			
		Vanadium	7.1E+01	1.00	3.3E-04	9.0E-04	5.0E-03	7E-02	2E-01	2E-05	1E-04			
		$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	1.00	1.9E-10	5.1E-10	7.0E-10	3E-01	7E-01	1E-11	6E-11	1E+05	1E-06	7E-06
		Aluminum	1.4E+04	1.00	6.7E-02	1.8E-01	1.0E+00	7E-02	2E-01	4E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.6E+00	0.60	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	6E-07	3E-06	2E+00	8E-07	5E-06
		Barium	1.0E+03	1.00	4.7E-03	1.3E-02	2.0E-01	2E-02	6E-02	3E-04	1E-03			
		Cadmium	2.0E+00	1.00	9.4E-06	2.6E-05	1.0E-03	9E-03	3E-02	5E-07	3E-06			
Upland	49	Chromium	2.9E+01	1.00	1.3E-04	3.7E-04	3.0E-03	4E-02	1E-01	1E-04	3E-04	5E-01	5E-05	1E-04
		Cobalt	4.5E+00	1.00	2.1E-05	5.8E-05	3.0E-04	7E-02	2E-01	1E-06	6E-06			
		Iron	1.5E+04	1.00	7.0E-02	1.9E-01	7.0E-01	1E-01	3E-01	4E-03	2E-02			
		Manganese	5.8E+02	1.00	2.7E-03	7.4E-03	2.4E-02	1E-01	3E-01	1E-04	8E-04			
		Mercury	8.0E+00	1.00	3.7E-05	1.0E-04	3.0E-04	1E-01	3E-01	2E-06	1E-05			
		Thallium	1.6E-01	1.00	7.5E-07	2.0E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	2.2E+01	1.00	1.0E-04	2.8E-04	5.0E-03	2E-02	6E-02	6E-06	3E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	1.00	1.1E-10	3.1E-10	7.0E-10	2E-01	4E-01	6E-12	3E-11	1E+05	8E-07	5E-06
		Aluminum	1.2E+04	1.00	5.4E-02	1.5E-01	1.0E+00	5E-02	1E-01	3E-03	2E-02			
		Antimony	1.2E+00	1.00	5.4E-06	1.5E-05	4.0E-04	1E-02	4E-02	3E-07	2E-06			
		Arsenic	7.9E+00	0.60	2.2E-05	6.0E-05	3.0E-04	7E-02	2E-01	1E-06	7E-06	2E+00	2E-06	1E-05
		Barium	5.2E+02	1.00	2.4E-03	6.6E-03	2.0E-01	1E-02	3E-02	1E-04	7E-04			
		Cadmium	3.9E+00	1.00	1.8E-05	5.0E-05	1.0E-03	2E-02	5E-02	1E-06	6E-06			
Upland	50	Chromium	2.4E+01	1.00	1.1E-04	3.1E-04	3.0E-03	4E-02	1E-01	8E-05	2E-04	5E-01	4E-05	1E-04
		Cobalt	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	6E-07	3E-06			
		Iron	4.4E+03	1.00	2.0E-02	5.6E-02	7.0E-01	3E-02	8E-02	1E-03	6E-03			
		Manganese	1.3E+03	1.00	5.9E-03	1.6E-02	2.4E-02	2E-01	7E-01	3E-04	2E-03			
		Mercury	7.5E-01	1.00	3.5E-06	9.6E-06	3.0E-04	1E-02	3E-02	2E-07	1E-06			
		Thallium	1.9E-01	1.00	8.9E-07	2.4E-06	1.0E-05	9E-02	2E-01	5E-08	3E-07			
		Vanadium	2.9E+01	1.00	1.3E-04	3.6E-04	5.0E-03	3E-02	7E-02	7E-06	4E-05			

Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	1.00	1.5E-11	4.0E-11	7.0E-10	2E-02	6E-02	8E-13	4E-12	1E+05	1E-07	6E-07
		Aluminum	3.2E+03	1.00	1.5E-02	4.1E-02	1.0E+00	2E-02	4E-02	8E-04	5E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.2E+00	0.60	6.2E-06	1.7E-05	3.0E-04	2E-02	6E-02	3E-07	2E-06	2E+00	5E-07	3E-06
		Barium	1.1E+02	1.00	5.0E-04	1.4E-03	2.0E-01	3E-03	7E-03	3E-05	2E-04			
		Cadmium	5.2E-01	1.00	2.4E-06	6.6E-06	1.0E-03	2E-03	7E-03	1E-07	7E-07			
		Chromium	9.0E+00	1.00	4.2E-05	1.2E-04	3.0E-03	1E-02	4E-02	3E-05	8E-05	5E-01	2E-05	4E-05
		Cobalt	2.0E+00	1.00	9.4E-06	2.6E-05	3.0E-04	3E-02	9E-02	5E-07	3E-06			
		Iron	5.2E+03	1.00	2.4E-02	6.6E-02	7.0E-01	3E-02	9E-02	1E-03	7E-03			
		Manganese	2.2E+02	1.00	1.0E-03	2.8E-03	2.4E-02	4E-02	1E-01	6E-05	3E-04			
		Mercury	1.6E-01	1.00	7.5E-07	2.0E-06	3.0E-04	2E-03	7E-03	4E-08	2E-07			
		Thallium	5.2E-02	1.00	2.4E-07	6.6E-07	1.0E-05	2E-02	7E-02	1E-08	7E-08			
		Vanadium	9.2E+00	1.00	4.3E-05	1.2E-04	5.0E-03	9E-03	2E-02	2E-06	1E-05			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	1.0E-11	2.8E-11	7.0E-10	1E-02	4E-02	6E-13	3E-12	1E+05	7E-08	4E-07
		Aluminum	4.9E+03	1.00	2.3E-02	6.3E-02	1.0E+00	2E-02	6E-02	1E-03	7E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.8E+00	0.60	5.0E-06	1.4E-05	3.0E-04	2E-02	5E-02	3E-07	2E-06	2E+00	4E-07	2E-06
		Barium	9.6E+01	1.00	4.5E-04	1.2E-03	2.0E-01	2E-03	6E-03	2E-05	1E-04			
		Cadmium	1.6E-01	1.00	7.4E-07	2.0E-06	1.0E-03	7E-04	2E-03	4E-08	2E-07			
		Chromium	6.8E+00	1.00	3.2E-05	8.7E-05	3.0E-03	1E-02	3E-02	2E-05	6E-05	5E-01	1E-05	3E-05
		Cobalt	2.7E+00	1.00	1.2E-05	3.4E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06			
		Iron	6.8E+03	1.00	3.2E-02	8.7E-02	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	1.3E+02	1.00	6.2E-04	1.7E-03	2.4E-02	3E-02	7E-02	3E-05	2E-04			
		Mercury	5.5E-02	1.00	2.6E-07	7.0E-07	3.0E-04	9E-04	2E-03	1E-08	8E-08			
		Thallium	6.6E-02	1.00	3.1E-07	8.4E-07	1.0E-05	3E-02	8E-02	2E-08	9E-08			
		Vanadium	7.7E+00	1.00	3.6E-05	9.9E-05	5.0E-03	7E-03	2E-02	2E-06	1E-05			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.1E-10	2.9E-10	7.0E-10	2E-01	4E-01	6E-12	3E-11	1E+05	8E-07	4E-06
		Aluminum	1.2E+04	1.00	5.7E-02	1.5E-01	1.0E+00	6E-02	2E-01	3E-03	2E-02			
		Antimony	4.6E-01	1.00	2.2E-06	5.9E-06	4.0E-04	5E-03	1E-02	1E-07	7E-07			
		Arsenic	2.6E+00	0.60	7.3E-06	2.0E-05	3.0E-04	2E-02	7E-02	4E-07	2E-06	2E+00	6E-07	3E-06
		Barium	5.7E+02	1.00	2.7E-03	7.3E-03	2.0E-01	1E-02	4E-02	1E-04	8E-04			
		Cadmium	1.2E+00	1.00	5.6E-06	1.5E-05	1.0E-03	6E-03	2E-02	3E-07	2E-06			
		Chromium	2.2E+01	1.00	1.0E-04	2.7E-04	3.0E-03	3E-02	9E-02	7E-05	2E-04	5E-01	4E-05	1E-04
		Cobalt	3.8E+00	1.00	1.8E-05	4.9E-05	3.0E-04	6E-02	2E-01	1E-06	5E-06			
		Iron	1.2E+04	1.00	5.6E-02	1.5E-01	7.0E-01	8E-02	2E-01	3E-03	2E-02			
		Manganese	4.4E+02	1.00	2.0E-03	5.6E-03	2.4E-02	9E-02	2E-01	1E-04	6E-04			
		Mercury	4.3E+00	1.00	2.0E-05	5.5E-05	3.0E-04	7E-02	2E-01	1E-06	6E-06			
		Thallium	1.5E-01	1.00	7.0E-07	1.9E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	1.4E+01	1.00	6.5E-05	1.8E-04	5.0E-03	1E-02	4E-02	4E-06	2E-05			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	6.8E-11	1.8E-10	7.0E-10	1E-01	3E-01	4E-12	2E-11	1E+05	5E-07	3E-06
		Aluminum	1.1E+04	1.00	5.0E-02	1.4E-01	1.0E+00	5E-02	1E-01	3E-03	2E-02			
		Antimony	1.9E+00	1.00	8.9E-06	2.4E-05	4.0E-04	2E-02	6E-02	5E-07	3E-06			
		Arsenic	1.1E+01	0.60	3.0E-05	8.2E-05	3.0E-04	1E-01	3E-01	2E-06	9E-06	2E+00	2E-06	1E-05
		Barium	7.1E+02	1.00	3.3E-03	9.0E-03	2.0E-01	2E-02	5E-02	2E-04	1E-03			
		Cadmium	4.7E+00	1.00	2.2E-05	6.0E-05	1.0E-03	2E-02	6E-02	1E-06	7E-06			
		Chromium	2.4E+01	1.00	1.1E-04	3.0E-04	3.0E-03	4E-02	1E-01	8E-05	2E-04	5E-01	4E-05	1E-04
		Cobalt	2.3E+00	1.00	1.1E-05	2.9E-05	3.0E-04	4E-02	1E-01	6E-07	3E-06			
		Iron	3.7E+03	1.00	1.7E-02	4.7E-02	7.0E-01	2E-02	7E-02	9E-04	5E-03			
		Manganese	2.0E+03	1.00	9.3E-03	2.5E-02	2.4E-02	4E-01	1E+00	5E-04	3E-03			
		Mercury	7.2E-01	1.00	3.4E-06	9.2E-06	3.0E-04	1E-02	3E-02	2E-07	1E-06			
		Thallium	1.9E-01	1.00	8.9E-07	2.4E-06	1.0E-05	9E-02	2E-01	5E-08	3E-07			
		Vanadium	1.4E+01	1.00	6.5E-05	1.8E-04	5.0E-03	1E-02	4E-02	4E-06	2E-05			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	2.6E-10	7.1E-10	7.0E-10	4E-01	1E+00	1E-11	8E-11	1E+05	2E-06	1E-05
		Aluminum	1.5E+04	1.00	7.2E-02	2.0E-01	1.0E+00	7E-02	2E-01	4E-03	2E-02			
		Antimony	1.2E+00	1.00	5.6E-06	1.5E-05	4.0E-04	1E-02	4E-02	3E-07	2E-06			
		Arsenic	1.4E+01	0.60	3.8E-05	1.0E-04	3.0E-04	1E-01	3E-01	2E-06	1E-05	2E+00	3E-06	2E-05
		Barium	1.1E+03	1.00	5.2E-03	1.4E-02	2.0E-01	3E-02	7E-02	3E-04	2E-03			
		Cadmium	5.6E+00	1.00	2.6E-05	7.2E-05	1.0E-03	3E-02	7E-02	1E-06	8E-06			
		Chromium	4.2E+01	1.00	1.9E-04	5.3E-04	3.0E-03	6E-02	2E-01	1E-04	4E-04	5E-01	7E-05	2E-04
		Cobalt	1.6E+00	1.00	7.5E-06	2.0E-05	3.0E-04	2E-02	7E-02	4E-07	2E-06			
		Iron	2.7E+03	1.00	1.3E-02	3.5E-02	7.0E-01	2E-02	5E-02	7E-04	4E-03			
		Manganese	2.7E+03	1.00	1.3E-02	3.5E-02	2.4E-02	5E-01	1E+00	7E-04	4E-03			
		Mercury	1.1E+00	1.00	5.1E-06	1.4E-05	3.0E-04	2E-02	5E-02	3E-07	2E-06			
		Thallium	2.7E-01	1.00	1.3E-06	3.5E-06	1.0E-05	1E-01	3E-01	7E-08	4E-07			
		Vanadium	4.9E+01	1.00	2.3E-04	6.3E-04	5.0E-03	5E-02	1E-01	1E-05	7E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	5.9E-05	1.00	2.7E-10	7.5E-10	7.0E-10	4E-01	1E+00	2E-11	8E-11	1E+05	2E-06	1E-05
		Aluminum	1.6E+04	1.00	7.5E-02	2.0E-01	1.0E+00	7E-02	2E-01	4E-03	2E-02			
		Antimony	1.7E+00	1.00	8.0E-06	2.2E-05	4.0E-04	2E-02	5E-02	4E-07	2E-06			
		Arsenic	1.2E+01	0.60	3.4E-05	9.4E-05	3.0E-04	1E-01	3E-01	2E-06	1E-05	2E+00	3E-06	2E-05
		Barium	7.8E+02	1.00	3.6E-03	9.9E-03	2.0E-01	2E-02	5E-02	2E-04	1E-03			
		Cadmium	6.7E+00	1.00	3.1E-05	8.5E-05	1.0E-03	3E-02	9E-02	2E-06	1E-05			
Upland	56	Chromium	4.9E+01	1.00	2.3E-04	6.2E-04	3.0E-03	8E-02	2E-01	2E-04	5E-04	5E-01	8E-05	2E-04
		Cobalt	2.4E+00	1.00	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	6E-07	3E-06			
		Iron	5.2E+03	1.00	2.4E-02	6.7E-02	7.0E-01	3E-02	1E-01	1E-03	8E-03			
		Manganese	1.8E+03	1.00	8.6E-03	2.3E-02	2.4E-02	4E-01	1E+00	5E-04	3E-03			
		Mercury	1.3E+00	1.00	6.0E-06	1.6E-05	3.0E-04	2E-02	5E-02	3E-07	2E-06			
		Thallium	3.5E-01	1.00	1.6E-06	4.5E-06	1.0E-05	2E-01	4E-01	9E-08	5E-07			
		Vanadium	5.8E+01	1.00	2.7E-04	7.4E-04	5.0E-03	5E-02	1E-01	1E-05	8E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	3.9E-10	1.1E-09	7.0E-10	6E-01	2E+00	2E-11	1E-10	1E+05	3E-06	2E-05
		Aluminum	1.6E+04	1.00	7.5E-02	2.1E-01	1.0E+00	8E-02	2E-01	4E-03	2E-02			
		Antimony	2.3E+00	1.00	1.1E-05	2.9E-05	4.0E-04	3E-02	7E-02	6E-07	3E-06			
		Arsenic	1.2E+01	0.60	3.3E-05	9.1E-05	3.0E-04	1E-01	3E-01	2E-06	1E-05	2E+00	3E-06	2E-05
		Barium	8.0E+02	1.00	3.7E-03	1.0E-02	2.0E-01	2E-02	5E-02	2E-04	1E-03			
		Cadmium	4.8E+00	1.00	2.2E-05	6.1E-05	1.0E-03	2E-02	6E-02	1E-06	7E-06			
Upland	58	Chromium	4.0E+01	1.00	1.9E-04	5.1E-04	3.0E-03	6E-02	2E-01	1E-04	4E-04	5E-01	7E-05	2E-04
		Cobalt	2.6E+00	1.00	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06			
		Iron	8.0E+03	1.00	3.8E-02	1.0E-01	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	1.5E+03	1.00	7.2E-03	2.0E-02	2.4E-02	3E-01	8E-01	4E-04	2E-03			
		Mercury	1.2E+00	1.00	5.6E-06	1.5E-05	3.0E-04	2E-02	5E-02	3E-07	2E-06			
		Thallium	2.0E-01	1.00	9.4E-07	2.6E-06	1.0E-05	9E-02	3E-01	5E-08	3E-07			
		Vanadium	4.7E+01	1.00	2.2E-04	6.1E-04	5.0E-03	4E-02	1E-01	1E-05	7E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	7.4E-11	2.0E-10	7.0E-10	1E-01	3E-01	4E-12	2E-11	1E+05	5E-07	3E-06
		Aluminum	8.6E+03	1.00	4.0E-02	1.1E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	8.2E-01	1.00	3.8E-06	1.0E-05	4.0E-04	1E-02	3E-02	2E-07	1E-06			
		Arsenic	6.2E+00	0.60	1.7E-05	4.8E-05	3.0E-04	6E-02	2E-01	1E-06	5E-06	2E+00	1E-06	8E-06
		Barium	7.4E+02	1.00	3.5E-03	9.5E-03	2.0E-01	2E-02	5E-02	2E-04	1E-03			
		Cadmium	3.3E+00	1.00	1.6E-05	4.3E-05	1.0E-03	2E-02	4E-02	9E-07	5E-06			
Upland	59	Chromium	2.1E+01	1.00	9.9E-05	2.7E-04	3.0E-03	3E-02	9E-02	7E-05	2E-04	5E-01	4E-05	1E-04
		Cobalt	2.1E+00	1.00	1.0E-05	2.7E-05	3.0E-04	3E-02	9E-02	5E-07	3E-06			
		Iron	5.1E+03	1.00	2.4E-02	6.5E-02	7.0E-01	3E-02	9E-02	1E-03	7E-03			
		Manganese	1.6E+03	1.00	7.6E-03	2.1E-02	2.4E-02	3E-01	9E-01	4E-04	2E-03			
		Mercury	1.0E+00	1.00	4.7E-06	1.3E-05	3.0E-04	2E-02	4E-02	3E-07	1E-06			
		Thallium	1.6E-01	1.00	7.5E-07	2.1E-06	1.0E-05	8E-02	2E-01	4E-08	2E-07			
		Vanadium	1.5E+01	1.00	6.9E-05	1.9E-04	5.0E-03	1E-02	4E-02	4E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	8.7E-06	1.00	4.1E-11	1.1E-10	7.0E-10	6E-02	2E-01	2E-12	1E-11	1E+05	3E-07	2E-06
		Aluminum	8.0E+03	1.00	3.8E-02	1.0E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	3.1E-01	1.00	1.4E-06	4.0E-06	4.0E-04	4E-03	1E-02	8E-08	4E-07			
		Arsenic	4.6E+00	0.60	1.3E-05	3.5E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	2.8E+02	1.00	1.3E-03	3.6E-03	2.0E-01	7E-03	2E-02	7E-05	4E-04			
		Cadmium	1.7E+00	1.00	7.9E-06	2.2E-05	1.0E-03	8E-03	2E-02	4E-07	2E-06			
Upland	60	Chromium	1.5E+01	1.00	7.0E-05	1.9E-04	3.0E-03	2E-02	6E-02	5E-05	1E-04	5E-01	3E-05	7E-05
		Cobalt	3.4E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06			
		Iron	8.4E+03	1.00	3.9E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	8.5E+02	1.00	4.0E-03	1.1E-02	2.4E-02	2E-01	5E-01	2E-04	1E-03			
		Mercury	1.9E-01	1.00	8.9E-07	2.4E-06	3.0E-04	3E-03	8E-03	5E-08	3E-07			
		Thallium	1.1E-01	1.00	5.1E-07	1.4E-06	1.0E-05	5E-02	1E-01	3E-08	2E-07			
		Vanadium	1.4E+01	1.00	6.5E-05	1.8E-04	5.0E-03	1E-02	4E-02	4E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	1.00	2.7E-11	7.4E-11	7.0E-10	4E-02	1E-01	1E-12	8E-12	1E+05	2E-07	1E-06
		Aluminum	8.2E+03	1.00	3.8E-02	1.0E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	2.0E-01	1.00	9.4E-07	2.6E-06	4.0E-04	2E-03	6E-03	5E-08	3E-07			
		Arsenic	3.7E+00	0.60	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	6E-07	3E-06	2E+00	9E-07	5E-06
		Barium	2.0E+02	1.00	9.1E-04	2.5E-03	2.0E-01	5E-03	1E-02	5E-05	3E-04			
		Cadmium	1.1E+00	1.00	5.1E-06	1.4E-05	1.0E-03	5E-03	1E-02	3E-07	2E-06			
Upland	61	Chromium	1.2E+01	1.00	5.8E-05	1.6E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	6E-05
		Cobalt	3.8E+00	1.00	1.8E-05	4.9E-05	3.0E-04	6E-02	2E-01	1E-06	5E-06			
		Iron	9.9E+03	1.00	4.6E-02	1.3E-01	7.0E-01	7E-02	2E-01	3E-03	1E-02			
		Manganese	4.8E+02	1.00	2.2E-03	6.1E-03	2.4E-02	9E-02	3E-01	1E-04	7E-04			
		Mercury	1.1E-01	1.00	5.1E-07	1.4E-06	3.0E-04	2E-03	5E-03	3E-08	2E-07			
		Thallium	1.1E-01	1.00	5.1E-07	1.4E-06	1.0E-05	5E-02	1E-01	3E-08	2E-07			
		Vanadium	1.3E+01	1.00	6.3E-05	1.7E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			

Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	1.00	5.2E-12	1.4E-11	7.0E-10	7E-03	2E-02	3E-13	2E-12	1E+05	4E-08	2E-07
		Aluminum	7.7E+03	1.00	3.6E-02	9.9E-02	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.6E+00	0.60	7.3E-06	2.0E-05	3.0E-04	2E-02	7E-02	4E-07	2E-06	2E+00	6E-07	3E-06
		Barium	1.6E+02	1.00	7.6E-04	2.1E-03	2.0E-01	4E-03	1E-02	4E-05	2E-04			
		Cadmium	3.7E-01	1.00	1.7E-06	4.7E-06	1.0E-03	2E-03	5E-03	9E-08	5E-07			
		Chromium	1.1E+01	1.00	5.0E-05	1.4E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	5E-05
		Cobalt	4.0E+00	1.00	1.9E-05	5.1E-05	3.0E-04	6E-02	2E-01	1E-06	6E-06			
		Iron	1.1E+04	1.00	5.0E-02	1.4E-01	7.0E-01	7E-02	2E-01	3E-03	2E-02			
		Manganese	2.7E+02	1.00	1.3E-03	3.5E-03	2.4E-02	5E-02	1E-01	7E-05	4E-04			
		Mercury	9.6E-02	1.00	4.5E-07	1.2E-06	3.0E-04	1E-03	4E-03	2E-08	1E-07			
		Thallium	1.2E-01	1.00	5.6E-07	1.5E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	1.1E+01	1.00	5.3E-05	1.4E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	7.7E-11	2.1E-10	7.0E-10	1E-01	3E-01	4E-12	2E-11	1E+05	5E-07	3E-06
		Aluminum	7.6E+03	1.00	3.6E-02	9.7E-02	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	1.1E-01	1.00	4.9E-07	1.3E-06	4.0E-04	1E-03	3E-03	3E-08	2E-07			
		Arsenic	3.0E+00	0.60	8.4E-06	2.3E-05	3.0E-04	3E-02	8E-02	5E-07	3E-06	2E+00	7E-07	4E-06
		Barium	2.7E+02	1.00	1.2E-03	3.4E-03	2.0E-01	6E-03	2E-02	7E-05	4E-04			
		Cadmium	7.9E-01	1.00	3.7E-06	1.0E-05	1.0E-03	4E-03	1E-02	2E-07	1E-06			
		Chromium	1.2E+01	1.00	5.5E-05	1.5E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	6E-05
		Cobalt	3.4E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06			
		Iron	9.9E+03	1.00	4.6E-02	1.3E-01	7.0E-01	7E-02	2E-01	3E-03	1E-02			
		Manganese	5.2E+02	1.00	2.4E-03	6.7E-03	2.4E-02	1E-01	3E-01	1E-04	8E-04			
		Mercury	3.6E+00	1.00	1.7E-05	4.6E-05	3.0E-04	6E-02	2E-01	9E-07	5E-06			
		Thallium	1.0E-01	1.00	4.7E-07	1.3E-06	1.0E-05	5E-02	1E-01	3E-08	1E-07			
		Vanadium	1.2E+01	1.00	5.4E-05	1.5E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
Upland	65[a]	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	1.00	6.1E-11	1.7E-10	7.0E-10	9E-02	2E-01	3E-12	2E-11	1E+05	4E-07	2E-06
		Aluminum	8.7E+03	1.00	4.1E-02	1.1E-01	1.0E+00	4E-02	1E-01	2E-03	1E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.3E+00	0.60	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	4.5E+02	1.00	2.1E-03	5.8E-03	2.0E-01	1E-02	3E-02	1E-04	7E-04			
		Cadmium	2.5E+00	1.00	1.2E-05	3.2E-05	1.0E-03	1E-02	3E-02	6E-07	4E-06			
		Chromium	2.7E+01	1.00	1.3E-04	3.4E-04	3.0E-03	4E-02	1E-01	9E-05	3E-04	5E-01	5E-05	1E-04
		Cobalt	3.1E+00	1.00	1.4E-05	4.0E-05	3.0E-04	5E-02	1E-01	8E-07	4E-06			
		Iron	9.6E+03	1.00	4.5E-02	1.2E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.4E+03	1.00	6.3E-03	1.7E-02	2.4E-02	3E-01	7E-01	3E-04	2E-03			
		Mercury	3.0E-01	1.00	1.4E-06	3.8E-06	3.0E-04	5E-03	1E-02	8E-08	4E-07			
		Thallium	1.2E-01	1.00	5.6E-07	1.5E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	1.3E+01	1.00	6.2E-05	1.7E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	1.00	7.2E-12	2.0E-11	7.0E-10	1E-02	3E-02	4E-13	2E-12	1E+05	5E-08	3E-07
		Aluminum	4.6E+03	1.00	2.2E-02	5.9E-02	1.0E+00	2E-02	6E-02	1E-03	7E-03			
		Antimony	2.2E-01	1.00	1.0E-06	2.8E-06	4.0E-04	3E-03	7E-03	6E-08	3E-07			
		Arsenic	3.2E+00	0.60	9.0E-06	2.5E-05	3.0E-04	3E-02	8E-02	5E-07	3E-06	2E+00	7E-07	4E-06
		Barium	2.6E+02	1.00	1.2E-03	3.3E-03	2.0E-01	6E-03	2E-02	7E-05	4E-04			
		Cadmium	9.0E-01	1.00	4.2E-06	1.1E-05	1.0E-03	4E-03	1E-02	2E-07	1E-06			
		Chromium	1.2E+01	1.00	5.6E-05	1.5E-04	3.0E-03	2E-02	5E-02	4E-05	1E-04	5E-01	2E-05	6E-05
		Cobalt	2.4E+00	1.00	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	6E-07	3E-06			
		Iron	6.3E+03	1.00	3.0E-02	8.1E-02	7.0E-01	4E-02	1E-01	2E-03	9E-03			
		Manganese	5.1E+02	1.00	2.4E-03	6.5E-03	2.4E-02	1E-01	3E-01	1E-04	7E-04			
		Mercury	6.6E-02	1.00	3.1E-07	8.5E-07	3.0E-04	1E-03	3E-03	2E-08	1E-07			
		Thallium	7.1E-02	1.00	3.3E-07	9.0E-07	1.0E-05	3E-02	9E-02	2E-08	1E-07			
		Vanadium	7.5E+00	1.00	3.5E-05	9.6E-05	5.0E-03	7E-03	2E-02	2E-06	1E-05			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	3.9E-10	1.1E-09	7.0E-10	6E-01	2E+00	2E-11	1E-10	1E+05	3E-06	2E-05
		Aluminum	6.0E+03	1.00	2.8E-02	7.7E-02	1.0E+00	3E-02	8E-02	2E-03	9E-03			
		Antimony	1.6E+00	1.00	7.5E-06	2.0E-05	4.0E-04	2E-02	5E-02	4E-07	2E-06			
		Arsenic	1.5E+01	0.60	4.2E-05	1.2E-04	3.0E-04	1E-01	4E-01	2E-06	1E-05	2E+00	3E-06	2E-05
		Barium	6.1E+02	1.00	2.9E-03	7.8E-03	2.0E-01	1E-02	4E-02	2E-04	9E-04			
		Cadmium	4.8E+00	1.00	2.2E-05	6.1E-05	1.0E-03	2E-02	6E-02	1E-06	7E-06			
		Chromium	1.9E+01	1.00	8.7E-05	2.4E-04	3.0E-03	3E-02	8E-02	6E-05	2E-04	5E-01	3E-05	9E-05
		Cobalt	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	6E-07	3E-06			
		Iron	3.5E+03	1.00	1.6E-02	4.5E-02	7.0E-01	2E-02	6E-02	9E-04	5E-03			
		Manganese	2.0E+03	1.00	9.5E-03	2.6E-02	2.4E-02	4E-01	1E+00	5E-04	3E-03			
		Mercury	1.0E-02	1.00	4.7E-08	1.3E-07	3.0E-04	2E-04	4E-04	3E-09	1E-08			
		Thallium	3.8E-01	1.00	1.8E-06	4.9E-06	1.0E-05	2E-01	5E-01	1E-07	5E-07			
		Vanadium	5.6E+00	1.00	2.6E-05	7.2E-05	5.0E-03	5E-03	1E-02	1E-06	8E-06			

Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	3.9E-10	1.1E-09	7.0E-10	6E-01	2E+00	2E-11	1E-10	1E+05	3E-06	2E-05
		Aluminum	6.0E+03	1.00	2.8E-02	7.7E-02	1.0E+00	3E-02	8E-02	2E-03	9E-03			
		Antimony	1.6E+00	1.00	7.5E-06	2.0E-05	4.0E-04	2E-02	5E-02	4E-07	2E-06			
		Arsenic	1.5E+01	0.60	4.2E-05	1.2E-04	3.0E-04	1E-01	4E-01	2E-06	1E-05	2E+00	3E-06	2E-05
		Barium	6.1E+02	1.00	2.9E-03	7.8E-03	2.0E-01	1E-02	4E-02	2E-04	9E-04			
		Cadmium	4.8E+00	1.00	2.2E-05	6.1E-05	1.0E-03	2E-02	6E-02	1E-06	7E-06			
		Chromium	1.9E+01	1.00	8.7E-05	2.4E-04	3.0E-03	3E-02	8E-02	6E-05	2E-04	5E-01	3E-05	9E-05
		Cobalt	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	6E-07	3E-06			
		Iron	3.5E+03	1.00	1.6E-02	4.5E-02	7.0E-01	2E-02	6E-02	9E-04	5E-03			
		Manganese	2.0E+03	1.00	9.5E-03	2.6E-02	2.4E-02	4E-01	1E+00	5E-04	3E-03			
		Mercury	1.0E-02	1.00	4.7E-08	1.3E-07	3.0E-04	2E-04	4E-04	3E-09	1E-08			
		Thallium	3.8E-01	1.00	1.8E-06	4.9E-06	1.0E-05	2E-01	5E-01	1E-07	5E-07			
		Vanadium	5.6E+00	1.00	2.6E-05	7.2E-05	5.0E-03	5E-03	1E-02	1E-06	8E-06			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.1E-06	1.00	1.9E-11	5.2E-11	7.0E-10	3E-02	7E-02	1E-12	6E-12	1E+05	1E-07	8E-07
		Aluminum	3.4E+03	1.00	1.6E-02	4.3E-02	1.0E+00	2E-02	4E-02	9E-04	5E-03			
		Antimony	4.7E-01	1.00	2.2E-06	6.0E-06	4.0E-04	5E-03	2E-02	1E-07	7E-07			
		Arsenic	6.0E+00	0.60	1.7E-05	4.6E-05	3.0E-04	6E-02	2E-01	9E-07	5E-06	2E+00	1E-06	8E-06
		Barium	4.5E+02	1.00	2.1E-03	5.8E-03	2.0E-01	1E-02	3E-02	1E-04	6E-04			
		Cadmium	1.8E+00	1.00	8.4E-06	2.3E-05	1.0E-03	8E-03	2E-02	5E-07	3E-06			
		Chromium	1.4E+01	1.00	6.6E-05	1.8E-04	3.0E-03	2E-02	6E-02	5E-05	1E-04	5E-01	2E-05	7E-05
		Cobalt	1.7E+00	1.00	7.9E-06	2.2E-05	3.0E-04	3E-02	7E-02	4E-07	2E-06			
		Iron	3.8E+03	1.00	1.8E-02	4.8E-02	7.0E-01	3E-02	7E-02	1E-03	5E-03			
		Manganese	1.0E+03	1.00	4.7E-03	1.3E-02	2.4E-02	2E-01	5E-01	3E-04	1E-03			
		Mercury	1.1E-01	1.00	5.1E-07	1.4E-06	3.0E-04	2E-03	5E-03	3E-08	2E-07			
		Thallium	1.4E-01	1.00	6.5E-07	1.8E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	1.2E+01	1.00	5.4E-05	1.5E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	1.00	1.1E-11	3.1E-11	7.0E-10	2E-02	4E-02	6E-13	3E-12	1E+05	8E-08	4E-07
		Aluminum	1.1E+03	1.00	5.1E-03	1.4E-02	1.0E+00	5E-03	1E-02	3E-04	2E-03			
		Antimony	7.5E-02	1.00	3.5E-07	9.6E-07	4.0E-04	9E-04	2E-03	2E-08	1E-07			
		Arsenic	5.8E+00	0.60	1.6E-05	4.4E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06	2E+00	1E-06	8E-06
		Barium	5.0E+02	1.00	2.3E-03	6.4E-03	2.0E-01	1E-02	3E-02	1E-04	7E-04			
		Cadmium	1.3E+00	1.00	6.1E-06	1.7E-05	1.0E-03	6E-03	2E-02	3E-07	2E-06			
		Chromium	3.4E+01	1.00	1.6E-04	4.4E-04	3.0E-03	5E-02	1E-01	1E-04	3E-04	5E-01	6E-05	2E-04
		Cobalt	2.5E+00	1.00	1.2E-05	3.2E-05	3.0E-04	4E-02	1E-01	6E-07	4E-06			
		Iron	3.0E+03	1.00	1.4E-02	3.8E-02	7.0E-01	2E-02	5E-02	8E-04	4E-03			
		Manganese	7.2E+02	1.00	3.3E-03	9.2E-03	2.4E-02	1E-01	4E-01	2E-04	1E-03			
		Mercury	5.0E-03	1.00	2.3E-08	6.4E-08	3.0E-04	8E-05	2E-04	1E-09	7E-09			
		Thallium	8.3E-02	1.00	3.9E-07	1.1E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	3.5E+00	1.00	1.6E-05	4.5E-05	5.0E-03	3E-03	9E-03	9E-07	5E-06			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.1E-10	3.0E-10	7.0E-10	2E-01	4E-01	6E-12	3E-11	1E+05	8E-07	4E-06
		Aluminum	2.3E+03	1.00	1.1E-02	2.9E-02	1.0E+00	1E-02	3E-02	6E-04	3E-03			
		Antimony	2.4E-01	1.00	1.1E-06	3.1E-06	4.0E-04	3E-03	8E-03	6E-08	3E-07			
		Arsenic	7.0E+00	0.60	2.0E-05	5.4E-05	3.0E-04	7E-02	2E-01	1E-06	6E-06	2E+00	2E-06	9E-06
		Barium	5.4E+02	1.00	2.5E-03	6.9E-03	2.0E-01	1E-02	3E-02	1E-04	8E-04			
		Cadmium	2.2E+00	1.00	1.0E-05	2.8E-05	1.0E-03	1E-02	3E-02	6E-07	3E-06			
		Chromium	1.9E+01	1.00	8.9E-05	2.4E-04	3.0E-03	3E-02	8E-02	7E-05	2E-04	5E-01	3E-05	9E-05
		Cobalt	1.3E+00	1.00	6.1E-06	1.7E-05	3.0E-04	2E-02	6E-02	3E-07	2E-06			
		Iron	1.3E+03	1.00	5.9E-03	1.6E-02	7.0E-01	8E-03	2E-02	3E-04	2E-03			
		Manganese	2.3E+03	1.00	1.1E-02	2.9E-02	2.4E-02	4E-01	1E+00	6E-04	3E-03			
		Mercury	4.9E-03	1.00	2.3E-08	6.2E-08	3.0E-04	8E-05	2E-04	1E-09	7E-09			
		Thallium	6.6E-02	1.00	3.1E-07	8.4E-07	1.0E-05	3E-02	8E-02	2E-08	9E-08			
		Vanadium	4.7E+00	1.00	2.2E-05	6.0E-05	5.0E-03	4E-03	1E-02	1E-06	7E-06			
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-04	1.00	1.4E-09	3.9E-09	7.0E-10	2E+00	6E+00	8E-11	4E-10	1E+05	1E-05	6E-05
		Aluminum	1.8E+04	1.00	8.5E-02	2.3E-01	1.0E+00	9E-02	2E-01	5E-03	3E-02			
		Antimony	2.4E+00	1.00	1.1E-05	3.0E-05	4.0E-04	3E-02	8E-02	6E-07	3E-06			
		Arsenic	4.1E+01	0.60	1.1E-04	3.1E-04	3.0E-04	4E-01	1E+00	6E-06	3E-05	2E+00	9E-06	5E-05
		Barium	8.3E+02	1.00	3.9E-03	1.1E-02	2.0E-01	2E-02	5E-02	2E-04	1E-03			
		Cadmium	6.4E+00	1.00	3.0E-05	8.2E-05	1.0E-03	3E-02	8E-02	2E-06	9E-06			
		Chromium	3.0E+01	1.00	1.4E-04	3.8E-04	3.0E-03	5E-02	1E-01	1E-04	3E-04	5E-01	5E-05	1E-04
		Cobalt	7.3E+00	1.00	3.4E-05	9.3E-05	3.0E-04	1E-01	3E-01	2E-06	1E-05			
		Iron	1.3E+04	1.00	6.3E-02	1.7E-01	7.0E-01	9E-02	2E-01	3E-03	2E-02			
		Manganese	2.3E+03	1.00	1.1E-02	3.0E-02	2.4E-02	5E-01	1E+00	6E-04	3E-03			
		Mercury	2.2E-01	1.00	1.0E-06	2.9E-06	3.0E-04	3E-03	1E-02	6E-08	3E-07			
		Thallium	7.7E-01	1.00	3.6E-06	9.8E-06	1.0E-05	4E-01	1E+00	2E-07	1E-06			
		Vanadium	2.2E+01	1.00	1.0E-04	2.9E-04	5.0E-03	2E-02	6E-02	6E-06	3E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	1.6E-12	4.4E-12	7.0E-10	2E-03	6E-03	9E-14	5E-13	1E+05	1E-08	6E-08
		Aluminum	1.2E+04	1.00	5.8E-02	1.6E-01	1.0E+00	6E-02	2E-01	3E-03	2E-02			
		Antimony	9.5E-02	1.00	4.4E-07	1.2E-06	4.0E-04	1E-03	3E-03	2E-08	1E-07			
		Arsenic	4.3E+00	0.60	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	2.1E+02	1.00	9.6E-04	2.6E-03	2.0E-01	5E-03	1E-02	5E-05	3E-04			
		Cadmium	1.5E-01	1.00	7.0E-07	1.9E-06	1.0E-03	7E-04	2E-03	4E-08	2E-07			
Upland	75	Chromium	1.3E+01	1.00	6.3E-05	1.7E-04	3.0E-03	2E-02	6E-02	5E-05	1E-04	5E-01	2E-05	6E-05
		Cobalt	6.4E+00	1.00	3.0E-05	8.2E-05	3.0E-04	1E-01	3E-01	2E-06	9E-06			
		Iron	1.6E+04	1.00	7.3E-02	2.0E-01	7.0E-01	1E-01	3E-01	4E-03	2E-02			
		Manganese	3.7E+02	1.00	1.7E-03	4.8E-03	2.4E-02	7E-02	2E-01	1E-04	5E-04			
		Mercury	1.4E-02	1.00	6.5E-08	1.8E-07	3.0E-04	2E-04	6E-04	4E-09	2E-08			
		Thallium	1.8E-01	1.00	8.4E-07	2.3E-06	1.0E-05	8E-02	2E-01	5E-08	3E-07			
		Vanadium	1.7E+01	1.00	8.0E-05	2.2E-04	5.0E-03	2E-02	4E-02	4E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	9.5E-12	2.6E-11	7.0E-10	1E-02	4E-02	5E-13	3E-12	1E+05	7E-08	4E-07
		Aluminum	6.8E+03	1.00	3.2E-02	8.7E-02	1.0E+00	3E-02	9E-02	2E-03	1E-02			
		Antimony	1.2E-01	1.00	5.6E-07	1.5E-06	4.0E-04	1E-03	4E-03	3E-08	2E-07			
		Arsenic	2.9E+00	0.60	8.0E-06	2.2E-05	3.0E-04	3E-02	7E-02	4E-07	2E-06	2E+00	7E-07	4E-06
		Barium	1.5E+02	1.00	6.9E-04	1.9E-03	2.0E-01	3E-03	9E-03	4E-05	2E-04			
		Cadmium	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-03	6E-04	2E-03	3E-08	2E-07			
Upland	76	Chromium	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	3E-05	9E-05	5E-01	2E-05	4E-05
		Cobalt	3.3E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06			
		Iron	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.7E+02	1.00	8.2E-04	2.2E-03	2.4E-02	3E-02	9E-02	4E-05	3E-04			
		Mercury	2.2E-02	1.00	1.0E-07	2.8E-07	3.0E-04	3E-04	9E-04	6E-09	3E-08			
		Thallium	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	1.0E+01	1.00	4.9E-05	1.3E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	9.5E-12	2.6E-11	7.0E-10	1E-02	4E-02	5E-13	3E-12	1E+05	7E-08	4E-07
		Aluminum	6.8E+03	1.00	3.2E-02	8.7E-02	1.0E+00	3E-02	9E-02	2E-03	1E-02			
		Antimony	1.2E-01	1.00	5.6E-07	1.5E-06	4.0E-04	1E-03	4E-03	3E-08	2E-07			
		Arsenic	2.9E+00	0.60	8.0E-06	2.2E-05	3.0E-04	3E-02	7E-02	4E-07	2E-06	2E+00	7E-07	4E-06
		Barium	1.5E+02	1.00	6.9E-04	1.9E-03	2.0E-01	3E-03	9E-03	4E-05	2E-04			
		Cadmium	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-03	6E-04	2E-03	3E-08	2E-07			
Upland	77	Chromium	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	3E-05	9E-05	5E-01	2E-05	4E-05
		Cobalt	3.3E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06			
		Iron	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.7E+02	1.00	8.2E-04	2.2E-03	2.4E-02	3E-02	9E-02	4E-05	3E-04			
		Mercury	2.2E-02	1.00	1.0E-07	2.8E-07	3.0E-04	3E-04	9E-04	6E-09	3E-08			
		Thallium	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	1.0E+01	1.00	4.9E-05	1.3E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	1.6E-12	4.4E-12	7.0E-10	2E-03	6E-03	9E-14	5E-13	1E+05	1E-08	6E-08
		Aluminum	1.2E+04	1.00	5.8E-02	1.6E-01	1.0E+00	6E-02	2E-01	3E-03	2E-02			
		Antimony	9.5E-02	1.00	4.4E-07	1.2E-06	4.0E-04	1E-03	3E-03	2E-08	1E-07			
		Arsenic	4.3E+00	0.60	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	2.1E+02	1.00	9.6E-04	2.6E-03	2.0E-01	5E-03	1E-02	5E-05	3E-04			
		Cadmium	1.5E-01	1.00	7.0E-07	1.9E-06	1.0E-03	7E-04	2E-03	4E-08	2E-07			
Upland	78	Chromium	1.3E+01	1.00	6.3E-05	1.7E-04	3.0E-03	2E-02	6E-02	5E-05	1E-04	5E-01	2E-05	6E-05
		Cobalt	6.4E+00	1.00	3.0E-05	8.2E-05	3.0E-04	1E-01	3E-01	2E-06	9E-06			
		Iron	1.6E+04	1.00	7.3E-02	2.0E-01	7.0E-01	1E-01	3E-01	4E-03	2E-02			
		Manganese	3.7E+02	1.00	1.7E-03	4.8E-03	2.4E-02	7E-02	2E-01	1E-04	5E-04			
		Mercury	1.4E-02	1.00	6.5E-08	1.8E-07	3.0E-04	2E-04	6E-04	4E-09	2E-08			
		Thallium	1.8E-01	1.00	8.4E-07	2.3E-06	1.0E-05	8E-02	2E-01	5E-08	3E-07			
		Vanadium	1.7E+01	1.00	8.0E-05	2.2E-04	5.0E-03	2E-02	4E-02	4E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	9.5E-12	2.6E-11	7.0E-10	1E-02	4E-02	5E-13	3E-12	1E+05	7E-08	4E-07
		Aluminum	6.8E+03	1.00	3.2E-02	8.7E-02	1.0E+00	3E-02	9E-02	2E-03	1E-02			
		Antimony	1.2E-01	1.00	5.6E-07	1.5E-06	4.0E-04	1E-03	4E-03	3E-08	2E-07			
		Arsenic	2.9E+00	0.60	8.0E-06	2.2E-05	3.0E-04	3E-02	7E-02	4E-07	2E-06	2E+00	7E-07	4E-06
		Barium	1.5E+02	1.00	6.9E-04	1.9E-03	2.0E-01	3E-03	9E-03	4E-05	2E-04			
		Cadmium	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-03	6E-04	2E-03	3E-08	2E-07			
Upland	79	Chromium	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	3E-05	9E-05	5E-01	2E-05	4E-05
		Cobalt	3.3E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06			
		Iron	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.7E+02	1.00	8.2E-04	2.2E-03	2.4E-02	3E-02	9E-02	4E-05	3E-04			
		Mercury	2.2E-02	1.00	1.0E-07	2.8E-07	3.0E-04	3E-04	9E-04	6E-09	3E-08			
		Thallium	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	1.0E+01	1.00	4.9E-05	1.3E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			

Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	9.5E-12	2.6E-11	7.0E-10	1E-02	4E-02	5E-13	3E-12	1E+05	7E-08	4E-07
		Aluminum	6.8E+03	1.00	3.2E-02	8.7E-02	1.0E+00	3E-02	9E-02	2E-03	1E-02			
		Antimony	1.2E-01	1.00	5.6E-07	1.5E-06	4.0E-04	1E-03	4E-03	3E-08	2E-07			
		Arsenic	2.9E+00	0.60	8.0E-06	2.2E-05	3.0E-04	3E-02	7E-02	4E-07	2E-06	2E+00	7E-07	4E-06
		Barium	1.5E+02	1.00	6.9E-04	1.9E-03	2.0E-01	3E-03	9E-03	4E-05	2E-04			
		Cadmium	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-03	6E-04	2E-03	3E-08	2E-07			
		Chromium	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	3E-05	9E-05	5E-01	2E-05	4E-05
		Cobalt	3.3E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06			
		Iron	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.7E+02	1.00	8.2E-04	2.2E-03	2.4E-02	3E-02	9E-02	4E-05	3E-04			
		Mercury	2.2E-02	1.00	1.0E-07	2.8E-07	3.0E-04	3E-04	9E-04	6E-09	3E-08			
		Thallium	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01	2E-08	1E-07			
		Vanadium	1.0E+01	1.00	4.9E-05	1.3E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	1.00	2.8E-12	7.7E-12	7.0E-10	4E-03	1E-02	2E-13	9E-13	1E+05	2E-08	1E-07
		Aluminum	7.0E+03	1.00	3.3E-02	8.9E-02	1.0E+00	3E-02	9E-02	2E-03	1E-02			
		Antimony	1.0E-01	1.00	4.7E-07	1.3E-06	4.0E-04	1E-03	3E-03	3E-08	1E-07			
		Arsenic	4.5E+00	0.60	1.3E-05	3.5E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	1.9E+02	1.00	8.8E-04	2.4E-03	2.0E-01	4E-03	1E-02	5E-05	3E-04			
		Cadmium	3.2E-01	1.00	1.5E-06	4.1E-06	1.0E-03	1E-03	4E-03	8E-08	5E-07			
		Chromium	8.4E+00	1.00	3.9E-05	1.1E-04	3.0E-03	1E-02	4E-02	3E-05	8E-05	5E-01	1E-05	4E-05
		Cobalt	3.9E+00	1.00	1.8E-05	5.0E-05	3.0E-04	6E-02	2E-01	1E-06	6E-06			
		Iron	9.6E+03	1.00	4.5E-02	1.2E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	2.8E+02	1.00	1.3E-03	3.6E-03	2.4E-02	6E-02	2E-01	7E-05	4E-04			
		Mercury	3.3E-02	1.00	1.5E-07	4.2E-07	3.0E-04	5E-04	1E-03	8E-09	5E-08			
		Thallium	1.1E-01	1.00	5.1E-07	1.4E-06	1.0E-05	5E-02	1E-01	3E-08	2E-07			
		Vanadium	1.3E+01	1.00	5.8E-05	1.6E-04	5.0E-03	1E-02	3E-02	3E-06	2E-05			
Floodplain	85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	1.00	1.9E-12	5.1E-12	7.0E-10	3E-03	7E-03	1E-13	6E-13	1E+05	1E-08	8E-08
		Aluminum	2.9E+03	1.00	1.4E-02	3.8E-02	1.0E+00	1E-02	4E-02	8E-04	4E-03			
		Antimony	8.5E-02	1.00	4.0E-07	1.1E-06	4.0E-04	1E-03	3E-03	2E-08	1E-07			
		Arsenic	1.9E+00	0.60	5.3E-06	1.5E-05	3.0E-04	2E-02	5E-02	3E-07	2E-06	2E+00	4E-07	2E-06
		Barium	2.9E+01	1.00	1.4E-04	3.7E-04	2.0E-01	7E-04	2E-03	8E-06	4E-05			
		Cadmium	1.6E-02	1.00	7.5E-08	2.0E-07	1.0E-03	7E-05	2E-04	4E-09	2E-08			
		Chromium	3.9E+00	1.00	1.8E-05	5.0E-05	3.0E-03	6E-03	2E-02	1E-05	4E-05	5E-01	7E-06	2E-05
		Cobalt	1.8E+00	1.00	8.4E-06	2.3E-05	3.0E-04	3E-02	8E-02	5E-07	3E-06			
		Iron	5.2E+03	1.00	2.4E-02	6.6E-02	7.0E-01	3E-02	9E-02	1E-03	7E-03			
		Manganese	6.4E+01	1.00	3.0E-04	8.2E-04	2.4E-02	1E-02	3E-02	2E-05	9E-05			
		Mercury	4.4E-03	1.00	2.0E-08	5.6E-08	3.0E-04	7E-05	2E-04	1E-09	6E-09			
		Thallium	4.4E-02	1.00	2.1E-07	5.6E-07	1.0E-05	2E-02	6E-02	1E-08	6E-08			
		Vanadium	5.1E+00	1.00	2.4E-05	6.5E-05	5.0E-03	5E-03	1E-02	1E-06	7E-06			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	1.00	8.6E-11	2.4E-10	7.0E-10	1E-01	3E-01	5E-12	3E-11	1E+05	6E-07	3E-06
		Aluminum	2.0E+04	1.00	9.2E-02	2.5E-01	1.0E+00	9E-02	3E-01	5E-03	3E-02			
		Antimony	4.5E-01	1.00	2.1E-06	5.8E-06	4.0E-04	5E-03	1E-02	1E-07	6E-07			
		Arsenic	4.6E+00	0.60	1.3E-05	3.5E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	4.6E+02	1.00	2.1E-03	5.9E-03	2.0E-01	1E-02	3E-02	1E-04	7E-04			
		Cadmium	5.4E-01	1.00	2.5E-06	6.9E-06	1.0E-03	3E-03	7E-03	1E-07	8E-07			
		Chromium	2.0E+01	1.00	9.1E-05	2.5E-04	3.0E-03	3E-02	8E-02	7E-05	2E-04	5E-01	3E-05	9E-05
		Cobalt	5.6E+00	1.00	2.6E-05	7.2E-05	3.0E-04	9E-02	2E-01	1E-06	8E-06			
		Iron	2.3E+04	1.00	1.1E-01	2.9E-01	7.0E-01	2E-01	4E-01	6E-03	3E-02			
		Manganese	5.6E+02	1.00	2.6E-03	7.1E-03	2.4E-02	1E-01	3E-01	1E-04	8E-04			
		Mercury	5.3E-01	1.00	2.5E-06	6.8E-06	3.0E-04	8E-03	2E-02	1E-07	8E-07			
		Thallium	2.0E-01	1.00	9.4E-07	2.6E-06	1.0E-05	9E-02	3E-01	5E-08	3E-07			
		Vanadium	2.1E+01	1.00	1.0E-04	2.7E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	1.00	3.2E-11	8.7E-11	7.0E-10	5E-02	1E-01	2E-12	1E-11	1E+05	2E-07	1E-06
		Aluminum	1.1E+04	1.00	5.0E-02	1.4E-01	1.0E+00	5E-02	1E-01	3E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.7E+00	0.60	1.3E-05	3.6E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	7.7E+02	1.00	3.6E-03	9.9E-03	2.0E-01	2E-02	5E-02	2E-04	1E-03			
		Cadmium	7.9E-01	1.00	3.7E-06	1.0E-05	1.0E-03	4E-03	1E-02	2E-07	1E-06			
		Chromium	1.6E+01	1.00	7.2E-05	2.0E-04	3.0E-03	2E-02	7E-02	5E-05	1E-04	5E-01	3E-05	7E-05
		Cobalt	4.0E+00	1.00	1.9E-05	5.1E-05	3.0E-04	6E-02	2E-01	1E-06	6E-06			
		Iron	1.2E+04	1.00	5.7E-02	1.6E-01	7.0E-01	8E-02	2E-01	3E-03	2E-02			
		Manganese	2.7E+02	1.00	1.3E-03	3.5E-03	2.4E-02	5E-02	1E-01	7E-05	4E-04			
		Mercury	1.0E-01	1.00	4.7E-07	1.3E-06	3.0E-04	2E-03	4E-03	3E-08	1E-07			
		Thallium	2.0E-01	1.00	9.4E-07	2.6E-06	1.0E-05	9E-02	3E-01	5E-08	3E-07			
		Vanadium	2.1E+01	1.00	9.6E-05	2.6E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	1.00	2.6E-10	7.1E-10	7.0E-10	4E-01	1E+00	1E-11	8E-11	1E+05	2E-06	1E-05
		Aluminum	1.2E+04	1.00	5.5E-02	1.5E-01	1.0E+00	6E-02	2E-01	3E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.5E+00	0.60	1.5E-05	4.2E-05	3.0E-04	5E-02	1E-01	8E-07	5E-06	2E+00	1E-06	7E-06
		Barium	1.5E+03	1.00	6.8E-03	1.9E-02	2.0E-01	3E-02	9E-02	4E-04	2E-03			
		Cadmium	1.8E+00	1.00	8.4E-06	2.3E-05	1.0E-03	8E-03	2E-02	5E-07	3E-06			
Floodplain	88	Chromium	2.6E+01	1.00	1.2E-04	3.4E-04	3.0E-03	4E-02	1E-01	9E-05	2E-04	5E-01	5E-05	1E-04
		Cobalt	2.6E+00	1.00	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06			
		Iron	8.7E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	5.3E+02	1.00	2.5E-03	6.7E-03	2.4E-02	1E-01	3E-01	1E-04	8E-04			
		Mercury	6.9E-01	1.00	3.2E-06	8.8E-06	3.0E-04	1E-02	3E-02	2E-07	1E-06			
		Thallium	1.5E-01	1.00	7.0E-07	1.9E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	1.4E+01	1.00	6.4E-05	1.8E-04	5.0E-03	1E-02	4E-02	4E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	1.00	4.5E-11	1.2E-10	7.0E-10	6E-02	2E-01	2E-12	1E-11	1E+05	3E-07	2E-06
		Aluminum	1.1E+04	1.00	5.3E-02	1.4E-01	1.0E+00	5E-02	1E-01	3E-03	2E-02			
		Antimony	3.7E-01	1.00	1.7E-06	4.7E-06	4.0E-04	4E-03	1E-02	9E-08	5E-07			
		Arsenic	4.8E+00	0.60	1.3E-05	3.7E-05	3.0E-04	4E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	5.0E+02	1.00	2.4E-03	6.4E-03	2.0E-01	1E-02	3E-02	1E-04	7E-04			
		Cadmium	5.5E-01	1.00	2.6E-06	7.0E-06	1.0E-03	3E-03	7E-03	1E-07	8E-07			
Floodplain	89	Chromium	1.7E+01	1.00	8.1E-05	2.2E-04	3.0E-03	3E-02	7E-02	6E-05	2E-04	5E-01	3E-05	8E-05
		Cobalt	4.5E+00	1.00	2.1E-05	5.7E-05	3.0E-04	7E-02	2E-01	1E-06	6E-06			
		Iron	1.3E+04	1.00	5.9E-02	1.6E-01	7.0E-01	8E-02	2E-01	3E-03	2E-02			
		Manganese	3.7E+02	1.00	1.7E-03	4.7E-03	2.4E-02	7E-02	2E-01	9E-05	5E-04			
		Mercury	1.8E-01	1.00	8.4E-07	2.3E-06	3.0E-04	3E-03	8E-03	5E-08	3E-07			
		Thallium	1.6E-01	1.00	7.3E-07	2.0E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	1.9E+01	1.00	8.8E-05	2.4E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	2.6E-10	7.1E-10	7.0E-10	4E-01	1E+00	1E-11	8E-11	1E+05	2E-06	1E-05
		Aluminum	1.1E+04	1.00	5.2E-02	1.4E-01	1.0E+00	5E-02	1E-01	3E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.0E+01	0.60	2.8E-05	7.7E-05	3.0E-04	9E-02	3E-01	2E-06	9E-06	2E+00	2E-06	1E-05
		Barium	7.6E+02	1.00	3.6E-03	9.8E-03	2.0E-01	2E-02	5E-02	2E-04	1E-03			
		Cadmium	2.8E+00	1.00	1.3E-05	3.6E-05	1.0E-03	1E-02	4E-02	7E-07	4E-06			
Floodplain	90	Chromium	2.8E+01	1.00	1.3E-04	3.6E-04	3.0E-03	4E-02	1E-01	1E-04	3E-04	5E-01	5E-05	1E-04
		Cobalt	3.1E+00	1.00	1.4E-05	4.0E-05	3.0E-04	5E-02	1E-01	8E-07	4E-06			
		Iron	9.3E+03	1.00	4.3E-02	1.2E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	1.1E+03	1.00	5.2E-03	1.4E-02	2.4E-02	2E-01	6E-01	3E-04	2E-03			
		Mercury	1.5E+00	1.00	7.0E-06	1.9E-05	3.0E-04	2E-02	6E-02	4E-07	2E-06			
		Thallium	1.6E-01	1.00	7.2E-07	2.0E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	3.1E+01	1.00	1.5E-04	4.0E-04	5.0E-03	3E-02	8E-02	8E-06	5E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.1E-10	2.9E-10	7.0E-10	2E-01	4E-01	6E-12	3E-11	1E+05	8E-07	4E-06
		Aluminum	1.5E+04	1.00	6.9E-02	1.9E-01	1.0E+00	7E-02	2E-01	4E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	6.3E+00	0.60	1.8E-05	4.8E-05	3.0E-04	6E-02	2E-01	1E-06	5E-06	2E+00	1E-06	8E-06
		Barium	9.2E+02	1.00	4.3E-03	1.2E-02	2.0E-01	2E-02	6E-02	2E-04	1E-03			
		Cadmium	1.7E+00	1.00	7.9E-06	2.2E-05	1.0E-03	8E-03	2E-02	4E-07	2E-06			
Floodplain	91	Chromium	2.6E+01	1.00	1.2E-04	3.4E-04	3.0E-03	4E-02	1E-01	9E-05	2E-04	5E-01	5E-05	1E-04
		Cobalt	5.3E+00	1.00	2.5E-05	6.8E-05	3.0E-04	8E-02	2E-01	1E-06	8E-06			
		Iron	1.4E+04	1.00	6.6E-02	1.8E-01	7.0E-01	9E-02	3E-01	4E-03	2E-02			
		Manganese	4.0E+02	1.00	1.9E-03	5.1E-03	2.4E-02	8E-02	2E-01	1E-04	6E-04			
		Mercury	8.3E-01	1.00	3.9E-06	1.1E-05	3.0E-04	1E-02	4E-02	2E-07	1E-06			
		Thallium	1.9E-01	1.00	8.9E-07	2.4E-06	1.0E-05	9E-02	2E-01	5E-08	3E-07			
		Vanadium	2.6E+01	1.00	1.2E-04	3.4E-04	5.0E-03	2E-02	7E-02	7E-06	4E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	1.00	2.2E-10	5.9E-10	7.0E-10	3E-01	8E-01	1E-11	7E-11	1E+05	2E-06	9E-06
		Aluminum	1.5E+04	1.00	7.1E-02	1.9E-01	1.0E+00	7E-02	2E-01	4E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	7.8E+00	0.60	2.2E-05	6.0E-05	3.0E-04	7E-02	2E-01	1E-06	7E-06	2E+00	2E-06	1E-05
		Barium	4.3E+02	1.00	2.0E-03	5.5E-03	2.0E-01	1E-02	3E-02	1E-04	6E-04			
		Cadmium	2.1E+00	1.00	9.9E-06	2.7E-05	1.0E-03	1E-02	3E-02	5E-07	3E-06			
Floodplain	93	Chromium	2.5E+01	1.00	1.2E-04	3.2E-04	3.0E-03	4E-02	1E-01	9E-05	2E-04	5E-01	4E-05	1E-04
		Cobalt	3.2E+00	1.00	1.5E-05	4.1E-05	3.0E-04	5E-02	1E-01	8E-07	5E-06			
		Iron	7.9E+03	1.00	3.7E-02	1.0E-01	7.0E-01	5E-02	1E-01	2E-03	1E-02			
		Manganese	8.8E+02	1.00	4.1E-03	1.1E-02	2.4E-02	2E-01	5E-01	2E-04	1E-03			
		Mercury	3.2E+00	1.00	1.5E-05	4.0E-05	3.0E-04	5E-02	1E-01	8E-07	5E-06			
		Thallium	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	2.9E+01	1.00	1.3E-04	3.7E-04	5.0E-03	3E-02	7E-02	7E-06	4E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	1.00	1.0E-10	2.9E-10	7.0E-10	1E-01	4E-01	6E-12	3E-11	1E+05	7E-07	4E-06
		Aluminum	1.0E+04	1.00	4.8E-02	1.3E-01	1.0E+00	5E-02	1E-01	3E-03	1E-02			
		Antimony	4.7E-01	1.00	2.2E-06	6.0E-06	4.0E-04	5E-03	2E-02	1E-07	7E-07			
		Arsenic	4.0E+00	0.60	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	6E-07	3E-06	2E+00	9E-07	5E-06
		Barium	4.1E+02	1.00	1.9E-03	5.3E-03	2.0E-01	1E-02	3E-02	1E-04	6E-04			
		Cadmium	1.2E+00	1.00	5.4E-06	1.5E-05	1.0E-03	5E-03	1E-02	3E-07	2E-06			
Floodplain	94	Chromium	2.0E+01	1.00	9.3E-05	2.5E-04	3.0E-03	3E-02	8E-02	7E-05	2E-04	5E-01	3E-05	9E-05
		Cobalt	3.2E+00	1.00	1.5E-05	4.1E-05	3.0E-04	5E-02	1E-01	8E-07	5E-06			
		Iron	9.5E+03	1.00	4.4E-02	1.2E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	4.0E+02	1.00	1.9E-03	5.2E-03	2.4E-02	8E-02	2E-01	1E-04	6E-04			
		Mercury	9.4E-01	1.00	4.4E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-07	1E-06			
		Thallium	1.5E-01	1.00	7.2E-07	2.0E-06	1.0E-05	7E-02	2E-01	4E-08	2E-07			
		Vanadium	1.8E+01	1.00	8.4E-05	2.3E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			
		TEQD/F (ND=1/2 DL)	2.1E-05	1.00	9.9E-11	2.7E-10	7.0E-10	1E-01	4E-01	5E-12	3E-11	1E+05	7E-07	4E-06
		Aluminum	9.8E+03	1.00	4.6E-02	1.2E-01	1.0E+00	5E-02	1E-01	3E-03	1E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.6E+00	0.60	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06	2E+00	1E-06	7E-06
		Barium	3.9E+02	1.00	1.8E-03	5.0E-03	2.0E-01	9E-03	3E-02	1E-04	6E-04			
		Cadmium	1.2E+00	1.00	5.8E-06	1.6E-05	1.0E-03	6E-03	2E-02	3E-07	2E-06			
Floodplain	95	Chromium	1.8E+01	1.00	8.3E-05	2.3E-04	3.0E-03	3E-02	8E-02	6E-05	2E-04	5E-01	3E-05	8E-05
		Cobalt	3.5E+00	1.00	1.6E-05	4.5E-05	3.0E-04	5E-02	1E-01	9E-07	5E-06			
		Iron	9.7E+03	1.00	4.5E-02	1.2E-01	7.0E-01	6E-02	2E-01	2E-03	1E-02			
		Manganese	7.4E+02	1.00	3.5E-03	9.5E-03	2.4E-02	1E-01	4E-01	2E-04	1E-03			
		Mercury	1.0E+00	1.00	4.9E-06	1.3E-05	3.0E-04	2E-02	4E-02	3E-07	2E-06			
		Thallium	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	2.3E+01	1.00	1.1E-04	3.0E-04	5.0E-03	2E-02	6E-02	6E-06	3E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	1.3E-11	3.6E-11	7.0E-10	2E-02	5E-02	7E-13	4E-12	1E+05	9E-08	5E-07
		Aluminum	6.9E+03	1.00	3.2E-02	8.9E-02	1.0E+00	3E-02	9E-02	2E-03	1E-02			
		Antimony	4.8E-02	1.00	2.2E-07	6.1E-07	4.0E-04	6E-04	2E-03	1E-08	7E-08			
		Arsenic	1.7E+00	0.60	4.8E-06	1.3E-05	3.0E-04	2E-02	4E-02	3E-07	1E-06	2E+00	4E-07	2E-06
		Barium	2.4E+02	1.00	1.1E-03	3.1E-03	2.0E-01	6E-03	2E-02	6E-05	3E-04			
		Cadmium	2.6E-01	1.00	1.2E-06	3.3E-06	1.0E-03	1E-03	3E-03	7E-08	4E-07			
Floodplain	97	Chromium	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	3E-05	9E-05	5E-01	2E-05	4E-05
		Cobalt	1.7E+00	1.00	7.9E-06	2.2E-05	3.0E-04	3E-02	7E-02	4E-07	2E-06			
		Iron	5.5E+03	1.00	2.6E-02	7.1E-02	7.0E-01	4E-02	1E-01	1E-03	8E-03			
		Manganese	9.3E+01	1.00	4.3E-04	1.2E-03	2.4E-02	2E-02	5E-02	2E-05	1E-04			
		Mercury	4.1E-02	1.00	1.9E-07	5.2E-07	3.0E-04	6E-04	2E-03	1E-08	6E-08			
		Thallium	7.5E-03	1.00	3.5E-08	9.6E-08	1.0E-05	4E-03	1E-02	2E-09	1E-08			
		Vanadium	8.7E+00	1.00	4.1E-05	1.1E-04	5.0E-03	8E-03	2E-02	2E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	6.8E-11	1.9E-10	7.0E-10	1E-01	3E-01	4E-12	2E-11	1E+05	5E-07	3E-06
		Aluminum	1.5E+04	1.00	7.1E-02	1.9E-01	1.0E+00	7E-02	2E-01	4E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.9E+00	0.60	1.4E-05	3.7E-05	3.0E-04	5E-02	1E-01	7E-07	4E-06	2E+00	1E-06	6E-06
		Barium	2.2E+03	1.00	1.0E-02	2.8E-02	2.0E-01	5E-02	1E-01	6E-04	3E-03			
		Cadmium	1.2E+00	1.00	5.7E-06	1.6E-05	1.0E-03	6E-03	2E-02	3E-07	2E-06			
Floodplain	98	Chromium	1.9E+01	1.00	9.0E-05	2.5E-04	3.0E-03	3E-02	8E-02	7E-05	2E-04	5E-01	3E-05	9E-05
		Cobalt	3.2E+00	1.00	1.5E-05	4.0E-05	3.0E-04	5E-02	1E-01	8E-07	5E-06			
		Iron	1.1E+04	1.00	4.9E-02	1.3E-01	7.0E-01	7E-02	2E-01	3E-03	2E-02			
		Manganese	2.9E+02	1.00	1.4E-03	3.7E-03	2.4E-02	6E-02	2E-01	7E-05	4E-04			
		Mercury	3.1E-01	1.00	1.4E-06	3.9E-06	3.0E-04	5E-03	1E-02	8E-08	4E-07			
		Thallium	1.3E-01	1.00	5.8E-07	1.6E-06	1.0E-05	6E-02	2E-01	3E-08	2E-07			
		Vanadium	2.1E+01	1.00	9.9E-05	2.7E-04	5.0E-03	2E-02	5E-02	5E-06	3E-05			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME	
Noncancer	4.68E-06	1.28E-05	*Based on Child HIFs*

Area	Grid	COPC	Target Organ	EPC mg/kg	RBA	Non-Cancer DI (mg/kg-d) CTE	DI (mg/kg-d) RME	RfD mg/kg-d	HQ CTE	HQ RME	HI Target Organ	HI CTE	HI RME
Upland	26	Arsenic	Dermal	9.3E+00	0.60	2.6E-05	7.1E-05	3.0E-04	9E-02	2E-01	Dermal	2E-01	6E-01
		Thallium	Dermal	2.1E-01	1.00	9.8E-07	2.7E-06	1.0E-05	1E-01	3E-01			
		Vanadium	Dermal	4.2E+01	1.00	1.9E-04	5.3E-04	5.0E-03	4E-02	1E-01			
		Iron	Gastrointestinal	1.7E+04	1.00	8.1E-02	2.2E-01	7.0E-01	1E-01	3E-01	Gastrointestinal	1E-01	3E-01
		Mercury	Immune	1.4E-01	1.00	6.5E-07	1.8E-06	3.0E-04	2E-03	6E-03	Immune	2E-03	6E-03
		Barium	Kidney	1.0E+03	1.00	4.9E-03	1.3E-02	2.0E-01	2E-02	7E-02	Kidney	3E-02	8E-02
		Cadmium	Kidney	7.0E-01	1.00	3.3E-06	8.9E-06	1.0E-03	3E-03	9E-03			
		Aluminum	Nervous	1.9E+04	1.00	8.8E-02	2.4E-01	1.0E+00	9E-02	2E-01	Nervous	2E-01	5E-01
		Manganese	Nervous	4.8E+02	1.00	2.3E-03	6.2E-03	2.4E-02	9E-02	3E-01			
		Chromium	--	2.0E+01	1.00	9.4E-05	2.6E-04	3.0E-03	3E-02	9E-02	Reproductive	2E-02	7E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.7E-06	1.00	1.7E-11	4.7E-11	7.0E-10	2E-02	7E-02			
		Antimony	Systemic	1.5E+00	1.00	7.0E-06	1.9E-05	4.0E-04	2E-02	5E-02	Systemic	2E-02	5E-02
		Cobalt	Thyroid	5.3E+00	1.00	2.5E-05	6.8E-05	3.0E-04	8E-02	2E-01	Thyroid	8E-02	2E-01
Upland	27	Arsenic	Dermal	1.0E+00	0.60	2.8E-06	7.7E-06	3.0E-04	9E-03	3E-02	Dermal	6E-02	2E-01
		Thallium	Dermal	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	9.4E+00	1.00	4.4E-05	1.2E-04	5.0E-03	9E-03	2E-02			
		Iron	Gastrointestinal	8.1E+03	1.00	3.8E-02	1.0E-01	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	1.2E-02	1.00	5.6E-08	1.5E-07	3.0E-04	2E-04	5E-04	Immune	2E-04	5E-04
		Barium	Kidney	2.0E+02	1.00	9.4E-04	2.6E-03	2.0E-01	5E-03	1E-02	Kidney	5E-03	1E-02
		Cadmium	Kidney	6.4E-02	1.00	3.0E-07	8.2E-07	1.0E-03	3E-04	8E-04			
		Aluminum	Nervous	6.7E+03	1.00	3.1E-02	8.6E-02	1.0E+00	3E-02	9E-02	Nervous	5E-02	1E-01
		Manganese	Nervous	1.1E+02	1.00	5.1E-04	1.4E-03	2.4E-02	2E-02	6E-02			
		Chromium	--	8.7E+00	1.00	4.1E-05	1.1E-04	3.0E-03	1E-02	4E-02	Reproductive	2E-02	5E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.5E-06	1.00	1.2E-11	3.2E-11	7.0E-10	2E-02	5E-02			
		Antimony	Systemic	9.0E-02	1.00	4.2E-07	1.2E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	2.6E+00	1.00	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	28	Arsenic	Dermal	9.5E-01	0.60	2.7E-06	7.3E-06	3.0E-04	9E-03	2E-02	Dermal	6E-02	2E-01
		Thallium	Dermal	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	8.7E+00	1.00	4.1E-05	1.1E-04	5.0E-03	8E-03	2E-02			
		Iron	Gastrointestinal	7.5E+03	1.00	3.5E-02	9.5E-02	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	1.6E-02	1.00	7.5E-08	2.0E-07	3.0E-04	2E-04	7E-04	Immune	2E-04	7E-04
		Barium	Kidney	2.0E+02	1.00	9.4E-04	2.6E-03	2.0E-01	5E-03	1E-02	Kidney	5E-03	1E-02
		Cadmium	Kidney	7.3E-02	1.00	3.4E-07	9.3E-07	1.0E-03	3E-04	9E-04			
		Aluminum	Nervous	6.4E+03	1.00	3.0E-02	8.1E-02	1.0E+00	3E-02	8E-02	Nervous	5E-02	1E-01
		Manganese	Nervous	8.4E+01	1.00	3.9E-04	1.1E-03	2.4E-02	2E-02	4E-02			
		Chromium	--	7.2E+00	1.00	3.4E-05	9.2E-05	3.0E-03	1E-02	3E-02	Reproductive	4E-03	1E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	6.6E-07	1.00	3.1E-12	8.4E-12	7.0E-10	4E-03	1E-02			
		Antimony	Systemic	9.0E-02	1.00	4.2E-07	1.2E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	2.4E+00	1.00	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	29	Arsenic	Dermal	1.7E+00	0.60	4.8E-06	1.3E-05	3.0E-04	2E-02	4E-02	Dermal	9E-02	2E-01
		Thallium	Dermal	1.1E-01	1.00	5.1E-07	1.4E-06	1.0E-05	5E-02	1E-01			
		Vanadium	Dermal	1.9E+01	1.00	8.8E-05	2.4E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	8.5E+03	1.00	4.0E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	3.3E-02	1.00	1.5E-07	4.2E-07	3.0E-04	5E-04	1E-03	Immune	5E-04	1E-03
		Barium	Kidney	1.9E+02	1.00	8.9E-04	2.4E-03	2.0E-01	4E-03	1E-02	Kidney	5E-03	1E-02
		Cadmium	Kidney	1.4E-01	1.00	6.5E-07	1.8E-06	1.0E-03	7E-04	2E-03			
		Aluminum	Nervous	7.6E+03	1.00	3.5E-02	9.7E-02	1.0E+00	4E-02	1E-01	Nervous	7E-02	2E-01
		Manganese	Nervous	1.5E+02	1.00	7.2E-04	2.0E-03	2.4E-02	3E-02	8E-02			
		Chromium	--	1.1E+01	1.00	5.0E-05	1.4E-04	3.0E-03	2E-02	5E-02	Reproductive	2E-02	5E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.9E-06	1.00	1.4E-11	3.7E-11	7.0E-10	2E-02	5E-02			
		Antimony	Systemic	1.9E-01	1.00	8.9E-07	2.4E-06	4.0E-04	2E-03	6E-03	Systemic	2E-03	6E-03
		Cobalt	Thyroid	3.1E+00	1.00	1.4E-05	4.0E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	30	Arsenic	Dermal	1.2E+00	0.60	3.4E-06	9.2E-06	3.0E-04	1E-02	3E-02	Dermal	8E-02	2E-01
		Thallium	Dermal	1.2E-01	1.00	5.6E-07	1.5E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	1.2E+01	1.00	5.5E-05	1.5E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	8.7E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	2.4E-02	1.00	1.1E-07	3.1E-07	3.0E-04	4E-04	1E-03	Immune	4E-04	1E-03
		Barium	Kidney	3.6E+02	1.00	1.7E-03	4.6E-03	2.0E-01	8E-03	2E-02	Kidney	9E-03	2E-02
		Cadmium	Kidney	1.3E-01	1.00	6.1E-07	1.7E-06	1.0E-03	6E-04	2E-03			
		Aluminum	Nervous	8.2E+03	1.00	3.8E-02	1.0E-01	1.0E+00	4E-02	1E-01	Nervous	6E-02	2E-01
		Manganese	Nervous	1.1E+02	1.00	5.1E-04	1.4E-03	2.4E-02	2E-02	6E-02			
		Chromium	--	1.0E+01	1.00	4.7E-05	1.3E-04	3.0E-03	2E-02	4E-02	Reproductive	1E-02	3E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.7E-06	1.00	8.0E-12	2.2E-11	7.0E-10	1E-02	3E-02			
		Antimony	Systemic	2.0E-01	1.00	9.4E-07	2.6E-06	4.0E-04	2E-03	6E-03	Systemic	2E-03	6E-03
		Cobalt	Thyroid	2.6E+00	1.00	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01

Upland	31	Arsenic	Dermal	1.9E+00	0.60	5.2E-06	1.4E-05	3.0E-04	2E-02	5E-02	Dermal	8E-02	2E-01
		Thallium	Dermal	1.1E-01	1.00	4.9E-07	1.3E-06	1.0E-05	5E-02	1E-01			
		Vanadium	Dermal	9.4E+00	1.00	4.4E-05	1.2E-04	5.0E-03	9E-03	2E-02			
		Iron	Gastrointestinal	7.9E+03	1.00	3.7E-02	1.0E-01	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	3.4E-03	1.00	1.6E-08	4.4E-08	3.0E-04	5E-05	1E-04	Immune	5E-05	1E-04
		Barium	Kidney	8.5E+01	1.00	4.0E-04	1.1E-03	2.0E-01	2E-03	5E-03	Kidney	2E-03	6E-03
		Cadmium	Kidney	4.4E-02	1.00	2.1E-07	5.6E-07	1.0E-03	2E-04	6E-04			
		Aluminum	Nervous	6.6E+03	1.00	3.1E-02	8.5E-02	1.0E+00	3E-02	8E-02	Nervous	6E-02	2E-01
		Manganese	Nervous	1.3E+02	1.00	5.9E-04	1.6E-03	2.4E-02	2E-02	7E-02			
		Chromium	--	1.0E+01	1.00	4.8E-05	1.3E-04	3.0E-03	2E-02	4E-02	Reproductive	5E-03	1E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	7.1E-07	1.00	3.3E-12	9.1E-12	7.0E-10	5E-03	1E-02			
		Antimony	Systemic	4.1E-02	1.00	1.9E-07	5.2E-07	4.0E-04	5E-04	1E-03	Systemic	5E-04	1E-03
		Cobalt	Thyroid	2.9E+00	1.00	1.3E-05	3.6E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	32	Arsenic	Dermal	1.1E+00	0.60	3.1E-06	8.4E-06	3.0E-04	1E-02	3E-02	Dermal	5E-02	1E-01
		Thallium	Dermal	6.9E-02	1.00	3.2E-07	8.8E-07	1.0E-05	3E-02	9E-02			
		Vanadium	Dermal	8.3E+00	1.00	3.9E-05	1.1E-04	5.0E-03	8E-03	2E-02			
		Iron	Gastrointestinal	7.6E+03	1.00	3.5E-02	9.7E-02	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	3.1E-03	1.00	1.4E-08	4.0E-08	3.0E-04	5E-05	1E-04	Immune	5E-05	1E-04
		Barium	Kidney	1.2E+02	1.00	5.7E-04	1.5E-03	2.0E-01	3E-03	8E-03	Kidney	3E-03	8E-03
		Cadmium	Kidney	4.6E-02	1.00	2.2E-07	5.9E-07	1.0E-03	2E-04	6E-04			
		Aluminum	Nervous	4.8E+03	1.00	2.3E-02	6.2E-02	1.0E+00	2E-02	6E-02	Nervous	4E-02	1E-01
		Manganese	Nervous	9.1E+01	1.00	4.2E-04	1.2E-03	2.4E-02	2E-02	5E-02			
		Chromium	--	6.3E+00	1.00	2.9E-05	8.1E-05	3.0E-03	1E-02	3E-02	Reproductive	4E-03	1E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	5.3E-07	1.00	2.5E-12	6.8E-12	7.0E-10	4E-03	1E-02			
		Antimony	Systemic	1.5E-01	1.00	7.0E-07	1.9E-06	4.0E-04	2E-03	5E-03	Systemic	2E-03	5E-03
		Cobalt	Thyroid	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02
Upland	33	Arsenic	Dermal	4.0E+00	0.60	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	1.3E-01	1.00	6.1E-07	1.7E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	1.7E+01	1.00	7.7E-05	2.1E-04	5.0E-03	2E-02	4E-02			
		Iron	Gastrointestinal	1.2E+04	1.00	5.4E-02	1.5E-01	7.0E-01	8E-02	2E-01	Gastrointestinal	8E-02	2E-01
		Mercury	Immune	1.7E-02	1.00	7.9E-08	2.2E-07	3.0E-04	3E-04	7E-04	Immune	3E-04	7E-04
		Barium	Kidney	2.3E+02	1.00	1.1E-03	2.9E-03	2.0E-01	5E-03	1E-02	Kidney	6E-03	2E-02
		Cadmium	Kidney	1.3E-01	1.00	6.1E-07	1.7E-06	1.0E-03	6E-04	2E-03			
		Aluminum	Nervous	8.8E+03	1.00	4.1E-02	1.1E-01	1.0E+00	4E-02	1E-01	Nervous	1E-01	3E-01
		Manganese	Nervous	3.9E+02	1.00	1.8E-03	5.0E-03	2.4E-02	8E-02	2E-01			
		Chromium	--	1.1E+01	1.00	5.0E-05	1.4E-04	3.0E-03	2E-02	5E-02	Reproductive	7E-03	2E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.0E-06	1.00	4.8E-12	1.3E-11	7.0E-10	7E-03	2E-02			
		Antimony	Systemic	9.0E-02	1.00	4.2E-07	1.2E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	4.2E+00	1.00	2.0E-05	5.4E-05	3.0E-04	7E-02	2E-01	Thyroid	7E-02	2E-01
Upland	34	Arsenic	Dermal	1.6E+00	0.60	4.5E-06	1.2E-05	3.0E-04	1E-02	4E-02	Dermal	7E-02	2E-01
		Thallium	Dermal	9.9E-02	1.00	4.6E-07	1.3E-06	1.0E-05	5E-02	1E-01			
		Vanadium	Dermal	1.1E+01	1.00	5.0E-05	1.4E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	1.3E-02	1.00	6.1E-08	1.7E-07	3.0E-04	2E-04	6E-04	Immune	2E-04	6E-04
		Barium	Kidney	2.0E+02	1.00	9.3E-04	2.5E-03	2.0E-01	5E-03	1E-02	Kidney	5E-03	1E-02
		Cadmium	Kidney	9.3E-02	1.00	4.3E-07	1.2E-06	1.0E-03	4E-04	1E-03			
		Aluminum	Nervous	7.2E+03	1.00	3.4E-02	9.2E-02	1.0E+00	3E-02	9E-02	Nervous	6E-02	2E-01
		Manganese	Nervous	1.6E+02	1.00	7.3E-04	2.0E-03	2.4E-02	3E-02	8E-02			
		Chromium	--	8.2E+00	1.00	3.8E-05	1.0E-04	3.0E-03	1E-02	3E-02	Reproductive	6E-03	2E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	8.3E-07	1.00	3.9E-12	1.1E-11	7.0E-10	6E-03	2E-02			
		Antimony	Systemic	8.5E-02	1.00	4.0E-07	1.1E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	3.2E+00	1.00	1.5E-05	4.1E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	35	Arsenic	Dermal	2.1E+00	0.60	5.9E-06	1.6E-05	3.0E-04	2E-02	5E-02	Dermal	9E-02	2E-01
		Thallium	Dermal	1.2E-01	1.00	5.6E-07	1.5E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	1.2E+01	1.00	5.4E-05	1.5E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	1.1E+04	1.00	5.3E-02	1.4E-01	7.0E-01	8E-02	2E-01	Gastrointestinal	8E-02	2E-01
		Mercury	Immune	1.8E-02	1.00	8.4E-08	2.3E-07	3.0E-04	3E-04	8E-04	Immune	3E-04	8E-04
		Barium	Kidney	2.3E+02	1.00	1.1E-03	2.9E-03	2.0E-01	5E-03	1E-02	Kidney	6E-03	2E-02
		Cadmium	Kidney	1.9E-01	1.00	8.9E-07	2.4E-06	1.0E-03	9E-04	2E-03			
		Aluminum	Nervous	9.5E+03	1.00	4.5E-02	1.2E-01	1.0E+00	4E-02	1E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	4.9E+02	1.00	2.3E-03	6.2E-03	2.4E-02	9E-02	3E-01			
		Chromium	--	8.9E+00	1.00	4.2E-05	1.1E-04	3.0E-03	1E-02	4E-02	Reproductive	5E-03	1E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	7.3E-07	1.00	3.4E-12	9.3E-12	7.0E-10	5E-03	1E-02			
		Antimony	Systemic	2.3E-01	1.00	1.1E-06	2.9E-06	4.0E-04	3E-03	7E-03	Systemic	3E-03	7E-03
		Cobalt	Thyroid	4.5E+00	1.00	2.1E-05	5.8E-05	3.0E-04	7E-02	2E-01	Thyroid	7E-02	2E-01

Upland	36	Arsenic	Dermal	5.1E+00	0.60	1.4E-05	3.9E-05	3.0E-04	5E-02	1E-01	Dermal	1E-01	4E-01
		Thallium	Dermal	1.4E-01	1.00	6.5E-07	1.8E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	3.1E+01	1.00	1.4E-04	4.0E-04	5.0E-03	3E-02	8E-02			
		Iron	Gastrointestinal	1.3E+04	1.00	6.0E-02	1.6E-01	7.0E-01	9E-02	2E-01	Gastrointestinal	9E-02	2E-01
		Mercury	Immune	2.7E-01	1.00	1.3E-06	3.5E-06	3.0E-04	4E-03	1E-02	Immune	4E-03	1E-02
		Barium	Kidney	4.9E+02	1.00	2.3E-03	6.3E-03	2.0E-01	1E-02	3E-02	Kidney	2E-02	4E-02
		Cadmium	Kidney	8.5E-01	1.00	4.0E-06	1.1E-05	1.0E-03	4E-03	1E-02			
		Aluminum	Nervous	1.3E+04	1.00	5.8E-02	1.6E-01	1.0E+00	6E-02	2E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	4.1E+02	1.00	1.9E-03	5.2E-03	2.4E-02	8E-02	2E-01			
		Chromium	--	1.8E+01	1.00	8.2E-05	2.3E-04	3.0E-03	3E-02	8E-02	Reproductive	6E-02	2E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	9.2E-06	1.00	4.3E-11	1.2E-10	7.0E-10	6E-02	2E-01			
		Antimony	Systemic	8.0E-01	1.00	3.7E-06	1.0E-05	4.0E-04	9E-03	3E-02	Systemic	9E-03	3E-02
		Cobalt	Thyroid	4.9E+00	1.00	2.3E-05	6.3E-05	3.0E-04	8E-02	2E-01	Thyroid	8E-02	2E-01
Upland	37	Arsenic	Dermal	2.5E+00	0.60	7.1E-06	1.9E-05	3.0E-04	2E-02	6E-02	Dermal	8E-02	2E-01
		Thallium	Dermal	8.7E-02	1.00	4.1E-07	1.1E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	1.1E+01	1.00	5.4E-05	1.5E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	9.9E+03	1.00	4.6E-02	1.3E-01	7.0E-01	7E-02	2E-01	Gastrointestinal	7E-02	2E-01
		Mercury	Immune	4.0E-02	1.00	1.9E-07	5.1E-07	3.0E-04	6E-04	2E-03	Immune	6E-04	2E-03
		Barium	Kidney	2.0E+02	1.00	9.5E-04	2.6E-03	2.0E-01	5E-03	1E-02	Kidney	6E-03	2E-02
		Cadmium	Kidney	2.6E-01	1.00	1.2E-06	3.3E-06	1.0E-03	1E-03	3E-03			
		Aluminum	Nervous	7.9E+03	1.00	3.7E-02	1.0E-01	1.0E+00	4E-02	1E-01	Nervous	9E-02	2E-01
		Manganese	Nervous	2.6E+02	1.00	1.2E-03	3.4E-03	2.4E-02	5E-02	1E-01			
		Chromium	--	1.0E+01	1.00	4.7E-05	1.3E-04	3.0E-03	2E-02	4E-02	Reproductive	1E-02	3E-02
		TEQD/F (ND=1/2 DL)	Reproductive	1.5E-06	1.00	7.2E-12	2.0E-11	7.0E-10	1E-02	3E-02			
		Antimony	Systemic	3.3E-01	1.00	1.5E-06	4.2E-06	4.0E-04	4E-03	1E-02	Systemic	4E-03	1E-02
		Cobalt	Thyroid	3.5E+00	1.00	1.6E-05	4.5E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	38[a]	Arsenic	Dermal	1.0E+00	0.60	2.8E-06	7.7E-06	3.0E-04	9E-03	3E-02	Dermal	2E-02	6E-02
		Thallium	Dermal	1.7E-02	1.00	7.7E-08	2.1E-07	1.0E-05	8E-03	2E-02			
		Vanadium	Dermal	5.3E+00	1.00	2.5E-05	6.8E-05	5.0E-03	5E-03	1E-02			
		Iron	Gastrointestinal	5.2E+03	1.00	2.4E-02	6.7E-02	7.0E-01	3E-02	1E-01	Gastrointestinal	3E-02	1E-01
		Mercury	Immune	4.6E-03	1.00	2.2E-08	5.9E-08	3.0E-04	7E-05	2E-04	Immune	7E-05	2E-04
		Barium	Kidney	4.4E+01	1.00	2.1E-04	5.6E-04	2.0E-01	1E-03	3E-03	Kidney	1E-03	3E-03
		Cadmium	Kidney	1.6E-02	1.00	7.5E-08	2.0E-07	1.0E-03	7E-05	2E-04			
		Aluminum	Nervous	2.7E+03	1.00	1.3E-02	3.5E-02	1.0E+00	1E-02	3E-02	Nervous	2E-02	6E-02
		Manganese	Nervous	3.9E+01	1.00	1.8E-04	4.9E-04	2.4E-02	8E-03	2E-02			
		Chromium	--	3.8E+00	1.00	1.8E-05	4.9E-05	3.0E-03	6E-03	2E-02	Reproductive	1E-02	4E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.1E-06	1.00	9.8E-12	2.7E-11	7.0E-10	1E-02	4E-02			
		Antimony	Systemic	8.5E-02	1.00	4.0E-07	1.1E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	1.5E+00	1.00	7.0E-06	1.9E-05	3.0E-04	2E-02	6E-02	Thyroid	2E-02	6E-02
Upland	39	Arsenic	Dermal	2.2E+00	0.60	6.1E-06	1.7E-05	3.0E-04	2E-02	6E-02	Dermal	1E-01	3E-01
		Thallium	Dermal	1.3E-01	1.00	6.3E-07	1.7E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	1.8E+01	1.00	8.4E-05	2.3E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	9.9E+03	1.00	4.6E-02	1.3E-01	7.0E-01	7E-02	2E-01	Gastrointestinal	7E-02	2E-01
		Mercury	Immune	7.4E-02	1.00	3.5E-07	9.5E-07	3.0E-04	1E-03	3E-03	Immune	1E-03	3E-03
		Barium	Kidney	4.3E+02	1.00	2.0E-03	5.4E-03	2.0E-01	1E-02	3E-02	Kidney	1E-02	3E-02
		Cadmium	Kidney	3.3E-01	1.00	1.6E-06	4.2E-06	1.0E-03	2E-03	4E-03			
		Aluminum	Nervous	9.7E+03	1.00	4.5E-02	1.2E-01	1.0E+00	5E-02	1E-01	Nervous	7E-02	2E-01
		Manganese	Nervous	1.3E+02	1.00	6.2E-04	1.7E-03	2.4E-02	3E-02	7E-02			
		Chromium	--	1.2E+01	1.00	5.6E-05	1.5E-04	3.0E-03	2E-02	5E-02	Reproductive	2E-02	5E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.8E-06	1.00	1.3E-11	3.6E-11	7.0E-10	2E-02	5E-02			
		Antimony	Systemic	4.3E-01	1.00	2.0E-06	5.4E-06	4.0E-04	5E-03	1E-02	Systemic	5E-03	1E-02
		Cobalt	Thyroid	3.3E+00	1.00	1.5E-05	4.2E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	40	Arsenic	Dermal	1.4E+00	0.60	3.9E-06	1.1E-05	3.0E-04	1E-02	4E-02	Dermal	5E-02	1E-01
		Thallium	Dermal	6.8E-02	1.00	3.2E-07	8.7E-07	1.0E-05	3E-02	9E-02			
		Vanadium	Dermal	7.6E+00	1.00	3.6E-05	9.7E-05	5.0E-03	7E-03	2E-02			
		Iron	Gastrointestinal	6.3E+03	1.00	2.9E-02	8.0E-02	7.0E-01	4E-02	1E-01	Gastrointestinal	4E-02	1E-01
		Mercury	Immune	4.0E-02	1.00	1.9E-07	5.1E-07	3.0E-04	6E-04	2E-03	Immune	6E-04	2E-03
		Barium	Kidney	2.1E+02	1.00	9.6E-04	2.6E-03	2.0E-01	5E-03	1E-02	Kidney	6E-03	2E-02
		Cadmium	Kidney	2.8E-01	1.00	1.3E-06	3.6E-06	1.0E-03	1E-03	4E-03			
		Aluminum	Nervous	6.0E+03	1.00	2.8E-02	7.6E-02	1.0E+00	3E-02	8E-02	Nervous	5E-02	1E-01
		Manganese	Nervous	9.2E+01	1.00	4.3E-04	1.2E-03	2.4E-02	2E-02	5E-02			
		Chromium	--	1.1E+01	1.00	5.2E-05	1.4E-04	3.0E-03	2E-02	5E-02	Reproductive	2E-02	6E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.5E-06	1.00	1.7E-11	4.5E-11	7.0E-10	2E-02	6E-02			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02

Upland	41	Arsenic	Dermal	1.3E+00	0.60	3.6E-06	1.0E-05	3.0E-04	1E-02	3E-02	Dermal	2E-02	6E-02
		Thallium	Dermal	6.5E-03	1.00	3.0E-08	8.3E-08	1.0E-05	3E-03	8E-03			
		Vanadium	Dermal	5.3E+00	1.00	2.5E-05	6.8E-05	5.0E-03	5E-03	1E-02			
		Iron	Gastrointestinal	4.7E+03	1.00	2.2E-02	6.1E-02	7.0E-01	3E-02	9E-02	Gastrointestinal	3E-02	9E-02
		Mercury	Immune	5.7E-02	1.00	2.7E-07	7.3E-07	3.0E-04	9E-04	2E-03	Immune	9E-04	2E-03
		Barium	Kidney	3.2E+02	1.00	1.5E-03	4.1E-03	2.0E-01	7E-03	2E-02	Kidney	9E-03	2E-02
		Cadmium	Kidney	2.8E-01	1.00	1.3E-06	3.6E-06	1.0E-03	1E-03	4E-03			
		Aluminum	Nervous	5.7E+03	1.00	2.7E-02	7.3E-02	1.0E+00	3E-02	7E-02	Nervous	5E-02	1E-01
		Manganese	Nervous	1.3E+02	1.00	5.9E-04	1.6E-03	2.4E-02	2E-02	7E-02			
		Chromium	--	8.3E+00	1.00	3.9E-05	1.1E-04	3.0E-03	1E-02	4E-02	Reproductive	3E-02	7E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.9E-06	1.00	1.8E-11	5.0E-11	7.0E-10	3E-02	7E-02			
		Antimony	Systemic	4.2E-02	1.00	2.0E-07	5.4E-07	4.0E-04	5E-04	1E-03	Systemic	5E-04	1E-03
		Cobalt	Thyroid	1.6E+00	1.00	7.5E-06	2.0E-05	3.0E-04	2E-02	7E-02	Thyroid	2E-02	7E-02
Upland	42	Arsenic	Dermal	3.1E+00	0.60	8.7E-06	2.4E-05	3.0E-04	3E-02	8E-02	Dermal	1E-01	3E-01
		Thallium	Dermal	1.7E-01	1.00	7.9E-07	2.2E-06	1.0E-05	8E-02	2E-01			
		Vanadium	Dermal	1.8E+01	1.00	8.5E-05	2.3E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	1.6E+04	1.00	7.5E-02	2.0E-01	7.0E-01	1E-01	3E-01	Gastrointestinal	1E-01	3E-01
		Mercury	Immune	1.6E-01	1.00	7.5E-07	2.0E-06	3.0E-04	2E-03	7E-03	Immune	2E-03	7E-03
		Barium	Kidney	3.0E+02	1.00	1.4E-03	3.8E-03	2.0E-01	7E-03	2E-02	Kidney	8E-03	2E-02
		Cadmium	Kidney	3.2E-01	1.00	1.5E-06	4.1E-06	1.0E-03	1E-03	4E-03			
		Aluminum	Nervous	1.3E+04	1.00	6.0E-02	1.6E-01	1.0E+00	6E-02	2E-01	Nervous	1E-01	3E-01
		Manganese	Nervous	3.0E+02	1.00	1.4E-03	3.8E-03	2.4E-02	6E-02	2E-01			
		Chromium	--	2.1E+01	1.00	9.6E-05	2.6E-04	3.0E-03	3E-02	9E-02	Reproductive	5E-02	1E-01
		TEQD/F (ND=1/2 DL)	Reproductive	7.5E-06	1.00	3.5E-11	9.6E-11	7.0E-10	5E-02	1E-01			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	4.9E+00	1.00	2.3E-05	6.3E-05	3.0E-04	8E-02	2E-01	Thyroid	8E-02	2E-01
Upland	43	Arsenic	Dermal	2.8E+00	0.60	7.9E-06	2.1E-05	3.0E-04	3E-02	7E-02	Dermal	1E-01	3E-01
		Thallium	Dermal	9.6E-02	1.00	4.5E-07	1.2E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	2.7E+01	1.00	1.3E-04	3.4E-04	5.0E-03	3E-02	7E-02			
		Iron	Gastrointestinal	7.8E+03	1.00	3.6E-02	1.0E-01	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	1.2E-01	1.00	5.6E-07	1.5E-06	3.0E-04	2E-03	5E-03	Immune	2E-03	5E-03
		Barium	Kidney	5.8E+02	1.00	2.7E-03	7.4E-03	2.0E-01	1E-02	4E-02	Kidney	2E-02	4E-02
		Cadmium	Kidney	4.7E-01	1.00	2.2E-06	6.0E-06	1.0E-03	2E-03	6E-03			
		Aluminum	Nervous	9.1E+03	1.00	4.3E-02	1.2E-01	1.0E+00	4E-02	1E-01	Nervous	7E-02	2E-01
		Manganese	Nervous	1.5E+02	1.00	6.9E-04	1.9E-03	2.4E-02	3E-02	8E-02			
		Chromium	--	1.3E+01	1.00	6.2E-05	1.7E-04	3.0E-03	2E-02	6E-02	Reproductive	3E-02	7E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.9E-06	1.00	1.8E-11	5.0E-11	7.0E-10	3E-02	7E-02			
		Antimony	Systemic	7.6E-01	1.00	3.6E-06	9.7E-06	4.0E-04	9E-03	2E-02	Systemic	9E-03	2E-02
		Cobalt	Thyroid	2.8E+00	1.00	1.3E-05	3.6E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	44	Arsenic	Dermal	4.4E+00	0.60	1.2E-05	3.4E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	9.5E-02	1.00	4.4E-07	1.2E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	3.4E+01	1.00	1.6E-04	4.4E-04	5.0E-03	3E-02	9E-02			
		Iron	Gastrointestinal	8.1E+03	1.00	3.8E-02	1.0E-01	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	1.6E-01	1.00	7.3E-07	2.0E-06	3.0E-04	2E-03	7E-03	Immune	2E-03	7E-03
		Barium	Kidney	2.9E+02	1.00	1.4E-03	3.7E-03	2.0E-01	7E-03	2E-02	Kidney	1E-02	3E-02
		Cadmium	Kidney	8.0E-01	1.00	3.7E-06	1.0E-05	1.0E-03	4E-03	1E-02			
		Aluminum	Nervous	9.9E+03	1.00	4.6E-02	1.3E-01	1.0E+00	5E-02	1E-01	Nervous	1E-01	3E-01
		Manganese	Nervous	3.3E+02	1.00	1.6E-03	4.3E-03	2.4E-02	7E-02	2E-01			
		Chromium	--	1.2E+01	1.00	5.6E-05	1.5E-04	3.0E-03	2E-02	5E-02	Reproductive	1E-02	4E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.2E-06	1.00	1.0E-11	2.8E-11	7.0E-10	1E-02	4E-02			
		Antimony	Systemic	1.2E+00	1.00	5.4E-06	1.5E-05	4.0E-04	1E-02	4E-02	Systemic	1E-02	4E-02
		Cobalt	Thyroid	3.0E+00	1.00	1.4E-05	3.9E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	45[a]	Arsenic	Dermal	3.1E+00	0.60	8.7E-06	2.4E-05	3.0E-04	3E-02	8E-02	Dermal	1E-01	4E-01
		Thallium	Dermal	2.1E-01	1.00	9.8E-07	2.7E-06	1.0E-05	1E-01	3E-01			
		Vanadium	Dermal	1.9E+01	1.00	8.8E-05	2.4E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	2.0E+04	1.00	9.5E-02	2.6E-01	7.0E-01	1E-01	4E-01	Gastrointestinal	1E-01	4E-01
		Mercury	Immune	1.9E-02	1.00	8.9E-08	2.4E-07	3.0E-04	3E-04	8E-04	Immune	3E-04	8E-04
		Barium	Kidney	3.1E+02	1.00	1.5E-03	4.0E-03	2.0E-01	7E-03	2E-02	Kidney	8E-03	2E-02
		Cadmium	Kidney	8.0E-02	1.00	3.7E-07	1.0E-06	1.0E-03	4E-04	1E-03			
		Aluminum	Nervous	2.1E+04	1.00	9.8E-02	2.7E-01	1.0E+00	1E-01	3E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	1.8E+02	1.00	8.2E-04	2.3E-03	2.4E-02	3E-02	9E-02			
		Chromium	--	1.8E+01	1.00	8.6E-05	2.4E-04	3.0E-03	3E-02	8E-02	Reproductive	2E-03	7E-03
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.7E-07	1.00	1.7E-12	4.7E-12	7.0E-10	2E-03	7E-03			
		Antimony	Systemic	2.3E-01	1.00	1.1E-06	2.9E-06	4.0E-04	3E-03	7E-03	Systemic	3E-03	7E-03
		Cobalt	Thyroid	6.9E+00	1.00	3.2E-05	8.8E-05	3.0E-04	1E-01	3E-01	Thyroid	1E-01	3E-01

Upland	46	Arsenic	Dermal	2.3E+00	0.60	6.5E-06	1.8E-05	3.0E-04	2E-02	6E-02	Dermal	1E-01	3E-01
		Thallium	Dermal	1.6E-01	1.00	7.5E-07	2.0E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	1.8E+01	1.00	8.3E-05	2.3E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	1.4E+04	1.00	6.5E-02	1.8E-01	7.0E-01	9E-02	3E-01	Gastrointestinal	9E-02	3E-01
		Mercury	Immune	4.1E-02	1.00	1.9E-07	5.2E-07	3.0E-04	6E-04	2E-03	Immune	6E-04	2E-03
		Barium	Kidney	4.2E+02	1.00	2.0E-03	5.3E-03	2.0E-01	1E-02	3E-02	Kidney	1E-02	3E-02
		Cadmium	Kidney	2.4E-01	1.00	1.1E-06	3.1E-06	1.0E-03	1E-03	3E-03			
		Aluminum	Nervous	1.2E+04	1.00	5.5E-02	1.5E-01	1.0E+00	5E-02	1E-01	Nervous	1E-01	3E-01
		Manganese	Nervous	2.4E+02	1.00	1.1E-03	3.0E-03	2.4E-02	5E-02	1E-01			
		Chromium	--	1.7E+01	1.00	8.1E-05	2.2E-04	3.0E-03	3E-02	7E-02	Reproductive	2E-02	6E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.0E-06	1.00	1.4E-11	3.9E-11	7.0E-10	2E-02	6E-02			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	4.9E+00	1.00	2.3E-05	6.3E-05	3.0E-04	8E-02	2E-01	Thyroid	8E-02	2E-01
Upland	47	Arsenic	Dermal	1.3E+01	0.60	3.6E-05	9.8E-05	3.0E-04	1E-01	3E-01	Dermal	3E-01	7E-01
		Thallium	Dermal	2.1E-01	1.00	9.8E-07	2.7E-06	1.0E-05	1E-01	3E-01			
		Vanadium	Dermal	5.1E+01	1.00	2.4E-04	6.5E-04	5.0E-03	5E-02	1E-01			
		Iron	Gastrointestinal	2.9E+03	1.00	1.4E-02	3.7E-02	7.0E-01	2E-02	5E-02	Gastrointestinal	2E-02	5E-02
		Mercury	Immune	8.1E-01	1.00	3.8E-06	1.0E-05	3.0E-04	1E-02	3E-02	Immune	1E-02	3E-02
		Barium	Kidney	5.6E+02	1.00	2.6E-03	7.2E-03	2.0E-01	1E-02	4E-02	Kidney	4E-02	1E-01
		Cadmium	Kidney	5.2E+00	1.00	2.4E-05	6.6E-05	1.0E-03	2E-02	7E-02			
		Aluminum	Nervous	1.8E+04	1.00	8.2E-02	2.3E-01	1.0E+00	8E-02	2E-01	Nervous	3E-01	8E-01
		Manganese	Nervous	1.1E+03	1.00	5.3E-03	1.5E-02	2.4E-02	2E-01	6E-01			
		Chromium	--	2.2E+01	1.00	1.0E-04	2.8E-04	3.0E-03	3E-02	9E-02	Reproductive	1E-01	3E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.6E-05	1.00	7.6E-11	2.1E-10	7.0E-10	1E-01	3E-01			
		Antimony	Systemic	1.6E+00	1.00	7.5E-06	2.0E-05	4.0E-04	2E-02	5E-02	Systemic	2E-02	5E-02
		Cobalt	Thyroid	2.0E+00	1.00	9.4E-06	2.6E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02
Upland	48	Arsenic	Dermal	1.4E+01	0.60	4.0E-05	1.1E-04	3.0E-04	1E-01	4E-01	Dermal	4E-01	1E+00
		Thallium	Dermal	3.3E-01	1.00	1.5E-06	4.2E-06	1.0E-05	2E-01	4E-01			
		Vanadium	Dermal	7.1E+01	1.00	3.3E-04	9.0E-04	5.0E-03	7E-02	2E-01			
		Iron	Gastrointestinal	3.6E+03	1.00	1.7E-02	4.6E-02	7.0E-01	2E-02	7E-02	Gastrointestinal	2E-02	7E-02
		Mercury	Immune	2.5E+00	1.00	1.2E-05	3.2E-05	3.0E-04	4E-02	1E-01	Immune	4E-02	1E-01
		Barium	Kidney	8.0E+02	1.00	3.7E-03	1.0E-02	2.0E-01	2E-02	5E-02	Kidney	6E-02	2E-01
		Cadmium	Kidney	8.3E+00	1.00	3.9E-05	1.1E-04	1.0E-03	4E-02	1E-01			
		Aluminum	Nervous	1.9E+04	1.00	8.7E-02	2.4E-01	1.0E+00	9E-02	2E-01	Nervous	4E-01	1E+00
		Manganese	Nervous	1.7E+03	1.00	7.7E-03	2.1E-02	2.4E-02	3E-01	9E-01			
		Chromium	--	5.8E+01	1.00	2.7E-04	7.4E-04	3.0E-03	9E-02	2E-01	Reproductive	3E-01	9E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	4.9E-05	1.00	2.3E-10	6.3E-10	7.0E-10	3E-01	9E-01			
		Antimony	Systemic	2.4E+00	1.00	1.1E-05	3.1E-05	4.0E-04	3E-02	8E-02	Systemic	3E-02	8E-02
		Cobalt	Thyroid	2.0E+00	1.00	9.4E-06	2.6E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02
Upland	49	Arsenic	Dermal	3.6E+00	0.60	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	Dermal	1E-01	4E-01
		Thallium	Dermal	1.6E-01	1.00	7.5E-07	2.0E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	2.2E+01	1.00	1.0E-04	2.8E-04	5.0E-03	2E-02	6E-02			
		Iron	Gastrointestinal	1.5E+04	1.00	7.0E-02	1.9E-01	7.0E-01	1E-01	3E-01	Gastrointestinal	1E-01	3E-01
		Mercury	Immune	8.0E+00	1.00	3.7E-05	1.0E-04	3.0E-04	1E-01	3E-01	Immune	1E-01	3E-01
		Barium	Kidney	1.0E+03	1.00	4.7E-03	1.3E-02	2.0E-01	2E-02	6E-02	Kidney	3E-02	9E-02
		Cadmium	Kidney	2.0E+00	1.00	9.4E-06	2.6E-05	1.0E-03	9E-03	3E-02			
		Aluminum	Nervous	1.4E+04	1.00	6.7E-02	1.8E-01	1.0E+00	7E-02	2E-01	Nervous	2E-01	5E-01
		Manganese	Nervous	5.8E+02	1.00	2.7E-03	7.4E-03	2.4E-02	1E-01	3E-01			
		Chromium	--	2.9E+01	1.00	1.3E-04	3.7E-04	3.0E-03	4E-02	1E-01	Reproductive	3E-01	7E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	4.0E-05	1.00	1.9E-10	5.1E-10	7.0E-10	3E-01	7E-01			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	4.5E+00	1.00	2.1E-05	5.8E-05	3.0E-04	7E-02	2E-01	Thyroid	7E-02	2E-01
Upland	50	Arsenic	Dermal	7.9E+00	0.60	2.2E-05	6.0E-05	3.0E-04	7E-02	2E-01	Dermal	2E-01	5E-01
		Thallium	Dermal	1.9E-01	1.00	8.9E-07	2.4E-06	1.0E-05	9E-02	2E-01			
		Vanadium	Dermal	2.9E+01	1.00	1.3E-04	3.6E-04	5.0E-03	3E-02	7E-02			
		Iron	Gastrointestinal	4.4E+03	1.00	2.0E-02	5.6E-02	7.0E-01	3E-02	8E-02	Gastrointestinal	3E-02	8E-02
		Mercury	Immune	7.5E-01	1.00	3.5E-06	9.6E-06	3.0E-04	1E-02	3E-02	Immune	1E-02	3E-02
		Barium	Kidney	5.2E+02	1.00	2.4E-03	6.6E-03	2.0E-01	1E-02	3E-02	Kidney	3E-02	8E-02
		Cadmium	Kidney	3.9E+00	1.00	1.8E-05	5.0E-05	1.0E-03	2E-02	5E-02			
		Aluminum	Nervous	1.2E+04	1.00	5.4E-02	1.5E-01	1.0E+00	5E-02	1E-01	Nervous	3E-01	8E-01
		Manganese	Nervous	1.3E+03	1.00	5.9E-03	1.6E-02	2.4E-02	2E-01	7E-01			
		Chromium	--	2.4E+01	1.00	1.1E-04	3.1E-04	3.0E-03	4E-02	1E-01	Reproductive	2E-01	4E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.4E-05	1.00	1.1E-10	3.1E-10	7.0E-10	2E-01	4E-01			
		Antimony	Systemic	1.2E+00	1.00	5.4E-06	1.5E-05	4.0E-04	1E-02	4E-02	Systemic	1E-02	4E-02
		Cobalt	Thyroid	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02

Upland	51	Arsenic	Dermal	2.2E+00	0.60	6.2E-06	1.7E-05	3.0E-04	2E-02	6E-02	Dermal	5E-02	1E-01
		Thallium	Dermal	5.2E-02	1.00	2.4E-07	6.6E-07	1.0E-05	2E-02	7E-02			
		Vanadium	Dermal	9.2E+00	1.00	4.3E-05	1.2E-04	5.0E-03	9E-03	2E-02			
		Iron	Gastrointestinal	5.2E+03	1.00	2.4E-02	6.6E-02	7.0E-01	3E-02	9E-02	Gastrointestinal	3E-02	9E-02
		Mercury	Immune	1.6E-01	1.00	7.5E-07	2.0E-06	3.0E-04	2E-03	7E-03	Immune	2E-03	7E-03
		Barium	Kidney	1.1E+02	1.00	5.0E-04	1.4E-03	2.0E-01	3E-03	7E-03	Kidney	5E-03	1E-02
		Cadmium	Kidney	5.2E-01	1.00	2.4E-06	6.6E-06	1.0E-03	2E-03	7E-03			
		Aluminum	Nervous	3.2E+03	1.00	1.5E-02	4.1E-02	1.0E+00	2E-02	4E-02	Nervous	6E-02	2E-01
		Manganese	Nervous	2.2E+02	1.00	1.0E-03	2.8E-03	2.4E-02	4E-02	1E-01			
		Chromium	--	9.0E+00	1.00	4.2E-05	1.2E-04	3.0E-03	1E-02	4E-02	Reproductive	2E-02	6E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.1E-06	1.00	1.5E-11	4.0E-11	7.0E-10	2E-02	6E-02			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	2.0E+00	1.00	9.4E-06	2.6E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02
Upland	52	Arsenic	Dermal	1.8E+00	0.60	5.0E-06	1.4E-05	3.0E-04	2E-02	5E-02	Dermal	5E-02	1E-01
		Thallium	Dermal	6.6E-02	1.00	3.1E-07	8.4E-07	1.0E-05	3E-02	8E-02			
		Vanadium	Dermal	7.7E+00	1.00	3.6E-05	9.9E-05	5.0E-03	7E-03	2E-02			
		Iron	Gastrointestinal	6.8E+03	1.00	3.2E-02	8.7E-02	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	5.5E-02	1.00	2.6E-07	7.0E-07	3.0E-04	9E-04	2E-03	Immune	9E-04	2E-03
		Barium	Kidney	9.6E+01	1.00	4.5E-04	1.2E-03	2.0E-01	2E-03	6E-03	Kidney	3E-03	8E-03
		Cadmium	Kidney	1.6E-01	1.00	7.4E-07	2.0E-06	1.0E-03	7E-04	2E-03			
		Aluminum	Nervous	4.9E+03	1.00	2.3E-02	6.3E-02	1.0E+00	2E-02	6E-02	Nervous	5E-02	1E-01
		Manganese	Nervous	1.3E+02	1.00	6.2E-04	1.7E-03	2.4E-02	3E-02	7E-02			
		Chromium	--	6.8E+00	1.00	3.2E-05	8.7E-05	3.0E-03	1E-02	3E-02	Reproductive	1E-02	4E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.2E-06	1.00	1.0E-11	2.8E-11	7.0E-10	1E-02	4E-02			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	2.7E+00	1.00	1.2E-05	3.4E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	53	Arsenic	Dermal	2.6E+00	0.60	7.3E-06	2.0E-05	3.0E-04	2E-02	7E-02	Dermal	1E-01	3E-01
		Thallium	Dermal	1.5E-01	1.00	7.0E-07	1.9E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	1.4E+01	1.00	6.5E-05	1.8E-04	5.0E-03	1E-02	4E-02			
		Iron	Gastrointestinal	1.2E+04	1.00	5.6E-02	1.5E-01	7.0E-01	8E-02	2E-01	Gastrointestinal	8E-02	2E-01
		Mercury	Immune	4.3E+00	1.00	2.0E-05	5.5E-05	3.0E-04	7E-02	2E-01	Immune	7E-02	2E-01
		Barium	Kidney	5.7E+02	1.00	2.7E-03	7.3E-03	2.0E-01	1E-02	4E-02	Kidney	2E-02	5E-02
		Cadmium	Kidney	1.2E+00	1.00	5.6E-06	1.5E-05	1.0E-03	6E-03	2E-02			
		Aluminum	Nervous	1.2E+04	1.00	5.7E-02	1.5E-01	1.0E+00	6E-02	2E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	4.4E+02	1.00	2.0E-03	5.6E-03	2.4E-02	9E-02	2E-01			
		Chromium	--	2.2E+01	1.00	1.0E-04	2.7E-04	3.0E-03	3E-02	9E-02	Reproductive	2E-01	4E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.3E-05	1.00	1.1E-10	2.9E-10	7.0E-10	2E-01	4E-01			
		Antimony	Systemic	4.6E-01	1.00	2.2E-06	5.9E-06	4.0E-04	5E-03	1E-02	Systemic	5E-03	1E-02
		Cobalt	Thyroid	3.8E+00	1.00	1.8E-05	4.9E-05	3.0E-04	6E-02	2E-01	Thyroid	6E-02	2E-01
Upland	54	Arsenic	Dermal	1.1E+01	0.60	3.0E-05	8.2E-05	3.0E-04	1E-01	3E-01	Dermal	2E-01	6E-01
		Thallium	Dermal	1.9E-01	1.00	8.9E-07	2.4E-06	1.0E-05	9E-02	2E-01			
		Vanadium	Dermal	1.4E+01	1.00	6.5E-05	1.8E-04	5.0E-03	1E-02	4E-02			
		Iron	Gastrointestinal	3.7E+03	1.00	1.7E-02	4.7E-02	7.0E-01	2E-02	7E-02	Gastrointestinal	2E-02	7E-02
		Mercury	Immune	7.2E-01	1.00	3.4E-06	9.2E-06	3.0E-04	1E-02	3E-02	Immune	1E-02	3E-02
		Barium	Kidney	7.1E+02	1.00	3.3E-03	9.0E-03	2.0E-01	2E-02	5E-02	Kidney	4E-02	1E-01
		Cadmium	Kidney	4.7E+00	1.00	2.2E-05	6.0E-05	1.0E-03	2E-02	6E-02			
		Aluminum	Nervous	1.1E+04	1.00	5.0E-02	1.4E-01	1.0E+00	5E-02	1E-01	Nervous	4E-01	1E+00
		Manganese	Nervous	2.0E+03	1.00	9.3E-03	2.5E-02	2.4E-02	4E-01	1E+00			
		Chromium	--	2.4E+01	1.00	1.1E-04	3.0E-04	3.0E-03	4E-02	1E-01	Reproductive	1E-01	3E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.4E-05	1.00	6.8E-11	1.8E-10	7.0E-10	1E-01	3E-01			
		Antimony	Systemic	1.9E+00	1.00	8.9E-06	2.4E-05	4.0E-04	2E-02	6E-02	Systemic	2E-02	6E-02
		Cobalt	Thyroid	2.3E+00	1.00	1.1E-05	2.9E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	55	Arsenic	Dermal	1.4E+01	0.60	3.8E-05	1.0E-04	3.0E-04	1E-01	3E-01	Dermal	3E-01	8E-01
		Thallium	Dermal	2.7E-01	1.00	1.3E-06	3.5E-06	1.0E-05	1E-01	3E-01			
		Vanadium	Dermal	4.9E+01	1.00	2.3E-04	6.3E-04	5.0E-03	5E-02	1E-01			
		Iron	Gastrointestinal	2.7E+03	1.00	1.3E-02	3.5E-02	7.0E-01	2E-02	5E-02	Gastrointestinal	2E-02	5E-02
		Mercury	Immune	1.1E+00	1.00	5.1E-06	1.4E-05	3.0E-04	2E-02	5E-02	Immune	2E-02	5E-02
		Barium	Kidney	1.1E+03	1.00	5.2E-03	1.4E-02	2.0E-01	3E-02	7E-02	Kidney	5E-02	1E-01
		Cadmium	Kidney	5.6E+00	1.00	2.6E-05	7.2E-05	1.0E-03	3E-02	7E-02			
		Aluminum	Nervous	1.5E+04	1.00	7.2E-02	2.0E-01	1.0E+00	7E-02	2E-01	Nervous	6E-01	2E+00
		Manganese	Nervous	2.7E+03	1.00	1.3E-02	3.5E-02	2.4E-02	5E-01	1E+00			
		Chromium	--	4.2E+01	1.00	1.9E-04	5.3E-04	3.0E-03	6E-02	2E-01	Reproductive	4E-01	1E+00
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	5.5E-05	1.00	2.6E-10	7.1E-10	7.0E-10	4E-01	1E+00			
		Antimony	Systemic	1.2E+00	1.00	5.6E-06	1.5E-05	4.0E-04	1E-02	4E-02	Systemic	1E-02	4E-02
		Cobalt	Thyroid	1.6E+00	1.00	7.5E-06	2.0E-05	3.0E-04	2E-02	7E-02	Thyroid	2E-02	7E-02

Upland	56	Arsenic	Dermal	1.2E+01	0.60	3.4E-05	9.4E-05	3.0E-04	1E-01	3E-01	Dermal	3E-01	9E-01
		Thallium	Dermal	3.5E-01	1.00	1.6E-06	4.5E-06	1.0E-05	2E-01	4E-01			
		Vanadium	Dermal	5.8E+01	1.00	2.7E-04	7.4E-04	5.0E-03	5E-02	1E-01			
		Iron	Gastrointestinal	5.2E+03	1.00	2.4E-02	6.7E-02	7.0E-01	3E-02	1E-01	Gastrointestinal	3E-02	1E-01
		Mercury	Immune	1.3E+00	1.00	6.0E-06	1.6E-05	3.0E-04	2E-02	5E-02	Immune	2E-02	5E-02
		Barium	Kidney	7.8E+02	1.00	3.6E-03	9.9E-03	2.0E-01	2E-02	5E-02	Kidney	5E-02	1E-01
		Cadmium	Kidney	6.7E+00	1.00	3.1E-05	8.5E-05	1.0E-03	3E-02	9E-02			
		Aluminum	Nervous	1.6E+04	1.00	7.5E-02	2.0E-01	1.0E+00	7E-02	2E-01	Nervous	4E-01	1E+00
		Manganese	Nervous	1.8E+03	1.00	8.6E-03	2.3E-02	2.4E-02	4E-01	1E+00			
		Chromium	--	4.9E+01	1.00	2.3E-04	6.2E-04	3.0E-03	8E-02	2E-01	Reproductive	4E-01	1E+00
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	5.9E-05	1.00	2.7E-10	7.5E-10	7.0E-10	4E-01	1E+00			
		Antimony	Systemic	1.7E+00	1.00	8.0E-06	2.2E-05	4.0E-04	2E-02	5E-02	Systemic	2E-02	5E-02
		Cobalt	Thyroid	2.4E+00	1.00	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	58	Arsenic	Dermal	1.2E+01	0.60	3.3E-05	9.1E-05	3.0E-04	1E-01	3E-01	Dermal	2E-01	7E-01
		Thallium	Dermal	2.0E-01	1.00	9.4E-07	2.6E-06	1.0E-05	9E-02	3E-01			
		Vanadium	Dermal	4.7E+01	1.00	2.2E-04	6.1E-04	5.0E-03	4E-02	1E-01			
		Iron	Gastrointestinal	8.0E+03	1.00	3.8E-02	1.0E-01	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	1.2E+00	1.00	5.6E-06	1.5E-05	3.0E-04	2E-02	5E-02	Immune	2E-02	5E-02
		Barium	Kidney	8.0E+02	1.00	3.7E-03	1.0E-02	2.0E-01	2E-02	5E-02	Kidney	4E-02	1E-01
		Cadmium	Kidney	4.8E+00	1.00	2.2E-05	6.1E-05	1.0E-03	2E-02	6E-02			
		Aluminum	Nervous	1.6E+04	1.00	7.5E-02	2.1E-01	1.0E+00	8E-02	2E-01	Nervous	4E-01	1E+00
		Manganese	Nervous	1.5E+03	1.00	7.2E-03	2.0E-02	2.4E-02	3E-01	8E-01			
		Chromium	--	4.0E+01	1.00	1.9E-04	5.1E-04	3.0E-03	6E-02	2E-01	Reproductive	6E-01	2E+00
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	8.3E-05	1.00	3.9E-10	1.1E-09	7.0E-10	6E-01	2E+00			
		Antimony	Systemic	2.3E+00	1.00	1.1E-05	2.9E-05	4.0E-04	3E-02	7E-02	Systemic	3E-02	7E-02
		Cobalt	Thyroid	2.6E+00	1.00	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	59	Arsenic	Dermal	6.2E+00	0.60	1.7E-05	4.8E-05	3.0E-04	6E-02	2E-01	Dermal	1E-01	4E-01
		Thallium	Dermal	1.6E-01	1.00	7.5E-07	2.1E-06	1.0E-05	8E-02	2E-01			
		Vanadium	Dermal	1.5E+01	1.00	6.9E-05	1.9E-04	5.0E-03	1E-02	4E-02			
		Iron	Gastrointestinal	5.1E+03	1.00	2.4E-02	6.5E-02	7.0E-01	3E-02	9E-02	Gastrointestinal	3E-02	9E-02
		Mercury	Immune	1.0E+00	1.00	4.7E-06	1.3E-05	3.0E-04	2E-02	4E-02	Immune	2E-02	4E-02
		Barium	Kidney	7.4E+02	1.00	3.5E-03	9.5E-03	2.0E-01	2E-02	5E-02	Kidney	3E-02	9E-02
		Cadmium	Kidney	3.3E+00	1.00	1.6E-05	4.3E-05	1.0E-03	2E-02	4E-02			
		Aluminum	Nervous	8.6E+03	1.00	4.0E-02	1.1E-01	1.0E+00	4E-02	1E-01	Nervous	4E-01	1E+00
		Manganese	Nervous	1.6E+03	1.00	7.6E-03	2.1E-02	2.4E-02	3E-01	9E-01			
		Chromium	--	2.1E+01	1.00	9.9E-05	2.7E-04	3.0E-03	3E-02	9E-02	Reproductive	1E-01	3E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.6E-05	1.00	7.4E-11	2.0E-10	7.0E-10	1E-01	3E-01			
		Antimony	Systemic	8.2E-01	1.00	3.8E-06	1.0E-05	4.0E-04	1E-02	3E-02	Systemic	1E-02	3E-02
		Cobalt	Thyroid	2.1E+00	1.00	1.0E-05	2.7E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02
Upland	60	Arsenic	Dermal	4.6E+00	0.60	1.3E-05	3.5E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	1.1E-01	1.00	5.1E-07	1.4E-06	1.0E-05	5E-02	1E-01			
		Vanadium	Dermal	1.4E+01	1.00	6.5E-05	1.8E-04	5.0E-03	1E-02	4E-02			
		Iron	Gastrointestinal	8.4E+03	1.00	3.9E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	1.9E-01	1.00	8.9E-07	2.4E-06	3.0E-04	3E-03	8E-03	Immune	3E-03	8E-03
		Barium	Kidney	2.8E+02	1.00	1.3E-03	3.6E-03	2.0E-01	7E-03	2E-02	Kidney	1E-02	4E-02
		Cadmium	Kidney	1.7E+00	1.00	7.9E-06	2.2E-05	1.0E-03	8E-03	2E-02			
		Aluminum	Nervous	8.0E+03	1.00	3.8E-02	1.0E-01	1.0E+00	4E-02	1E-01	Nervous	2E-01	6E-01
		Manganese	Nervous	8.5E+02	1.00	4.0E-03	1.1E-02	2.4E-02	2E-01	5E-01			
		Chromium	--	1.5E+01	1.00	7.0E-05	1.9E-04	3.0E-03	2E-02	6E-02	Reproductive	6E-02	2E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	8.7E-06	1.00	4.1E-11	1.1E-10	7.0E-10	6E-02	2E-01			
		Antimony	Systemic	3.1E-01	1.00	1.4E-06	4.0E-06	4.0E-04	4E-03	1E-02	Systemic	4E-03	1E-02
		Cobalt	Thyroid	3.4E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	61	Arsenic	Dermal	3.7E+00	0.60	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	Dermal	1E-01	3E-01
		Thallium	Dermal	1.1E-01	1.00	5.1E-07	1.4E-06	1.0E-05	5E-02	1E-01			
		Vanadium	Dermal	1.3E+01	1.00	6.3E-05	1.7E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	9.9E+03	1.00	4.6E-02	1.3E-01	7.0E-01	7E-02	2E-01	Gastrointestinal	7E-02	2E-01
		Mercury	Immune	1.1E-01	1.00	5.1E-07	1.4E-06	3.0E-04	2E-03	5E-03	Immune	2E-03	5E-03
		Barium	Kidney	2.0E+02	1.00	9.1E-04	2.5E-03	2.0E-01	5E-03	1E-02	Kidney	1E-02	3E-02
		Cadmium	Kidney	1.1E+00	1.00	5.1E-06	1.4E-05	1.0E-03	5E-03	1E-02			
		Aluminum	Nervous	8.2E+03	1.00	3.8E-02	1.0E-01	1.0E+00	4E-02	1E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	4.8E+02	1.00	2.2E-03	6.1E-03	2.4E-02	9E-02	3E-01			
		Chromium	--	1.2E+01	1.00	5.8E-05	1.6E-04	3.0E-03	2E-02	5E-02	Reproductive	4E-02	1E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	5.8E-06	1.00	2.7E-11	7.4E-11	7.0E-10	4E-02	1E-01			
		Antimony	Systemic	2.0E-01	1.00	9.4E-07	2.6E-06	4.0E-04	2E-03	6E-03	Systemic	2E-03	6E-03
		Cobalt	Thyroid	3.8E+00	1.00	1.8E-05	4.9E-05	3.0E-04	6E-02	2E-01	Thyroid	6E-02	2E-01

Upland	62	Arsenic	Dermal	2.6E+00	0.60	7.3E-06	2.0E-05	3.0E-04	2E-02	7E-02	Dermal	9E-02	2E-01
		Thallium	Dermal	1.2E-01	1.00	5.6E-07	1.5E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	1.1E+01	1.00	5.3E-05	1.4E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	1.1E+04	1.00	5.0E-02	1.4E-01	7.0E-01	7E-02	2E-01	Gastrointestinal	7E-02	2E-01
		Mercury	Immune	9.6E-02	1.00	4.5E-07	1.2E-06	3.0E-04	1E-03	4E-03	Immune	1E-03	4E-03
		Barium	Kidney	1.6E+02	1.00	7.6E-04	2.1E-03	2.0E-01	4E-03	1E-02	Kidney	6E-03	2E-02
		Cadmium	Kidney	3.7E-01	1.00	1.7E-06	4.7E-06	1.0E-03	2E-03	5E-03			
		Aluminum	Nervous	7.7E+03	1.00	3.6E-02	9.9E-02	1.0E+00	4E-02	1E-01	Nervous	9E-02	2E-01
		Manganese	Nervous	2.7E+02	1.00	1.3E-03	3.5E-03	2.4E-02	5E-02	1E-01			
		Chromium	--	1.1E+01	1.00	5.0E-05	1.4E-04	3.0E-03	2E-02	5E-02	Reproductive*	2E-02	7E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.1E-06	1.00	5.2E-12	1.4E-11	7.0E-10	7E-03	2E-02			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	4.0E+00	1.00	1.9E-05	5.1E-05	3.0E-04	6E-02	2E-01	Thyroid	6E-02	2E-01
Upland	64	Arsenic	Dermal	3.0E+00	0.60	8.4E-06	2.3E-05	3.0E-04	3E-02	8E-02	Dermal	9E-02	2E-01
		Thallium	Dermal	1.0E-01	1.00	4.7E-07	1.3E-06	1.0E-05	5E-02	1E-01			
		Vanadium	Dermal	1.2E+01	1.00	5.4E-05	1.5E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	9.9E+03	1.00	4.6E-02	1.3E-01	7.0E-01	7E-02	2E-01	Gastrointestinal	7E-02	2E-01
		Mercury	Immune	3.6E+00	1.00	1.7E-05	4.6E-05	3.0E-04	6E-02	2E-01	Immune	6E-02	2E-01
		Barium	Kidney	2.7E+02	1.00	1.2E-03	3.4E-03	2.0E-01	6E-03	2E-02	Kidney	1E-02	3E-02
		Cadmium	Kidney	7.9E-01	1.00	3.7E-06	1.0E-05	1.0E-03	4E-03	1E-02			
		Aluminum	Nervous	7.6E+03	1.00	3.6E-02	9.7E-02	1.0E+00	4E-02	1E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	5.2E+02	1.00	2.4E-03	6.7E-03	2.4E-02	1E-01	3E-01			
		Chromium	--	1.2E+01	1.00	5.5E-05	1.5E-04	3.0E-03	2E-02	5E-02	Reproductive	1E-01	3E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.6E-05	1.00	7.7E-11	2.1E-10	7.0E-10	1E-01	3E-01			
		Antimony	Systemic	1.1E-01	1.00	4.9E-07	1.3E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	3.4E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	65[a]	Arsenic	Dermal	4.3E+00	0.60	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	1.2E-01	1.00	5.6E-07	1.5E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	1.3E+01	1.00	6.2E-05	1.7E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	9.6E+03	1.00	4.5E-02	1.2E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	3.0E-01	1.00	1.4E-06	3.8E-06	3.0E-04	5E-03	1E-02	Immune	5E-03	1E-02
		Barium	Kidney	4.5E+02	1.00	2.1E-03	5.8E-03	2.0E-01	1E-02	3E-02	Kidney	2E-02	6E-02
		Cadmium	Kidney	2.5E+00	1.00	1.2E-05	3.2E-05	1.0E-03	1E-02	3E-02			
		Aluminum	Nervous	8.7E+03	1.00	4.1E-02	1.1E-01	1.0E+00	4E-02	1E-01	Nervous	3E-01	8E-01
		Manganese	Nervous	1.4E+03	1.00	6.3E-03	1.7E-02	2.4E-02	3E-01	7E-01			
		Chromium	--	2.7E+01	1.00	1.3E-04	3.4E-04	3.0E-03	4E-02	1E-01	Reproductive	9E-02	2E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.3E-05	1.00	6.1E-11	1.7E-10	7.0E-10	9E-02	2E-01			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	3.1E+00	1.00	1.4E-05	4.0E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	66	Arsenic	Dermal	3.2E+00	0.60	9.0E-06	2.5E-05	3.0E-04	3E-02	8E-02	Dermal	7E-02	2E-01
		Thallium	Dermal	7.1E-02	1.00	3.3E-07	9.0E-07	1.0E-05	3E-02	9E-02			
		Vanadium	Dermal	7.5E+00	1.00	3.5E-05	9.6E-05	5.0E-03	7E-03	2E-02			
		Iron	Gastrointestinal	6.3E+03	1.00	3.0E-02	8.1E-02	7.0E-01	4E-02	1E-01	Gastrointestinal	4E-02	1E-01
		Mercury	Immune	6.6E-02	1.00	3.1E-07	8.5E-07	3.0E-04	1E-03	3E-03	Immune	1E-03	3E-03
		Barium	Kidney	2.6E+02	1.00	1.2E-03	3.3E-03	2.0E-01	6E-03	2E-02	Kidney	1E-02	3E-02
		Cadmium	Kidney	9.0E-01	1.00	4.2E-06	1.1E-05	1.0E-03	4E-03	1E-02			
		Aluminum	Nervous	4.6E+03	1.00	2.2E-02	5.9E-02	1.0E+00	2E-02	6E-02	Nervous	1E-01	3E-01
		Manganese	Nervous	5.1E+02	1.00	2.4E-03	6.5E-03	2.4E-02	1E-01	3E-01			
		Chromium	--	1.2E+01	1.00	5.6E-05	1.5E-04	3.0E-03	2E-02	5E-02	Reproductive*	3E-02	8E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.5E-06	1.00	7.2E-12	2.0E-11	7.0E-10	1E-02	3E-02			
		Antimony	Systemic	2.2E-01	1.00	1.0E-06	2.8E-06	4.0E-04	3E-03	7E-03	Systemic	3E-03	7E-03
		Cobalt	Thyroid	2.4E+00	1.00	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	67	Arsenic	Dermal	1.5E+01	0.60	4.2E-05	1.2E-04	3.0E-04	1E-01	4E-01	Dermal	3E-01	9E-01
		Thallium	Dermal	3.8E-01	1.00	1.8E-06	4.9E-06	1.0E-05	2E-01	5E-01			
		Vanadium	Dermal	5.6E+00	1.00	2.6E-05	7.2E-05	5.0E-03	5E-03	1E-02			
		Iron	Gastrointestinal	3.5E+03	1.00	1.6E-02	4.5E-02	7.0E-01	2E-02	6E-02	Gastrointestinal	2E-02	6E-02
		Mercury	Immune	1.0E-02	1.00	4.7E-08	1.3E-07	3.0E-04	2E-04	4E-04	Immune	2E-04	4E-04
		Barium	Kidney	6.1E+02	1.00	2.9E-03	7.8E-03	2.0E-01	1E-02	4E-02	Kidney	4E-02	1E-01
		Cadmium	Kidney	4.8E+00	1.00	2.2E-05	6.1E-05	1.0E-03	2E-02	6E-02			
		Aluminum	Nervous	6.0E+03	1.00	2.8E-02	7.7E-02	1.0E+00	3E-02	8E-02	Nervous	4E-01	1E+00
		Manganese	Nervous	2.0E+03	1.00	9.5E-03	2.6E-02	2.4E-02	4E-01	1E+00			
		Chromium	--	1.9E+01	1.00	8.7E-05	2.4E-04	3.0E-03	3E-02	8E-02	Reproductive	6E-01	2E+00
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	8.3E-05	1.00	3.9E-10	1.1E-09	7.0E-10	6E-01	2E+00			
		Antimony	Systemic	1.6E+00	1.00	7.5E-06	2.0E-05	4.0E-04	2E-02	5E-02	Systemic	2E-02	5E-02
		Cobalt	Thyroid	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02

Upland	68	Arsenic	Dermal	1.5E+01	0.60	4.2E-05	1.2E-04	3.0E-04	1E-01	4E-01	Dermal	3E-01	9E-01
		Thallium	Dermal	3.8E-01	1.00	1.8E-06	4.9E-06	1.0E-05	2E-01	5E-01			
		Vanadium	Dermal	5.6E+00	1.00	2.6E-05	7.2E-05	5.0E-03	5E-03	1E-02			
		Iron	Gastrointestinal	3.5E+03	1.00	1.6E-02	4.5E-02	7.0E-01	2E-02	6E-02	Gastrointestinal	2E-02	6E-02
		Mercury	Immune	1.0E-02	1.00	4.7E-08	1.3E-07	3.0E-04	2E-04	4E-04	Immune	2E-04	4E-04
		Barium	Kidney	6.1E+02	1.00	2.9E-03	7.8E-03	2.0E-01	1E-02	4E-02	Kidney	4E-02	1E-01
		Cadmium	Kidney	4.8E+00	1.00	2.2E-05	6.1E-05	1.0E-03	2E-02	6E-02			
		Aluminum	Nervous	6.0E+03	1.00	2.8E-02	7.7E-02	1.0E+00	3E-02	8E-02	Nervous	4E-01	1E+00
		Manganese	Nervous	2.0E+03	1.00	9.5E-03	2.6E-02	2.4E-02	4E-01	1E+00			
		Chromium	--	1.9E+01	1.00	8.7E-05	2.4E-04	3.0E-03	3E-02	8E-02	Reproductive	6E-01	2E+00
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	8.3E-05	1.00	3.9E-10	1.1E-09	7.0E-10	6E-01	2E+00			
		Antimony	Systemic	1.6E+00	1.00	7.5E-06	2.0E-05	4.0E-04	2E-02	5E-02	Systemic	2E-02	5E-02
		Cobalt	Thyroid	2.2E+00	1.00	1.0E-05	2.8E-05	3.0E-04	3E-02	9E-02	Thyroid	3E-02	9E-02
Upland	70	Arsenic	Dermal	6.0E+00	0.60	1.7E-05	4.6E-05	3.0E-04	6E-02	2E-01	Dermal	1E-01	4E-01
		Thallium	Dermal	1.4E-01	1.00	6.5E-07	1.8E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	1.2E+01	1.00	5.4E-05	1.5E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	3.8E+03	1.00	1.8E-02	4.8E-02	7.0E-01	3E-02	7E-02	Gastrointestinal	3E-02	7E-02
		Mercury	Immune	1.1E-01	1.00	5.1E-07	1.4E-06	3.0E-04	2E-03	5E-03	Immune	2E-03	5E-03
		Barium	Kidney	4.5E+02	1.00	2.1E-03	5.8E-03	2.0E-01	1E-02	3E-02	Kidney	2E-02	5E-02
		Cadmium	Kidney	1.8E+00	1.00	8.4E-06	2.3E-05	1.0E-03	8E-03	2E-02			
		Aluminum	Nervous	3.4E+03	1.00	1.6E-02	4.3E-02	1.0E+00	2E-02	4E-02	Nervous	2E-01	6E-01
		Manganese	Nervous	1.0E+03	1.00	4.7E-03	1.3E-02	2.4E-02	2E-01	5E-01			
		Chromium	--	1.4E+01	1.00	6.6E-05	1.8E-04	3.0E-03	2E-02	6E-02	Reproductive*	5E-02	1E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	4.1E-06	1.00	1.9E-11	5.2E-11	7.0E-10	3E-02	7E-02			
		Antimony	Systemic	4.7E-01	1.00	2.2E-06	6.0E-06	4.0E-04	5E-03	2E-02	Systemic	5E-03	2E-02
		Cobalt	Thyroid	1.7E+00	1.00	7.9E-06	2.2E-05	3.0E-04	3E-02	7E-02	Thyroid	3E-02	7E-02
Upland	71	Arsenic	Dermal	5.8E+00	0.60	1.6E-05	4.4E-05	3.0E-04	5E-02	1E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	8.3E-02	1.00	3.9E-07	1.1E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	3.5E+00	1.00	1.6E-05	4.5E-05	5.0E-03	3E-03	9E-03			
		Iron	Gastrointestinal	3.0E+03	1.00	1.4E-02	3.8E-02	7.0E-01	2E-02	5E-02	Gastrointestinal	2E-02	5E-02
		Mercury	Immune	5.0E-03	1.00	2.3E-08	6.4E-08	3.0E-04	8E-05	2E-04	Immune	8E-05	2E-04
		Barium	Kidney	5.0E+02	1.00	2.3E-03	6.4E-03	2.0E-01	1E-02	3E-02	Kidney	2E-02	5E-02
		Cadmium	Kidney	1.3E+00	1.00	6.1E-06	1.7E-05	1.0E-03	6E-03	2E-02			
		Aluminum	Nervous	1.1E+03	1.00	5.1E-03	1.4E-02	1.0E+00	5E-03	1E-02	Nervous	1E-01	4E-01
		Manganese	Nervous	7.2E+02	1.00	3.3E-03	9.2E-03	2.4E-02	1E-01	4E-01			
		Chromium	--	3.4E+01	1.00	1.6E-04	4.4E-04	3.0E-03	5E-02	1E-01	Reproductive	2E-02	4E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.4E-06	1.00	1.1E-11	3.1E-11	7.0E-10	2E-02	4E-02			
		Antimony	Systemic	7.5E-02	1.00	3.5E-07	9.6E-07	4.0E-04	9E-04	2E-03	Systemic	9E-04	2E-03
		Cobalt	Thyroid	2.5E+00	1.00	1.2E-05	3.2E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Upland	72	Arsenic	Dermal	7.0E+00	0.60	2.0E-05	5.4E-05	3.0E-04	7E-02	2E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	6.6E-02	1.00	3.1E-07	8.4E-07	1.0E-05	3E-02	8E-02			
		Vanadium	Dermal	4.7E+00	1.00	2.2E-05	6.0E-05	5.0E-03	4E-03	1E-02			
		Iron	Gastrointestinal	1.3E+03	1.00	5.9E-03	1.6E-02	7.0E-01	8E-03	2E-02	Gastrointestinal	8E-03	2E-02
		Mercury	Immune	4.9E-03	1.00	2.3E-08	6.2E-08	3.0E-04	8E-05	2E-04	Immune	8E-05	2E-04
		Barium	Kidney	5.4E+02	1.00	2.5E-03	6.9E-03	2.0E-01	1E-02	3E-02	Kidney	2E-02	6E-02
		Cadmium	Kidney	2.2E+00	1.00	1.0E-05	2.8E-05	1.0E-03	1E-02	3E-02			
		Aluminum	Nervous	2.3E+03	1.00	1.1E-02	2.9E-02	1.0E+00	1E-02	3E-02	Nervous	4E-01	1E+00
		Manganese	Nervous	2.3E+03	1.00	1.1E-02	2.9E-02	2.4E-02	4E-01	1E+00			
		Chromium	--	1.9E+01	1.00	8.9E-05	2.4E-04	3.0E-03	3E-02	8E-02	Reproductive	2E-01	4E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.3E-05	1.00	1.1E-10	3.0E-10	7.0E-10	2E-01	4E-01			
		Antimony	Systemic	2.4E-01	1.00	1.1E-06	3.1E-06	4.0E-04	3E-03	8E-03	Systemic	3E-03	8E-03
		Cobalt	Thyroid	1.3E+00	1.00	6.1E-06	1.7E-05	3.0E-04	2E-02	6E-02	Thyroid	2E-02	6E-02
Upland	74	Arsenic	Dermal	4.1E+01	0.60	1.1E-04	3.1E-04	3.0E-04	4E-01	1E+00	Dermal	8E-01	2E+00
		Thallium	Dermal	7.7E-01	1.00	3.6E-06	9.8E-06	1.0E-05	4E-01	1E+00			
		Vanadium	Dermal	2.2E+01	1.00	1.0E-04	2.9E-04	5.0E-03	2E-02	6E-02			
		Iron	Gastrointestinal	1.3E+04	1.00	6.3E-02	1.7E-01	7.0E-01	9E-02	2E-01	Gastrointestinal	9E-02	2E-01
		Mercury	Immune	2.2E-01	1.00	1.0E-06	2.9E-06	3.0E-04	3E-03	1E-02	Immune	3E-03	1E-02
		Barium	Kidney	8.3E+02	1.00	3.9E-03	1.1E-02	2.0E-01	2E-02	5E-02	Kidney	5E-02	1E-01
		Cadmium	Kidney	6.4E+00	1.00	3.0E-05	8.2E-05	1.0E-03	3E-02	8E-02			
		Aluminum	Nervous	1.8E+04	1.00	8.5E-02	2.3E-01	1.0E+00	9E-02	2E-01	Nervous	5E-01	1E+00
		Manganese	Nervous	2.3E+03	1.00	1.1E-02	3.0E-02	2.4E-02	5E-01	1E+00			
		Chromium	--	3.0E+01	1.00	1.4E-04	3.8E-04	3.0E-03	5E-02	1E-01	Reproductive	2E+00	6E+00
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.1E-04	1.00	1.4E-09	3.9E-09	7.0E-10	2E+00	6E+00			
		Antimony	Systemic	2.4E+00	1.00	1.1E-05	3.0E-05	4.0E-04	3E-02	8E-02	Systemic	3E-02	8E-02
		Cobalt	Thyroid	7.3E+00	1.00	3.4E-05	9.3E-05	3.0E-04	1E-01	3E-01	Thyroid	1E-01	3E-01

Upland	75	Arsenic	Dermal	4.3E+00	0.60	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	4E-01
		Thallium	Dermal	1.8E-01	1.00	8.4E-07	2.3E-06	1.0E-05	8E-02	2E-01			
		Vanadium	Dermal	1.7E+01	1.00	8.0E-05	2.2E-04	5.0E-03	2E-02	4E-02			
		Iron	Gastrointestinal	1.6E+04	1.00	7.3E-02	2.0E-01	7.0E-01	1E-01	3E-01	Gastrointestinal	1E-01	3E-01
		Mercury	Immune	1.4E-02	1.00	6.5E-08	1.8E-07	3.0E-04	2E-04	6E-04	Immune	2E-04	6E-04
		Barium	Kidney	2.1E+02	1.00	9.6E-04	2.6E-03	2.0E-01	5E-03	1E-02	Kidney	6E-03	2E-02
		Cadmium	Kidney	1.5E-01	1.00	7.0E-07	1.9E-06	1.0E-03	7E-04	2E-03			
		Aluminum	Nervous	1.2E+04	1.00	5.8E-02	1.6E-01	1.0E+00	6E-02	2E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	3.7E+02	1.00	1.7E-03	4.8E-03	2.4E-02	7E-02	2E-01			
		Chromium	--	1.3E+01	1.00	6.3E-05	1.7E-04	3.0E-03	2E-02	6E-02	Reproductive*	2E-02	6E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.4E-07	1.00	1.6E-12	4.4E-12	7.0E-10	2E-03	6E-03			
		Antimony	Systemic	9.5E-02	1.00	4.4E-07	1.2E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	6.4E+00	1.00	3.0E-05	8.2E-05	3.0E-04	1E-01	3E-01	Thyroid	1E-01	3E-01
Upland	76	Arsenic	Dermal	2.9E+00	0.60	8.0E-06	2.2E-05	3.0E-04	3E-02	7E-02	Dermal	8E-02	2E-01
		Thallium	Dermal	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	1.0E+01	1.00	4.9E-05	1.3E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	2.2E-02	1.00	1.0E-07	2.8E-07	3.0E-04	3E-04	9E-04	Immune	3E-04	9E-04
		Barium	Kidney	1.5E+02	1.00	6.9E-04	1.9E-03	2.0E-01	3E-03	9E-03	Kidney	4E-03	1E-02
		Cadmium	Kidney	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-03	6E-04	2E-03			
		Aluminum	Nervous	6.8E+03	1.00	3.2E-02	8.7E-02	1.0E+00	3E-02	9E-02	Nervous	7E-02	2E-01
		Manganese	Nervous	1.7E+02	1.00	8.2E-04	2.2E-03	2.4E-02	3E-02	9E-02			
		Chromium	--	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	Reproductive	1E-02	4E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.0E-06	1.00	9.5E-12	2.6E-11	7.0E-10	1E-02	4E-02			
		Antimony	Systemic	1.2E-01	1.00	5.6E-07	1.5E-06	4.0E-04	1E-03	4E-03	Systemic	1E-03	4E-03
		Cobalt	Thyroid	3.3E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	77	Arsenic	Dermal	2.9E+00	0.60	8.0E-06	2.2E-05	3.0E-04	3E-02	7E-02	Dermal	8E-02	2E-01
		Thallium	Dermal	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	1.0E+01	1.00	4.9E-05	1.3E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	2.2E-02	1.00	1.0E-07	2.8E-07	3.0E-04	3E-04	9E-04	Immune	3E-04	9E-04
		Barium	Kidney	1.5E+02	1.00	6.9E-04	1.9E-03	2.0E-01	3E-03	9E-03	Kidney	4E-03	1E-02
		Cadmium	Kidney	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-03	6E-04	2E-03			
		Aluminum	Nervous	6.8E+03	1.00	3.2E-02	8.7E-02	1.0E+00	3E-02	9E-02	Nervous	7E-02	2E-01
		Manganese	Nervous	1.7E+02	1.00	8.2E-04	2.2E-03	2.4E-02	3E-02	9E-02			
		Chromium	--	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	Reproductive	1E-02	4E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.0E-06	1.00	9.5E-12	2.6E-11	7.0E-10	1E-02	4E-02			
		Antimony	Systemic	1.2E-01	1.00	5.6E-07	1.5E-06	4.0E-04	1E-03	4E-03	Systemic	1E-03	4E-03
		Cobalt	Thyroid	3.3E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Upland	78	Arsenic	Dermal	4.3E+00	0.60	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	4E-01
		Thallium	Dermal	1.8E-01	1.00	8.4E-07	2.3E-06	1.0E-05	8E-02	2E-01			
		Vanadium	Dermal	1.7E+01	1.00	8.0E-05	2.2E-04	5.0E-03	2E-02	4E-02			
		Iron	Gastrointestinal	1.6E+04	1.00	7.3E-02	2.0E-01	7.0E-01	1E-01	3E-01	Gastrointestinal	1E-01	3E-01
		Mercury	Immune	1.4E-02	1.00	6.5E-08	1.8E-07	3.0E-04	2E-04	6E-04	Immune	2E-04	6E-04
		Barium	Kidney	2.1E+02	1.00	9.6E-04	2.6E-03	2.0E-01	5E-03	1E-02	Kidney	6E-03	2E-02
		Cadmium	Kidney	1.5E-01	1.00	7.0E-07	1.9E-06	1.0E-03	7E-04	2E-03			
		Aluminum	Nervous	1.2E+04	1.00	5.8E-02	1.6E-01	1.0E+00	6E-02	2E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	3.7E+02	1.00	1.7E-03	4.8E-03	2.4E-02	7E-02	2E-01			
		Chromium	--	1.3E+01	1.00	6.3E-05	1.7E-04	3.0E-03	2E-02	6E-02	Reproductive	2E-03	6E-03
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	3.4E-07	1.00	1.6E-12	4.4E-12	7.0E-10	2E-03	6E-03			
		Antimony	Systemic	9.5E-02	1.00	4.4E-07	1.2E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	6.4E+00	1.00	3.0E-05	8.2E-05	3.0E-04	1E-01	3E-01	Thyroid	1E-01	3E-01
Upland	79	Arsenic	Dermal	2.9E+00	0.60	8.0E-06	2.2E-05	3.0E-04	3E-02	7E-02	Dermal	8E-02	2E-01
		Thallium	Dermal	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	1.0E+01	1.00	4.9E-05	1.3E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	2.2E-02	1.00	1.0E-07	2.8E-07	3.0E-04	3E-04	9E-04	Immune	3E-04	9E-04
		Barium	Kidney	1.5E+02	1.00	6.9E-04	1.9E-03	2.0E-01	3E-03	9E-03	Kidney	4E-03	1E-02
		Cadmium	Kidney	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-03	6E-04	2E-03			
		Aluminum	Nervous	6.8E+03	1.00	3.2E-02	8.7E-02	1.0E+00	3E-02	9E-02	Nervous	7E-02	2E-01
		Manganese	Nervous	1.7E+02	1.00	8.2E-04	2.2E-03	2.4E-02	3E-02	9E-02			
		Chromium	--	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	Reproductive	1E-02	4E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.0E-06	1.00	9.5E-12	2.6E-11	7.0E-10	1E-02	4E-02			
		Antimony	Systemic	1.2E-01	1.00	5.6E-07	1.5E-06	4.0E-04	1E-03	4E-03	Systemic	1E-03	4E-03
		Cobalt	Thyroid	3.3E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01

Upland	80	Arsenic	Dermal	2.9E+00	0.60	8.0E-06	2.2E-05	3.0E-04	3E-02	7E-02	Dermal	8E-02	2E-01
		Thallium	Dermal	8.5E-02	1.00	4.0E-07	1.1E-06	1.0E-05	4E-02	1E-01			
		Vanadium	Dermal	1.0E+01	1.00	4.9E-05	1.3E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	8.8E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	2.2E-02	1.00	1.0E-07	2.8E-07	3.0E-04	3E-04	9E-04	Immune	3E-04	9E-04
		Barium	Kidney	1.5E+02	1.00	6.9E-04	1.9E-03	2.0E-01	3E-03	9E-03	Kidney	4E-03	1E-02
		Cadmium	Kidney	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-03	6E-04	2E-03			
		Aluminum	Nervous	6.8E+03	1.00	3.2E-02	8.7E-02	1.0E+00	3E-02	9E-02	Nervous	7E-02	2E-01
		Manganese	Nervous	1.7E+02	1.00	8.2E-04	2.2E-03	2.4E-02	3E-02	9E-02			
		Chromium	--	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	Reproductive	1E-02	4E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.0E-06	1.00	9.5E-12	2.6E-11	7.0E-10	1E-02	4E-02			
		Antimony	Systemic	1.2E-01	1.00	5.6E-07	1.5E-06	4.0E-04	1E-03	4E-03	Systemic	1E-03	4E-03
		Cobalt	Thyroid	3.3E+00	1.00	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Floodplain	81	Arsenic	Dermal	4.5E+00	0.60	1.3E-05	3.5E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	1.1E-01	1.00	5.1E-07	1.4E-06	1.0E-05	5E-02	1E-01			
		Vanadium	Dermal	1.3E+01	1.00	5.8E-05	1.6E-04	5.0E-03	1E-02	3E-02			
		Iron	Gastrointestinal	9.6E+03	1.00	4.5E-02	1.2E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	3.3E-02	1.00	1.5E-07	4.2E-07	3.0E-04	5E-04	1E-03	Immune	5E-04	1E-03
		Barium	Kidney	1.9E+02	1.00	8.8E-04	2.4E-03	2.0E-01	4E-03	1E-02	Kidney	6E-03	2E-02
		Cadmium	Kidney	3.2E-01	1.00	1.5E-06	4.1E-06	1.0E-03	1E-03	4E-03			
		Aluminum	Nervous	7.0E+03	1.00	3.3E-02	8.9E-02	1.0E+00	3E-02	9E-02	Nervous	9E-02	2E-01
		Manganese	Nervous	2.8E+02	1.00	1.3E-03	3.6E-03	2.4E-02	6E-02	2E-01			
		Chromium	--	8.4E+00	1.00	3.9E-05	1.1E-04	3.0E-03	1E-02	4E-02	Reproductive	4E-03	1E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	6.0E-07	1.00	2.8E-12	7.7E-12	7.0E-10	4E-03	1E-02			
		Antimony	Systemic	1.0E-01	1.00	4.7E-07	1.3E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	3.9E+00	1.00	1.8E-05	5.0E-05	3.0E-04	6E-02	2E-01	Thyroid	6E-02	2E-01
Floodplain	85[a]	Arsenic	Dermal	1.9E+00	0.60	5.3E-06	1.5E-05	3.0E-04	2E-02	5E-02	Dermal	4E-02	1E-01
		Thallium	Dermal	4.4E-02	1.00	2.1E-07	5.6E-07	1.0E-05	2E-02	6E-02			
		Vanadium	Dermal	5.1E+00	1.00	2.4E-05	6.5E-05	5.0E-03	5E-03	1E-02			
		Iron	Gastrointestinal	5.2E+03	1.00	2.4E-02	6.6E-02	7.0E-01	3E-02	9E-02	Gastrointestinal	3E-02	9E-02
		Mercury	Immune	4.4E-03	1.00	2.0E-08	5.6E-08	3.0E-04	7E-05	2E-04	Immune	7E-05	2E-04
		Barium	Kidney	2.9E+01	1.00	1.4E-04	3.7E-04	2.0E-01	7E-04	2E-03	Kidney	8E-04	2E-03
		Cadmium	Kidney	1.6E-02	1.00	7.5E-08	2.0E-07	1.0E-03	7E-05	2E-04			
		Aluminum	Nervous	2.9E+03	1.00	1.4E-02	3.8E-02	1.0E+00	1E-02	4E-02	Nervous	3E-02	7E-02
		Manganese	Nervous	6.4E+01	1.00	3.0E-04	8.2E-04	2.4E-02	1E-02	3E-02			
		Chromium	--	3.9E+00	1.00	1.8E-05	5.0E-05	3.0E-03	6E-03	2E-02	Reproductive	3E-03	7E-03
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	4.0E-07	1.00	1.9E-12	5.1E-12	7.0E-10	3E-03	7E-03			
		Antimony	Systemic	8.5E-02	1.00	4.0E-07	1.1E-06	4.0E-04	1E-03	3E-03	Systemic	1E-03	3E-03
		Cobalt	Thyroid	1.8E+00	1.00	8.4E-06	2.3E-05	3.0E-04	3E-02	8E-02	Thyroid	3E-02	8E-02
Floodplain	86	Arsenic	Dermal	4.6E+00	0.60	1.3E-05	3.5E-05	3.0E-04	4E-02	1E-01	Dermal	2E-01	4E-01
		Thallium	Dermal	2.0E-01	1.00	9.4E-07	2.6E-06	1.0E-05	9E-02	3E-01			
		Vanadium	Dermal	2.1E+01	1.00	1.0E-04	2.7E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	2.3E+04	1.00	1.1E-01	2.9E-01	7.0E-01	2E-01	4E-01	Gastrointestinal	2E-01	4E-01
		Mercury	Immune	5.3E-01	1.00	2.5E-06	6.8E-06	3.0E-04	8E-03	2E-02	Immune	8E-03	2E-02
		Barium	Kidney	4.6E+02	1.00	2.1E-03	5.9E-03	2.0E-01	1E-02	3E-02	Kidney	1E-02	4E-02
		Cadmium	Kidney	5.4E-01	1.00	2.5E-06	6.9E-06	1.0E-03	3E-03	7E-03			
		Aluminum	Nervous	2.0E+04	1.00	9.2E-02	2.5E-01	1.0E+00	9E-02	3E-01	Nervous	2E-01	5E-01
		Manganese	Nervous	5.6E+02	1.00	2.6E-03	7.1E-03	2.4E-02	1E-01	3E-01			
		Chromium	--	2.0E+01	1.00	9.1E-05	2.5E-04	3.0E-03	3E-02	8E-02	Reproductive	1E-01	3E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.8E-05	1.00	8.6E-11	2.4E-10	7.0E-10	1E-01	3E-01			
		Antimony	Systemic	4.5E-01	1.00	2.1E-06	5.8E-06	4.0E-04	5E-03	1E-02	Systemic	5E-03	1E-02
		Cobalt	Thyroid	5.6E+00	1.00	2.6E-05	7.2E-05	3.0E-04	9E-02	2E-01	Thyroid	9E-02	2E-01
Floodplain	87	Arsenic	Dermal	4.7E+00	0.60	1.3E-05	3.6E-05	3.0E-04	4E-02	1E-01	Dermal	2E-01	4E-01
		Thallium	Dermal	2.0E-01	1.00	9.4E-07	2.6E-06	1.0E-05	9E-02	3E-01			
		Vanadium	Dermal	2.1E+01	1.00	9.6E-05	2.6E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	1.2E+04	1.00	5.7E-02	1.6E-01	7.0E-01	8E-02	2E-01	Gastrointestinal	8E-02	2E-01
		Mercury	Immune	1.0E-01	1.00	4.7E-07	1.3E-06	3.0E-04	2E-03	4E-03	Immune	2E-03	4E-03
		Barium	Kidney	7.7E+02	1.00	3.6E-03	9.9E-03	2.0E-01	2E-02	5E-02	Kidney	2E-02	6E-02
		Cadmium	Kidney	7.9E-01	1.00	3.7E-06	1.0E-05	1.0E-03	4E-03	1E-02			
		Aluminum	Nervous	1.1E+04	1.00	5.0E-02	1.4E-01	1.0E+00	5E-02	1E-01	Nervous	1E-01	3E-01
		Manganese	Nervous	2.7E+02	1.00	1.3E-03	3.5E-03	2.4E-02	5E-02	1E-01			
		Chromium	--	1.6E+01	1.00	7.2E-05	2.0E-04	3.0E-03	2E-02	7E-02	Reproductive	5E-02	1E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	6.8E-06	1.00	3.2E-11	8.7E-11	7.0E-10	5E-02	1E-01			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	4.0E+00	1.00	1.9E-05	5.1E-05	3.0E-04	6E-02	2E-01	Thyroid	6E-02	2E-01

Floodplain	88	Arsenic	Dermal	5.5E+00	0.60	1.5E-05	4.2E-05	3.0E-04	5E-02	1E-01	Dermal	1E-01	4E-01
		Thallium	Dermal	1.5E-01	1.00	7.0E-07	1.9E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	1.4E+01	1.00	6.4E-05	1.8E-04	5.0E-03	1E-02	4E-02			
		Iron	Gastrointestinal	8.7E+03	1.00	4.1E-02	1.1E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	6.9E-01	1.00	3.2E-06	8.8E-06	3.0E-04	1E-02	3E-02	Immune	1E-02	3E-02
		Barium	Kidney	1.5E+03	1.00	6.8E-03	1.9E-02	2.0E-01	3E-02	9E-02	Kidney	4E-02	1E-01
		Cadmium	Kidney	1.8E+00	1.00	8.4E-06	2.3E-05	1.0E-03	8E-03	2E-02			
		Aluminum	Nervous	1.2E+04	1.00	5.5E-02	1.5E-01	1.0E+00	6E-02	2E-01	Nervous	2E-01	4E-01
		Manganese	Nervous	5.3E+02	1.00	2.5E-03	6.7E-03	2.4E-02	1E-01	3E-01			
		Chromium	--	2.6E+01	1.00	1.2E-04	3.4E-04	3.0E-03	4E-02	1E-01	Reproductive	4E-01	1E+00
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	5.6E-05	1.00	2.6E-10	7.1E-10	7.0E-10	4E-01	1E+00			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	2.6E+00	1.00	1.2E-05	3.3E-05	3.0E-04	4E-02	1E-01	Thyroid	4E-02	1E-01
Floodplain	89	Arsenic	Dermal	4.8E+00	0.60	1.3E-05	3.7E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	4E-01
		Thallium	Dermal	1.6E-01	1.00	7.3E-07	2.0E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	1.9E+01	1.00	8.8E-05	2.4E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	1.3E+04	1.00	5.9E-02	1.6E-01	7.0E-01	8E-02	2E-01	Gastrointestinal	8E-02	2E-01
		Mercury	Immune	1.8E-01	1.00	8.4E-07	2.3E-06	3.0E-04	3E-03	8E-03	Immune	3E-03	8E-03
		Barium	Kidney	5.0E+02	1.00	2.4E-03	6.4E-03	2.0E-01	1E-02	3E-02	Kidney	1E-02	4E-02
		Cadmium	Kidney	5.5E-01	1.00	2.6E-06	7.0E-06	1.0E-03	3E-03	7E-03			
		Aluminum	Nervous	1.1E+04	1.00	5.3E-02	1.4E-01	1.0E+00	5E-02	1E-01	Nervous	1E-01	3E-01
		Manganese	Nervous	3.7E+02	1.00	1.7E-03	4.7E-03	2.4E-02	7E-02	2E-01			
		Chromium	--	1.7E+01	1.00	8.1E-05	2.2E-04	3.0E-03	3E-02	7E-02	Reproductive	6E-02	2E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	9.7E-06	1.00	4.5E-11	1.2E-10	7.0E-10	6E-02	2E-01			
		Antimony	Systemic	3.7E-01	1.00	1.7E-06	4.7E-06	4.0E-04	4E-03	1E-02	Systemic	4E-03	1E-02
		Cobalt	Thyroid	4.5E+00	1.00	2.1E-05	5.7E-05	3.0E-04	7E-02	2E-01	Thyroid	7E-02	2E-01
Floodplain	90	Arsenic	Dermal	1.0E+01	0.60	2.8E-05	7.7E-05	3.0E-04	9E-02	3E-01	Dermal	2E-01	5E-01
		Thallium	Dermal	1.6E-01	1.00	7.2E-07	2.0E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	3.1E+01	1.00	1.5E-04	4.0E-04	5.0E-03	3E-02	8E-02			
		Iron	Gastrointestinal	9.3E+03	1.00	4.3E-02	1.2E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	1.5E+00	1.00	7.0E-06	1.9E-05	3.0E-04	2E-02	6E-02	Immune	2E-02	6E-02
		Barium	Kidney	7.6E+02	1.00	3.6E-03	9.8E-03	2.0E-01	2E-02	5E-02	Kidney	3E-02	8E-02
		Cadmium	Kidney	2.8E+00	1.00	1.3E-05	3.6E-05	1.0E-03	1E-02	4E-02			
		Aluminum	Nervous	1.1E+04	1.00	5.2E-02	1.4E-01	1.0E+00	5E-02	1E-01	Nervous	3E-01	7E-01
		Manganese	Nervous	1.1E+03	1.00	5.2E-03	1.4E-02	2.4E-02	2E-01	6E-01			
		Chromium	--	2.8E+01	1.00	1.3E-04	3.6E-04	3.0E-03	4E-02	1E-01	Reproductive	4E-01	1E+00
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	5.5E-05	1.00	2.6E-10	7.1E-10	7.0E-10	4E-01	1E+00			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	3.1E+00	1.00	1.4E-05	4.0E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Floodplain	91	Arsenic	Dermal	6.3E+00	0.60	1.8E-05	4.8E-05	3.0E-04	6E-02	2E-01	Dermal	2E-01	5E-01
		Thallium	Dermal	1.9E-01	1.00	8.9E-07	2.4E-06	1.0E-05	9E-02	2E-01			
		Vanadium	Dermal	2.6E+01	1.00	1.2E-04	3.4E-04	5.0E-03	2E-02	7E-02			
		Iron	Gastrointestinal	1.4E+04	1.00	6.6E-02	1.8E-01	7.0E-01	9E-02	3E-01	Gastrointestinal	9E-02	3E-01
		Mercury	Immune	8.3E-01	1.00	3.9E-06	1.1E-05	3.0E-04	1E-02	4E-02	Immune	1E-02	4E-02
		Barium	Kidney	9.2E+02	1.00	4.3E-03	1.2E-02	2.0E-01	2E-02	6E-02	Kidney	3E-02	8E-02
		Cadmium	Kidney	1.7E+00	1.00	7.9E-06	2.2E-05	1.0E-03	8E-03	2E-02			
		Aluminum	Nervous	1.5E+04	1.00	6.9E-02	1.9E-01	1.0E+00	7E-02	2E-01	Nervous	1E-01	4E-01
		Manganese	Nervous	4.0E+02	1.00	1.9E-03	5.1E-03	2.4E-02	8E-02	2E-01			
		Chromium	--	2.6E+01	1.00	1.2E-04	3.4E-04	3.0E-03	4E-02	1E-01	Reproductive	2E-01	4E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.3E-05	1.00	1.1E-10	2.9E-10	7.0E-10	2E-01	4E-01			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	5.3E+00	1.00	2.5E-05	6.8E-05	3.0E-04	8E-02	2E-01	Thyroid	8E-02	2E-01
Floodplain	93	Arsenic	Dermal	7.8E+00	0.60	2.2E-05	6.0E-05	3.0E-04	7E-02	2E-01	Dermal	2E-01	4E-01
		Thallium	Dermal	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	2.9E+01	1.00	1.3E-04	3.7E-04	5.0E-03	3E-02	7E-02			
		Iron	Gastrointestinal	7.9E+03	1.00	3.7E-02	1.0E-01	7.0E-01	5E-02	1E-01	Gastrointestinal	5E-02	1E-01
		Mercury	Immune	3.2E+00	1.00	1.5E-05	4.0E-05	3.0E-04	5E-02	1E-01	Immune	5E-02	1E-01
		Barium	Kidney	4.3E+02	1.00	2.0E-03	5.5E-03	2.0E-01	1E-02	3E-02	Kidney	2E-02	5E-02
		Cadmium	Kidney	2.1E+00	1.00	9.9E-06	2.7E-05	1.0E-03	1E-02	3E-02			
		Aluminum	Nervous	1.5E+04	1.00	7.1E-02	1.9E-01	1.0E+00	7E-02	2E-01	Nervous	2E-01	7E-01
		Manganese	Nervous	8.8E+02	1.00	4.1E-03	1.1E-02	2.4E-02	2E-01	5E-01			
		Chromium	--	2.5E+01	1.00	1.2E-04	3.2E-04	3.0E-03	4E-02	1E-01	Reproductive	3E-01	8E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	4.6E-05	1.00	2.2E-10	5.9E-10	7.0E-10	3E-01	8E-01			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	3.2E+00	1.00	1.5E-05	4.1E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01

Floodplain	94	Arsenic	Dermal	4.0E+00	0.60	1.1E-05	3.1E-05	3.0E-04	4E-02	1E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	1.5E-01	1.00	7.2E-07	2.0E-06	1.0E-05	7E-02	2E-01			
		Vanadium	Dermal	1.8E+01	1.00	8.4E-05	2.3E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	9.5E+03	1.00	4.4E-02	1.2E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	9.4E-01	1.00	4.4E-06	1.2E-05	3.0E-04	1E-02	4E-02	Immune	1E-02	4E-02
		Barium	Kidney	4.1E+02	1.00	1.9E-03	5.3E-03	2.0E-01	1E-02	3E-02	Kidney	2E-02	4E-02
		Cadmium	Kidney	1.2E+00	1.00	5.4E-06	1.5E-05	1.0E-03	5E-03	1E-02			
		Aluminum	Nervous	1.0E+04	1.00	4.8E-02	1.3E-01	1.0E+00	5E-02	1E-01	Nervous	1E-01	3E-01
		Manganese	Nervous	4.0E+02	1.00	1.9E-03	5.2E-03	2.4E-02	8E-02	2E-01			
		Chromium	--	2.0E+01	1.00	9.3E-05	2.5E-04	3.0E-03	3E-02	8E-02	Reproductive	1E-01	4E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.2E-05	1.00	1.0E-10	2.9E-10	7.0E-10	1E-01	4E-01			
		Antimony	Systemic	4.7E-01	1.00	2.2E-06	6.0E-06	4.0E-04	5E-03	2E-02	Systemic	5E-03	2E-02
		Cobalt	Thyroid	3.2E+00	1.00	1.5E-05	4.1E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Floodplain	95	Arsenic	Dermal	5.6E+00	0.60	1.6E-05	4.3E-05	3.0E-04	5E-02	1E-01	Dermal	1E-01	4E-01
		Thallium	Dermal	1.2E-01	1.00	5.7E-07	1.6E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	2.3E+01	1.00	1.1E-04	3.0E-04	5.0E-03	2E-02	6E-02			
		Iron	Gastrointestinal	9.7E+03	1.00	4.5E-02	1.2E-01	7.0E-01	6E-02	2E-01	Gastrointestinal	6E-02	2E-01
		Mercury	Immune	1.0E+00	1.00	4.9E-06	1.3E-05	3.0E-04	2E-02	4E-02	Immune	2E-02	4E-02
		Barium	Kidney	3.9E+02	1.00	1.8E-03	5.0E-03	2.0E-01	9E-03	3E-02	Kidney	2E-02	4E-02
		Cadmium	Kidney	1.2E+00	1.00	5.8E-06	1.6E-05	1.0E-03	6E-03	2E-02			
		Aluminum	Nervous	9.8E+03	1.00	4.6E-02	1.2E-01	1.0E+00	5E-02	1E-01	Nervous	2E-01	5E-01
		Manganese	Nervous	7.4E+02	1.00	3.5E-03	9.5E-03	2.4E-02	1E-01	4E-01			
		Chromium	--	1.8E+01	1.00	8.3E-05	2.3E-04	3.0E-03	3E-02	8E-02	Reproductive	1E-01	4E-01
		TEQD/F (ND=1/2 DL)	Reproductive	2.1E-05	1.00	9.9E-11	2.7E-10	7.0E-10	1E-01	4E-01			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	3.5E+00	1.00	1.6E-05	4.5E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01
Floodplain	97	Arsenic	Dermal	1.7E+00	0.60	4.8E-06	1.3E-05	3.0E-04	2E-02	4E-02	Dermal	3E-02	8E-02
		Thallium	Dermal	7.5E-03	1.00	3.5E-08	9.6E-08	1.0E-05	4E-03	1E-02			
		Vanadium	Dermal	8.7E+00	1.00	4.1E-05	1.1E-04	5.0E-03	8E-03	2E-02			
		Iron	Gastrointestinal	5.5E+03	1.00	2.6E-02	7.1E-02	7.0E-01	4E-02	1E-01	Gastrointestinal	4E-02	1E-01
		Mercury	Immune	4.1E-02	1.00	1.9E-07	5.2E-07	3.0E-04	6E-04	2E-03	Immune	6E-04	2E-03
		Barium	Kidney	2.4E+02	1.00	1.1E-03	3.1E-03	2.0E-01	6E-03	2E-02	Kidney	7E-03	2E-02
		Cadmium	Kidney	2.6E-01	1.00	1.2E-06	3.3E-06	1.0E-03	1E-03	3E-03			
		Aluminum	Nervous	6.9E+03	1.00	3.2E-02	8.9E-02	1.0E+00	3E-02	9E-02	Nervous	5E-02	1E-01
		Manganese	Nervous	9.3E+01	1.00	4.3E-04	1.2E-03	2.4E-02	2E-02	5E-02			
		Chromium	--	9.3E+00	1.00	4.3E-05	1.2E-04	3.0E-03	1E-02	4E-02	Reproductive	2E-02	5E-02
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	2.8E-06	1.00	1.3E-11	3.6E-11	7.0E-10	2E-02	5E-02			
		Antimony	Systemic	4.8E-02	1.00	2.2E-07	6.1E-07	4.0E-04	6E-04	2E-03	Systemic	6E-04	2E-03
		Cobalt	Thyroid	1.7E+00	1.00	7.9E-06	2.2E-05	3.0E-04	3E-02	7E-02	Thyroid	3E-02	7E-02
Floodplain	98	Arsenic	Dermal	4.9E+00	0.60	1.4E-05	3.7E-05	3.0E-04	5E-02	1E-01	Dermal	1E-01	3E-01
		Thallium	Dermal	1.3E-01	1.00	5.8E-07	1.6E-06	1.0E-05	6E-02	2E-01			
		Vanadium	Dermal	2.1E+01	1.00	9.9E-05	2.7E-04	5.0E-03	2E-02	5E-02			
		Iron	Gastrointestinal	1.1E+04	1.00	4.9E-02	1.3E-01	7.0E-01	7E-02	2E-01	Gastrointestinal	7E-02	2E-01
		Mercury	Immune	3.1E-01	1.00	1.4E-06	3.9E-06	3.0E-04	5E-03	1E-02	Immune	5E-03	1E-02
		Barium	Kidney	2.2E+03	1.00	1.0E-02	2.8E-02	2.0E-01	5E-02	1E-01	Kidney	6E-02	2E-01
		Cadmium	Kidney	1.2E+00	1.00	5.7E-06	1.6E-05	1.0E-03	6E-03	2E-02			
		Aluminum	Nervous	1.5E+04	1.00	7.1E-02	1.9E-01	1.0E+00	7E-02	2E-01	Nervous	1E-01	3E-01
		Manganese	Nervous	2.9E+02	1.00	1.4E-03	3.7E-03	2.4E-02	6E-02	2E-01			
		Chromium	--	1.9E+01	1.00	9.0E-05	2.5E-04	3.0E-03	3E-02	8E-02	Reproductive	1E-01	3E-01
		$TEQ_{D/F}$ (ND=1/2 DL)	Reproductive	1.4E-05	1.00	6.8E-11	1.9E-10	7.0E-10	1E-01	3E-01			
		Antimony	Systemic	no data	1.00	--	--	4.0E-04	--	--	Systemic	--	--
		Cobalt	Thyroid	3.2E+00	1.00	1.5E-05	4.0E-05	3.0E-04	5E-02	1E-01	Thyroid	5E-02	1E-01

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME	
Noncancer	4.44E-06	3.03E-05	*Based on Child HIFs*
Cancer	2.58E-07	4.05E-06	*Based on TWA HIFs*

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-06	0.03	4.9E-13	3.4E-12	7.0E-10	7E-04	5E-03	3E-14	4E-13	1E+05	4E-09	6E-08
		Arsenic	9.3E+00	0.03	1.2E-06	8.5E-06	3.0E-04	4E-03	3E-02	7E-08	1E-06	2E+00	1E-07	2E-06
		Cadmium	7.0E-01	0.001	3.1E-09	2.1E-08	2.5E-05	1E-04	8E-04	2E-10	3E-09			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	0.03	3.4E-13	2.3E-12	7.0E-10	5E-04	3E-03	2E-14	3E-13	1E+05	3E-09	4E-08
		Arsenic	1.0E+00	0.03	1.3E-07	9.1E-07	3.0E-04	4E-04	3E-03	8E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	6.4E-02	0.001	2.8E-10	1.9E-09	2.5E-05	1E-05	8E-05	2E-11	3E-10			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	0.03	8.7E-14	6.0E-13	7.0E-10	1E-04	9E-04	5E-15	8E-14	1E+05	7E-10	1E-08
		Arsenic	9.5E-01	0.03	1.3E-07	8.6E-07	3.0E-04	4E-04	3E-03	7E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	7.3E-02	0.001	3.2E-10	2.2E-09	2.5E-05	1E-05	9E-05	2E-11	3E-10			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	0.03	3.9E-13	2.7E-12	7.0E-10	6E-04	4E-03	2E-14	4E-13	1E+05	3E-09	5E-08
		Arsenic	1.7E+00	0.03	2.3E-07	1.5E-06	3.0E-04	8E-04	5E-03	1E-08	2E-07	2E+00	2E-08	3E-07
		Cadmium	1.4E-01	0.001	6.2E-10	4.2E-09	2.5E-05	2E-05	2E-04	4E-11	6E-10			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	0.03	2.3E-13	1.6E-12	7.0E-10	3E-04	2E-03	1E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	1.2E+00	0.03	1.6E-07	1.1E-06	3.0E-04	5E-04	4E-03	9E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	1.3E-01	0.001	5.8E-10	3.9E-09	2.5E-05	2E-05	2E-04	3E-11	5E-10			
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	7.1E-07	0.03	9.5E-14	6.5E-13	7.0E-10	1E-04	9E-04	6E-15	9E-14	1E+05	7E-10	1E-08
		Arsenic	1.9E+00	0.03	2.5E-07	1.7E-06	3.0E-04	8E-04	6E-03	1E-08	2E-07	2E+00	2E-08	3E-07
		Cadmium	4.4E-02	0.001	2.0E-10	1.3E-09	2.5E-05	8E-06	5E-05	1E-11	2E-10			
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	0.03	7.1E-14	4.8E-13	7.0E-10	1E-04	7E-04	4E-15	6E-14	1E+05	5E-10	8E-09
		Arsenic	1.1E+00	0.03	1.5E-07	1.0E-06	3.0E-04	5E-04	3E-03	9E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	4.6E-02	0.001	2.0E-10	1.4E-09	2.5E-05	8E-06	6E-05	1E-11	2E-10			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	1.0E-06	0.03	1.4E-13	9.3E-13	7.0E-10	2E-04	1E-03	8E-15	1E-13	1E+05	1E-09	2E-08
		Arsenic	4.0E+00	0.03	5.3E-07	3.6E-06	3.0E-04	2E-03	1E-02	3E-08	5E-07	2E+00	5E-08	7E-07
		Cadmium	1.3E-01	0.001	5.8E-10	3.9E-09	2.5E-05	2E-05	2E-04	3E-11	5E-10			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	0.03	1.1E-13	7.6E-13	7.0E-10	2E-04	1E-03	6E-15	1E-13	1E+05	8E-10	1E-08
		Arsenic	1.6E+00	0.03	2.1E-07	1.5E-06	3.0E-04	7E-04	5E-03	1E-08	2E-07	2E+00	2E-08	3E-07
		Cadmium	9.3E-02	0.001	4.1E-10	2.8E-09	2.5E-05	2E-05	1E-04	2E-11	4E-10			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	0.03	9.7E-14	6.6E-13	7.0E-10	1E-04	9E-04	6E-15	9E-14	1E+05	7E-10	1E-08
		Arsenic	2.1E+00	0.03	2.8E-07	1.9E-06	3.0E-04	9E-04	6E-03	2E-08	3E-07	2E+00	2E-08	4E-07
		Cadmium	1.9E-01	0.001	8.4E-10	5.8E-09	2.5E-05	3E-05	2E-04	5E-11	8E-10			
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	0.03	1.2E-12	8.3E-12	7.0E-10	2E-03	1E-02	7E-14	1E-12	1E+05	9E-09	1E-07
		Arsenic	5.1E+00	0.03	6.8E-07	4.6E-06	3.0E-04	2E-03	2E-02	4E-08	6E-07	2E+00	6E-08	9E-07
		Cadmium	8.5E-01	0.001	3.8E-09	2.6E-08	2.5E-05	2E-04	1E-03	2E-10	3E-09			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	2.0E-13	1.4E-12	7.0E-10	3E-04	2E-03	1E-14	2E-13	1E+05	2E-09	2E-08
		Arsenic	2.5E+00	0.03	3.4E-07	2.3E-06	3.0E-04	1E-03	8E-03	2E-08	3E-07	2E+00	3E-08	5E-07
		Cadmium	2.6E-01	0.001	1.1E-09	7.8E-09	2.5E-05	5E-05	3E-04	7E-11	1E-09			
Upland	38[a]	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	0.03	2.8E-13	1.9E-12	7.0E-10	4E-04	3E-03	2E-14	3E-13	1E+05	2E-09	3E-08
		Arsenic	1.0E+00	0.03	1.3E-07	9.1E-07	3.0E-04	4E-04	3E-03	8E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	1.6E-02	0.001	7.1E-11	4.9E-10	2.5E-05	3E-06	2E-05	4E-12	6E-11			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	3.7E-13	2.5E-12	7.0E-10	5E-04	4E-03	2E-14	3E-13	1E+05	3E-09	4E-08
		Arsenic	2.2E+00	0.03	2.9E-07	2.0E-06	3.0E-04	1E-03	7E-03	2E-08	3E-07	2E+00	3E-08	4E-07
		Cadmium	3.3E-01	0.001	1.5E-09	1.0E-08	2.5E-05	6E-05	4E-04	9E-11	1E-09			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	0.03	4.7E-13	3.2E-12	7.0E-10	7E-04	5E-03	3E-14	4E-13	1E+05	4E-09	6E-08
		Arsenic	1.4E+00	0.03	1.9E-07	1.3E-06	3.0E-04	6E-04	4E-03	1E-08	2E-07	2E+00	2E-08	3E-07
		Cadmium	2.8E-01	0.001	1.2E-09	8.5E-09	2.5E-05	5E-05	3E-04	7E-11	1E-09			
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	5.2E-13	3.6E-12	7.0E-10	7E-04	5E-03	3E-14	5E-13	1E+05	4E-09	6E-08
		Arsenic	1.3E+00	0.03	1.7E-07	1.2E-06	3.0E-04	6E-04	4E-03	1E-08	2E-07	2E+00	2E-08	2E-07
		Cadmium	2.8E-01	0.001	1.2E-09	8.5E-09	2.5E-05	5E-05	3E-04	7E-11	1E-09			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	0.03	1.0E-12	6.8E-12	7.0E-10	1E-03	1E-02	6E-14	9E-13	1E+05	8E-09	1E-07
		Arsenic	3.1E+00	0.03	4.1E-07	2.8E-06	3.0E-04	1E-03	9E-03	2E-08	4E-07	2E+00	4E-08	6E-07
		Cadmium	3.2E-01	0.001	1.4E-09	9.7E-09	2.5E-05	6E-05	4E-04	8E-11	1E-09			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	5.2E-13	3.6E-12	7.0E-10	7E-04	5E-03	3E-14	5E-13	1E+05	4E-09	6E-08
		Arsenic	2.8E+00	0.03	3.7E-07	2.5E-06	3.0E-04	1E-03	8E-03	2E-08	3E-07	2E+00	3E-08	5E-07
		Cadmium	4.7E-01	0.001	2.1E-09	1.4E-08	2.5E-05	8E-05	6E-04	1E-10	2E-09			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	2.9E-13	2.0E-12	7.0E-10	4E-04	3E-03	2E-14	3E-13	1E+05	2E-09	3E-08
		Arsenic	4.4E+00	0.03	5.9E-07	4.0E-06	3.0E-04	2E-03	1E-02	3E-08	5E-07	2E+00	5E-08	8E-07
		Cadmium	8.0E-01	0.001	3.5E-09	2.4E-08	2.5E-05	1E-04	1E-03	2E-10	3E-09			
Upland	45[a]	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	0.03	4.9E-14	3.4E-13	7.0E-10	7E-05	5E-04	3E-15	4E-14	1E+05	4E-10	6E-09
		Arsenic	3.1E+00	0.03	4.1E-07	2.8E-06	3.0E-04	1E-03	9E-03	2E-08	4E-07	2E+00	4E-08	6E-07
		Cadmium	8.0E-02	0.001	3.6E-10	2.4E-09	2.5E-05	1E-05	1E-04	2E-11	3E-10			
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-06	0.03	4.0E-13	2.7E-12	7.0E-10	6E-04	4E-03	2E-14	4E-13	1E+05	3E-09	5E-08
		Arsenic	2.3E+00	0.03	3.1E-07	2.1E-06	3.0E-04	1E-03	7E-03	2E-08	3E-07	2E+00	3E-08	4E-07
		Cadmium	2.4E-01	0.001	1.1E-09	7.3E-09	2.5E-05	4E-05	3E-04	6E-11	1E-09			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	2.2E-12	1.5E-11	7.0E-10	3E-03	2E-02	1E-13	2E-12	1E+05	2E-08	3E-07
		Arsenic	1.3E+01	0.03	1.7E-06	1.2E-05	3.0E-04	6E-03	4E-02	1E-07	2E-06	2E+00	1E-07	2E-06
		Cadmium	5.2E+00	0.001	2.3E-08	1.6E-07	2.5E-05	9E-04	6E-03	1E-09	2E-08			
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	0.03	6.6E-12	4.5E-11	7.0E-10	9E-03	6E-02	4E-13	6E-12	1E+05	5E-08	8E-07
		Arsenic	1.4E+01	0.03	1.9E-06	1.3E-05	3.0E-04	6E-03	4E-02	1E-07	2E-06	2E+00	2E-07	3E-06

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME	
Noncancer	4.44E-06	3.03E-05	*Based on Child HIFs*
Cancer	2.58E-07	4.05E-06	*Based on TWA HIFs*

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
		Cadmium	8.3E+00	0.001	3.7E-08	2.5E-07	2.5E-05	1E-03	1E-02	2E-09	3E-08			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	0.03	5.3E-12	3.6E-11	7.0E-10	8E-03	5E-02	3E-13	5E-12	1E+05	4E-08	6E-07
		Arsenic	3.6E+00	0.03	4.8E-07	3.3E-06	3.0E-04	2E-03	1E-02	3E-08	4E-07	2E+00	4E-08	7E-07
		Cadmium	2.0E+00	0.001	8.9E-09	6.1E-08	2.5E-05	4E-04	2E-03	5E-10	8E-09			
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	0.03	3.2E-12	2.2E-11	7.0E-10	5E-03	3E-02	2E-13	3E-12	1E+05	2E-08	4E-07
		Arsenic	7.9E+00	0.03	1.0E-06	7.1E-06	3.0E-04	3E-03	2E-02	6E-08	1E-06	2E+00	9E-08	1E-06
		Cadmium	3.9E+00	0.001	1.7E-08	1.2E-07	2.5E-05	7E-04	5E-03	1E-09	2E-08			
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	0.03	4.1E-13	2.8E-12	7.0E-10	6E-04	4E-03	2E-14	4E-13	1E+05	3E-09	5E-08
		Arsenic	2.2E+00	0.03	2.9E-07	2.0E-06	3.0E-04	1E-03	7E-03	2E-08	3E-07	2E+00	3E-08	4E-07
		Cadmium	5.2E-01	0.001	2.3E-09	1.6E-08	2.5E-05	9E-05	6E-04	1E-10	2E-09			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	2.9E-13	2.0E-12	7.0E-10	4E-04	3E-03	2E-14	3E-13	1E+05	2E-09	3E-08
		Arsenic	1.8E+00	0.03	2.4E-07	1.6E-06	3.0E-04	8E-04	5E-03	1E-08	2E-07	2E+00	2E-08	3E-07
		Cadmium	1.6E-01	0.001	7.0E-10	4.8E-09	2.5E-05	3E-05	2E-04	4E-11	6E-10			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	3.0E-12	2.1E-11	7.0E-10	4E-03	3E-02	2E-13	3E-12	1E+05	2E-08	4E-07
		Arsenic	2.6E+00	0.03	3.5E-07	2.4E-06	3.0E-04	1E-03	8E-03	2E-08	3E-07	2E+00	3E-08	5E-07
		Cadmium	1.2E+00	0.001	5.3E-09	3.6E-08	2.5E-05	2E-04	1E-03	3E-10	5E-09			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	1.9E-12	1.3E-11	7.0E-10	3E-03	2E-02	1E-13	2E-12	1E+05	1E-08	2E-07
		Arsenic	1.1E+01	0.03	1.4E-06	9.7E-06	3.0E-04	5E-03	3E-02	8E-08	1E-06	2E+00	1E-07	2E-06
		Cadmium	4.7E+00	0.001	2.1E-08	1.4E-07	2.5E-05	8E-04	6E-03	1E-09	2E-08			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	7.4E-12	5.0E-11	7.0E-10	1E-02	7E-02	4E-13	7E-12	1E+05	6E-08	9E-07
		Arsenic	1.4E+01	0.03	1.8E-06	1.2E-05	3.0E-04	6E-03	4E-02	1E-07	2E-06	2E+00	2E-07	2E-06
		Cadmium	5.6E+00	0.001	2.5E-08	1.7E-07	2.5E-05	1E-03	7E-03	1E-09	2E-08			
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.9E-05	0.03	7.8E-12	5.3E-11	7.0E-10	1E-02	8E-02	5E-13	7E-12	1E+05	6E-08	9E-07
		Arsenic	1.2E+01	0.03	1.6E-06	1.1E-05	3.0E-04	5E-03	4E-02	1E-07	1E-06	2E+00	1E-07	2E-06
		Cadmium	6.7E+00	0.001	3.0E-08	2.0E-07	2.5E-05	1E-03	8E-03	2E-09	3E-08			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.1E-11	7.6E-11	7.0E-10	2E-02	1E-01	6E-13	1E-11	1E+05	8E-08	1E-06
		Arsenic	1.2E+01	0.03	1.6E-06	1.1E-05	3.0E-04	5E-03	4E-02	9E-08	1E-06	2E+00	1E-07	2E-06
		Cadmium	4.8E+00	0.001	2.1E-08	1.5E-07	2.5E-05	9E-04	6E-03	1E-09	2E-08			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	2.1E-12	1.4E-11	7.0E-10	3E-03	2E-02	1E-13	2E-12	1E+05	2E-08	2E-07
		Arsenic	6.2E+00	0.03	8.3E-07	5.7E-06	3.0E-04	3E-03	2E-02	5E-08	8E-07	2E+00	7E-08	1E-06
		Cadmium	3.3E+00	0.001	1.5E-08	1.0E-07	2.5E-05	6E-04	4E-03	9E-10	1E-08			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.7E-06	0.03	1.2E-12	7.9E-12	7.0E-10	2E-03	1E-02	7E-14	1E-12	1E+05	9E-09	1E-07
		Arsenic	4.6E+00	0.03	6.1E-07	4.2E-06	3.0E-04	2E-03	1E-02	4E-08	6E-07	2E+00	5E-08	8E-07
		Cadmium	1.7E+00	0.001	7.5E-09	5.2E-08	2.5E-05	3E-04	2E-03	4E-10	7E-09			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	0.03	7.7E-13	5.3E-12	7.0E-10	1E-03	8E-03	4E-14	7E-13	1E+05	6E-09	9E-08
		Arsenic	3.7E+00	0.03	4.9E-07	3.4E-06	3.0E-04	2E-03	1E-02	3E-08	4E-07	2E+00	4E-08	7E-07
		Cadmium	1.1E+00	0.001	4.9E-09	3.3E-08	2.5E-05	2E-04	1E-03	3E-10	4E-09			
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	0.03	1.5E-13	1.0E-12	7.0E-10	2E-04	1E-03	9E-15	1E-13	1E+05	1E-09	2E-08
		Arsenic	2.6E+00	0.03	3.5E-07	2.4E-06	3.0E-04	1E-03	8E-03	2E-08	3E-07	2E+00	3E-08	5E-07
		Cadmium	3.7E-01	0.001	1.6E-09	1.1E-08	2.5E-05	7E-05	4E-04	1E-10	1E-09			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	2.2E-12	1.5E-11	7.0E-10	3E-03	2E-02	1E-13	2E-12	1E+05	2E-08	3E-07
		Arsenic	3.0E+00	0.03	4.0E-07	2.7E-06	3.0E-04	1E-03	9E-03	2E-08	4E-07	2E+00	3E-08	5E-07
		Cadmium	7.9E-01	0.001	3.5E-09	2.4E-08	2.5E-05	1E-04	1E-03	2E-10	3E-09			
Upland	65[a]	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	0.03	1.7E-12	1.2E-11	7.0E-10	2E-03	2E-02	1E-13	2E-12	1E+05	1E-08	2E-07
		Arsenic	4.3E+00	0.03	5.7E-07	3.9E-06	3.0E-04	2E-03	1E-02	3E-08	5E-07	2E+00	5E-08	8E-07
		Cadmium	2.5E+00	0.001	1.1E-08	7.6E-08	2.5E-05	4E-04	3E-03	6E-10	1E-08			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	2.0E-13	1.4E-12	7.0E-10	3E-04	2E-03	1E-14	2E-13	1E+05	2E-09	2E-08
		Arsenic	3.2E+00	0.03	4.3E-07	2.9E-06	3.0E-04	1E-03	1E-02	2E-08	4E-07	2E+00	4E-08	6E-07
		Cadmium	9.0E-01	0.001	4.0E-09	2.7E-08	2.5E-05	2E-04	1E-03	2E-10	4E-09			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.1E-11	7.5E-11	7.0E-10	2E-02	1E-01	6E-13	1E-11	1E+05	8E-08	1E-06
		Arsenic	1.5E+01	0.03	2.0E-06	1.4E-05	3.0E-04	7E-03	5E-02	1E-07	2E-06	2E+00	2E-07	3E-06
		Cadmium	4.8E+00	0.001	2.1E-08	1.5E-07	2.5E-05	9E-04	6E-03	1E-09	2E-08			
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.1E-11	7.5E-11	7.0E-10	2E-02	1E-01	6E-13	1E-11	1E+05	8E-08	1E-06
		Arsenic	1.5E+01	0.03	2.0E-06	1.4E-05	3.0E-04	7E-03	5E-02	1E-07	2E-06	2E+00	2E-07	3E-06
		Cadmium	4.8E+00	0.001	2.1E-08	1.5E-07	2.5E-05	9E-04	6E-03	1E-09	2E-08			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.1E-06	0.03	5.4E-13	3.7E-12	7.0E-10	8E-04	5E-03	3E-14	5E-13	1E+05	4E-09	6E-08
		Arsenic	6.0E+00	0.03	8.0E-07	5.5E-06	3.0E-04	3E-03	2E-02	5E-08	7E-07	2E+00	7E-08	1E-06
		Cadmium	1.8E+00	0.001	8.0E-09	5.5E-08	2.5E-05	3E-04	2E-03	5E-10	7E-09			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	0.03	3.2E-13	2.2E-12	7.0E-10	5E-04	3E-03	2E-14	3E-13	1E+05	2E-09	4E-08
		Arsenic	5.8E+00	0.03	7.7E-07	5.3E-06	3.0E-04	3E-03	2E-02	4E-08	7E-07	2E+00	7E-08	1E-06
		Cadmium	1.3E+00	0.001	5.8E-09	3.9E-08	2.5E-05	2E-04	2E-03	3E-10	5E-09			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	3.1E-12	2.1E-11	7.0E-10	4E-03	3E-02	2E-13	3E-12	1E+05	2E-08	4E-07
		Arsenic	7.0E+00	0.03	9.3E-07	6.4E-06	3.0E-04	3E-03	2E-02	5E-08	8E-07	2E+00	8E-08	1E-06
		Cadmium	2.2E+00	0.001	9.8E-09	6.7E-08	2.5E-05	4E-04	3E-03	6E-10	9E-09			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME	
Noncancer	4.44E-06	3.03E-05	*Based on Child HIFs*
Cancer	2.58E-07	4.05E-06	*Based on TWA HIFs*

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-04	0.03	4.1E-11	2.8E-10	7.0E-10	6E-02	4E-01	2E-12	4E-11	1E+05	3E-07	5E-06
		Arsenic	4.1E+01	0.03	5.4E-06	3.7E-05	3.0E-04	2E-02	1E-01	3E-07	5E-06	2E+00	5E-07	7E-06
		Cadmium	6.4E+00	0.001	2.8E-08	1.9E-07	2.5E-05	1E-03	8E-03	2E-09	3E-08			
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	4.6E-14	3.1E-13	7.0E-10	7E-05	4E-04	3E-15	4E-14	1E+05	3E-10	5E-09
		Arsenic	4.3E+00	0.03	5.7E-07	3.9E-06	3.0E-04	2E-03	1E-02	3E-08	5E-07	2E+00	5E-08	8E-07
		Cadmium	1.5E-01	0.001	6.7E-10	4.6E-09	2.5E-05	3E-05	2E-04	4E-11	6E-10			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	2.7E-13	1.9E-12	7.0E-10	4E-04	3E-03	2E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	2.9E+00	0.03	3.8E-07	2.6E-06	3.0E-04	1E-03	9E-03	2E-08	3E-07	2E+00	3E-08	5E-07
		Cadmium	1.2E-01	0.001	5.4E-10	3.7E-09	2.5E-05	2E-05	1E-04	3E-11	5E-10			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	2.7E-13	1.9E-12	7.0E-10	4E-04	3E-03	2E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	2.9E+00	0.03	3.8E-07	2.6E-06	3.0E-04	1E-03	9E-03	2E-08	3E-07	2E+00	3E-08	5E-07
		Cadmium	1.2E-01	0.001	5.4E-10	3.7E-09	2.5E-05	2E-05	1E-04	3E-11	5E-10			
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	4.6E-14	3.1E-13	7.0E-10	7E-05	4E-04	3E-15	4E-14	1E+05	3E-10	5E-09
		Arsenic	4.3E+00	0.03	5.7E-07	3.9E-06	3.0E-04	2E-03	1E-02	3E-08	5E-07	2E+00	5E-08	8E-07
		Cadmium	1.5E-01	0.001	6.7E-10	4.6E-09	2.5E-05	3E-05	2E-04	4E-11	6E-10			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	2.7E-13	1.9E-12	7.0E-10	4E-04	3E-03	2E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	2.9E+00	0.03	3.8E-07	2.6E-06	3.0E-04	1E-03	9E-03	2E-08	3E-07	2E+00	3E-08	5E-07
		Cadmium	1.2E-01	0.001	5.4E-10	3.7E-09	2.5E-05	2E-05	1E-04	3E-11	5E-10			
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	2.7E-13	1.9E-12	7.0E-10	4E-04	3E-03	2E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	2.9E+00	0.03	3.8E-07	2.6E-06	3.0E-04	1E-03	9E-03	2E-08	3E-07	2E+00	3E-08	5E-07
		Cadmium	1.2E-01	0.001	5.4E-10	3.7E-09	2.5E-05	2E-05	1E-04	3E-11	5E-10			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	0.03	8.0E-14	5.5E-13	7.0E-10	1E-04	8E-04	5E-15	7E-14	1E+05	6E-10	9E-09
		Arsenic	4.5E+00	0.03	6.0E-07	4.1E-06	3.0E-04	2E-03	1E-02	3E-08	5E-07	2E+00	5E-08	8E-07
		Cadmium	3.2E-01	0.001	1.4E-09	9.7E-09	2.5E-05	6E-05	4E-04	8E-11	1E-09			
Floodplain	85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	0.03	5.3E-14	3.7E-13	7.0E-10	8E-05	5E-04	3E-15	5E-14	1E+05	4E-10	6E-09
		Arsenic	1.9E+00	0.03	2.5E-07	1.7E-06	3.0E-04	8E-04	6E-03	1E-08	2E-07	2E+00	2E-08	3E-07
		Cadmium	1.6E-02	0.001	7.1E-11	4.9E-10	2.5E-05	3E-06	2E-05	4E-12	6E-11			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	0.03	2.5E-12	1.7E-11	7.0E-10	4E-03	2E-02	1E-13	2E-12	1E+05	2E-08	3E-07
		Arsenic	4.6E+00	0.03	6.1E-07	4.2E-06	3.0E-04	2E-03	1E-02	4E-08	6E-07	2E+00	5E-08	8E-07
		Cadmium	5.4E-01	0.001	2.4E-09	1.6E-08	2.5E-05	1E-04	7E-04	1E-10	2E-09			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	0.03	9.1E-13	6.2E-12	7.0E-10	1E-03	9E-03	5E-14	8E-13	1E+05	7E-09	1E-07
		Arsenic	4.7E+00	0.03	6.3E-07	4.3E-06	3.0E-04	2E-03	1E-02	4E-08	6E-07	2E+00	5E-08	9E-07
		Cadmium	7.9E-01	0.001	3.5E-09	2.4E-08	2.5E-05	1E-04	1E-03	2E-10	3E-09			
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	0.03	7.4E-12	5.1E-11	7.0E-10	1E-02	7E-02	4E-13	7E-12	1E+05	6E-08	9E-07
		Arsenic	5.5E+00	0.03	7.3E-07	5.0E-06	3.0E-04	2E-03	2E-02	4E-08	7E-07	2E+00	6E-08	1E-06
		Cadmium	1.8E+00	0.001	8.0E-09	5.5E-08	2.5E-05	3E-04	2E-03	5E-10	7E-09			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	0.03	1.3E-12	8.8E-12	7.0E-10	2E-03	1E-02	8E-14	1E-12	1E+05	1E-08	2E-07
		Arsenic	4.8E+00	0.03	6.3E-07	4.3E-06	3.0E-04	2E-03	1E-02	4E-08	6E-07	2E+00	6E-08	9E-07
		Cadmium	5.5E-01	0.001	2.4E-09	1.7E-08	2.5E-05	1E-04	7E-04	1E-10	2E-09			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	7.4E-12	5.0E-11	7.0E-10	1E-02	7E-02	4E-13	7E-12	1E+05	6E-08	9E-07
		Arsenic	1.0E+01	0.03	1.3E-06	9.1E-06	3.0E-04	4E-03	3E-02	8E-08	1E-06	2E+00	1E-07	2E-06
		Cadmium	2.8E+00	0.001	1.2E-08	8.5E-08	2.5E-05	5E-04	3E-03	7E-10	1E-08			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	3.0E-12	2.1E-11	7.0E-10	4E-03	3E-02	2E-13	3E-12	1E+05	2E-08	4E-07
		Arsenic	6.3E+00	0.03	8.4E-07	5.7E-06	3.0E-04	3E-03	2E-02	5E-08	8E-07	2E+00	7E-08	1E-06
		Cadmium	1.7E+00	0.001	7.5E-09	5.1E-08	2.5E-05	3E-04	2E-03	4E-10	7E-09			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	0.03	6.1E-12	4.2E-11	7.0E-10	9E-03	6E-02	4E-13	6E-12	1E+05	5E-08	7E-07
		Arsenic	7.8E+00	0.03	1.0E-06	7.1E-06	3.0E-04	3E-03	2E-02	6E-08	9E-07	2E+00	9E-08	1E-06
		Cadmium	2.1E+00	0.001	9.4E-09	6.4E-08	2.5E-05	4E-04	3E-03	5E-10	9E-09			
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	0.03	3.0E-12	2.0E-11	7.0E-10	4E-03	3E-02	2E-13	3E-12	1E+05	2E-08	4E-07
		Arsenic	4.0E+00	0.03	5.4E-07	3.7E-06	3.0E-04	2E-03	1E-02	3E-08	5E-07	2E+00	5E-08	7E-07
		Cadmium	1.2E+00	0.001	5.1E-09	3.5E-08	2.5E-05	2E-04	1E-03	3E-10	5E-09			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	0.03	2.8E-12	1.9E-11	7.0E-10	4E-03	3E-02	2E-13	3E-12	1E+05	2E-08	3E-07
		Arsenic	5.6E+00	0.03	7.5E-07	5.1E-06	3.0E-04	2E-03	2E-02	4E-08	7E-07	2E+00	7E-08	1E-06
		Cadmium	1.2E+00	0.001	5.5E-09	3.8E-08	2.5E-05	2E-04	2E-03	3E-10	5E-09			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	3.7E-13	2.5E-12	7.0E-10	5E-04	4E-03	2E-14	3E-13	1E+05	3E-09	4E-08
		Arsenic	1.7E+00	0.03	2.3E-07	1.5E-06	3.0E-04	8E-04	5E-03	1E-08	2E-07	2E+00	2E-08	3E-07
		Cadmium	2.6E-01	0.001	1.2E-09	7.9E-09	2.5E-05	5E-05	3E-04	7E-11	1E-09			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	1.9E-12	1.3E-11	7.0E-10	3E-03	2E-02	1E-13	2E-12	1E+05	1E-08	2E-07
		Arsenic	4.9E+00	0.03	6.5E-07	4.4E-06	3.0E-04	2E-03	1E-02	4E-08	6E-07	2E+00	6E-08	9E-07
		Cadmium	1.2E+00	0.001	5.4E-09	3.7E-08	2.5E-05	2E-04	1E-03	3E-10	5E-09			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-06	1.00	1.4E-12	3.2E-12	7.0E-10	2E-03	5E-03	2E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	1.9E+04	1.00	7.1E-03	1.6E-02	1.0E+00	7E-03	2E-02	9E-04	6E-03			
		Antimony	1.5E+00	1.00	5.6E-07	1.3E-06	4.0E-04	1E-03	3E-03	7E-08	5E-07			
		Arsenic	9.3E+00	0.60	2.1E-06	4.8E-06	3.0E-04	7E-03	2E-02	3E-07	2E-06	2E+00	4E-07	3E-06
		Barium	1.0E+03	1.00	3.9E-04	8.9E-04	2.0E-01	2E-03	4E-03	5E-05	3E-04			
		Cadmium	7.0E-01	1.00	2.6E-07	6.0E-07	1.0E-03	3E-04	6E-04	3E-08	2E-07			
		Chromium	2.0E+01	1.00	7.5E-06	1.7E-05	3.0E-03	3E-03	6E-03	1E-06	6E-06	5E-01	5E-07	3E-06
		Cobalt	5.3E+00	1.00	2.0E-06	4.5E-06	3.0E-04	7E-03	2E-02	3E-07	2E-06			
		Iron	1.7E+04	1.00	6.5E-03	1.5E-02	7.0E-01	9E-03	2E-02	8E-04	5E-03			
		Manganese	4.8E+02	1.00	1.8E-04	4.1E-04	2.4E-02	8E-03	2E-02	2E-05	1E-04			
		Mercury	1.4E-01	1.00	5.3E-08	1.2E-07	3.0E-04	2E-04	4E-04	7E-09	4E-08			
		Thallium	2.1E-01	1.00	7.9E-08	1.8E-07	1.0E-05	8E-03	2E-02	1E-08	6E-08			
		Vanadium	4.2E+01	1.00	1.6E-05	3.6E-05	5.0E-03	3E-03	7E-03	2E-06	1E-05			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	1.00	9.5E-13	2.2E-12	7.0E-10	1E-03	3E-03	1E-13	8E-13	1E+05	2E-08	1E-07
		Aluminum	6.7E+03	1.00	2.5E-03	5.8E-03	1.0E+00	3E-03	6E-03	3E-04	2E-03			
		Antimony	9.0E-02	1.00	3.4E-08	7.7E-08	4.0E-04	8E-05	2E-04	4E-09	3E-08			
		Arsenic	1.0E+00	0.60	2.3E-07	5.1E-07	3.0E-04	8E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	2.0E+02	1.00	7.5E-05	1.7E-04	2.0E-01	4E-04	9E-04	1E-05	6E-05			
		Cadmium	6.4E-02	1.00	2.4E-08	5.5E-08	1.0E-03	2E-05	5E-05	3E-09	2E-08			
		Chromium	8.7E+00	1.00	3.3E-06	7.4E-06	3.0E-03	1E-03	2E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	2.6E+00	1.00	9.8E-07	2.2E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07			
		Iron	8.1E+03	1.00	3.0E-03	6.9E-03	7.0E-01	4E-03	1E-02	4E-04	2E-03			
		Manganese	1.1E+02	1.00	4.1E-05	9.3E-05	2.4E-02	2E-03	4E-03	5E-06	3E-05			
		Mercury	1.2E-02	1.00	4.5E-09	1.0E-08	3.0E-04	2E-05	3E-05	6E-10	4E-09			
		Thallium	8.5E-02	1.00	3.2E-08	7.3E-08	1.0E-05	3E-03	7E-03	4E-09	3E-08			
		Vanadium	9.4E+00	1.00	3.5E-06	8.0E-06	5.0E-03	7E-04	2E-03	5E-07	3E-06			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	1.00	2.5E-13	5.6E-13	7.0E-10	4E-04	8E-04	3E-14	2E-13	1E+05	4E-09	3E-08
		Aluminum	6.4E+03	1.00	2.4E-03	5.4E-03	1.0E+00	2E-03	5E-03	3E-04	2E-03			
		Antimony	9.0E-02	1.00	3.4E-08	7.7E-08	4.0E-04	8E-05	2E-04	4E-09	3E-08			
		Arsenic	9.5E-01	0.60	2.1E-07	4.9E-07	3.0E-04	7E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	2.0E+02	1.00	7.5E-05	1.7E-04	2.0E-01	4E-04	9E-04	1E-05	6E-05			
		Cadmium	7.3E-02	1.00	2.7E-08	6.3E-08	1.0E-03	3E-05	6E-05	4E-09	2E-08			
		Chromium	7.2E+00	1.00	2.7E-06	6.2E-06	3.0E-03	9E-04	2E-03	3E-07	2E-06	5E-01	2E-07	1E-06
		Cobalt	2.4E+00	1.00	9.0E-07	2.1E-06	3.0E-04	3E-03	7E-03	1E-07	7E-07			
		Iron	7.5E+03	1.00	2.8E-03	6.4E-03	7.0E-01	4E-03	9E-03	4E-04	2E-03			
		Manganese	8.4E+01	1.00	3.2E-05	7.2E-05	2.4E-02	1E-03	3E-03	4E-06	3E-05			
		Mercury	1.6E-02	1.00	6.0E-09	1.4E-08	3.0E-04	2E-05	5E-05	8E-10	5E-09			
		Thallium	8.5E-02	1.00	3.2E-08	7.3E-08	1.0E-05	3E-03	7E-03	4E-09	3E-08			
		Vanadium	8.7E+00	1.00	3.3E-06	7.4E-06	5.0E-03	7E-04	1E-03	4E-07	3E-06			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	1.00	1.1E-12	2.5E-12	7.0E-10	2E-03	4E-03	1E-13	9E-13	1E+05	2E-08	1E-07
		Aluminum	7.6E+03	1.00	2.8E-03	6.5E-03	1.0E+00	3E-03	6E-03	4E-04	2E-03			
		Antimony	1.9E-01	1.00	7.1E-08	1.6E-07	4.0E-04	2E-04	4E-04	9E-09	6E-08			
		Arsenic	1.7E+00	0.60	3.8E-07	8.7E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07	2E+00	7E-08	5E-07
		Barium	1.9E+02	1.00	7.2E-05	1.6E-04	2.0E-01	4E-04	8E-04	9E-06	6E-05			
		Cadmium	1.4E-01	1.00	5.3E-08	1.2E-07	1.0E-03	5E-05	1E-04	7E-09	4E-08			
		Chromium	1.1E+01	1.00	4.1E-06	9.2E-06	3.0E-03	1E-03	3E-03	5E-07	3E-06	5E-01	3E-07	2E-06
		Cobalt	3.1E+00	1.00	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	1E-07	9E-07			
		Iron	8.5E+03	1.00	3.2E-03	7.3E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	1.5E+02	1.00	5.8E-05	1.3E-04	2.4E-02	2E-03	5E-03	7E-06	5E-05			
		Mercury	3.3E-02	1.00	1.2E-08	2.8E-08	3.0E-04	4E-05	9E-05	2E-09	1E-08			
		Thallium	1.1E-01	1.00	4.1E-08	9.4E-08	1.0E-05	4E-03	9E-03	5E-09	3E-08			
		Vanadium	1.9E+01	1.00	7.1E-06	1.6E-05	5.0E-03	1E-03	3E-03	9E-07	6E-06			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	1.00	6.4E-13	1.5E-12	7.0E-10	9E-04	2E-03	8E-14	5E-13	1E+05	1E-08	7E-08
		Aluminum	8.2E+03	1.00	3.1E-03	7.0E-03	1.0E+00	3E-03	7E-03	4E-04	3E-03			
		Antimony	2.0E-01	1.00	7.5E-08	1.7E-07	4.0E-04	2E-04	4E-04	1E-08	6E-08			
		Arsenic	1.2E+00	0.60	2.7E-07	6.2E-07	3.0E-04	9E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Barium	3.6E+02	1.00	1.3E-04	3.1E-04	2.0E-01	7E-04	2E-03	2E-05	1E-04			
		Cadmium	1.3E-01	1.00	4.9E-08	1.1E-07	1.0E-03	5E-05	1E-04	6E-09	4E-08			
		Chromium	1.0E+01	1.00	3.8E-06	8.6E-06	3.0E-03	1E-03	3E-03	5E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	2.6E+00	1.00	9.8E-07	2.2E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07			
		Iron	8.7E+03	1.00	3.3E-03	7.4E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	1.1E+02	1.00	4.1E-05	9.3E-05	2.4E-02	2E-03	4E-03	5E-06	3E-05			
		Mercury	2.4E-02	1.00	9.0E-09	2.1E-08	3.0E-04	3E-05	7E-05	1E-09	7E-09			
		Thallium	1.2E-01	1.00	4.5E-08	1.0E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	1.2E+01	1.00	4.4E-06	1.0E-05	5.0E-03	9E-04	2E-03	6E-07	4E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	7.1E-07	1.00	2.7E-13	6.1E-13	7.0E-10	4E-04	9E-04	3E-14	2E-13	1E+05	4E-09	3E-08
		Aluminum	6.6E+03	1.00	2.5E-03	5.7E-03	1.0E+00	2E-03	6E-03	3E-04	2E-03			
		Antimony	4.1E-02	1.00	1.5E-08	3.5E-08	4.0E-04	4E-05	9E-05	2E-09	1E-08			
		Arsenic	1.9E+00	0.60	4.2E-07	9.5E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07	2E+00	8E-08	5E-07
		Barium	8.5E+01	1.00	3.2E-05	7.3E-05	2.0E-01	2E-04	4E-04	4E-06	3E-05			
		Cadmium	4.4E-02	1.00	1.7E-08	3.8E-08	1.0E-03	2E-05	4E-05	2E-09	1E-08			
		Chromium	1.0E+01	1.00	3.9E-06	8.8E-06	3.0E-03	1E-03	3E-03	5E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	2.9E+00	1.00	1.1E-06	2.4E-06	3.0E-04	4E-03	8E-03	1E-07	9E-07			
		Iron	7.9E+03	1.00	3.0E-03	6.8E-03	7.0E-01	4E-03	1E-02	4E-04	2E-03			
		Manganese	1.3E+02	1.00	4.7E-05	1.1E-04	2.4E-02	2E-03	4E-03	6E-06	4E-05			
		Mercury	3.4E-03	1.00	1.3E-09	2.9E-09	3.0E-04	4E-06	1E-05	2E-10	1E-09			
		Thallium	1.1E-01	1.00	3.9E-08	9.0E-08	1.0E-05	4E-03	9E-03	5E-09	3E-08			
		Vanadium	9.4E+00	1.00	3.5E-06	8.0E-06	5.0E-03	7E-04	2E-03	5E-07	3E-06			
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	1.00	2.0E-13	4.5E-13	7.0E-10	3E-04	6E-04	3E-14	2E-13	1E+05	3E-09	2E-08
		Aluminum	4.8E+03	1.00	1.8E-03	4.1E-03	1.0E+00	2E-03	4E-03	2E-04	1E-03			
		Antimony	1.5E-01	1.00	5.6E-08	1.3E-07	4.0E-04	1E-04	3E-04	7E-09	5E-08			
		Arsenic	1.1E+00	0.60	2.5E-07	5.7E-07	3.0E-04	8E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Barium	1.2E+02	1.00	4.5E-05	1.0E-04	2.0E-01	2E-04	5E-04	6E-06	4E-05			
		Cadmium	4.6E-02	1.00	1.7E-08	3.9E-08	1.0E-03	2E-05	4E-05	2E-09	1E-08			
		Chromium	6.3E+00	1.00	2.4E-06	5.4E-06	3.0E-03	8E-04	2E-03	3E-07	2E-06	5E-01	2E-07	1E-06
		Cobalt	2.2E+00	1.00	8.3E-07	1.9E-06	3.0E-04	3E-03	6E-03	1E-07	7E-07			
		Iron	7.6E+03	1.00	2.8E-03	6.5E-03	7.0E-01	4E-03	9E-03	4E-04	2E-03			
		Manganese	9.1E+01	1.00	3.4E-05	7.7E-05	2.4E-02	1E-03	3E-03	4E-06	3E-05			
		Mercury	3.1E-03	1.00	1.2E-09	2.7E-09	3.0E-04	4E-06	9E-06	1E-10	9E-10			
		Thallium	6.9E-02	1.00	2.6E-08	5.9E-08	1.0E-05	3E-03	6E-03	3E-09	2E-08			
		Vanadium	8.3E+00	1.00	3.1E-06	7.1E-06	5.0E-03	6E-04	1E-03	4E-07	3E-06			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	1.0E-06	1.00	3.8E-13	8.7E-13	7.0E-10	5E-04	1E-03	5E-14	3E-13	1E+05	6E-09	4E-08
		Aluminum	8.8E+03	1.00	3.3E-03	7.5E-03	1.0E+00	3E-03	8E-03	4E-04	3E-03			
		Antimony	9.0E-02	1.00	3.4E-08	7.7E-08	4.0E-04	8E-05	2E-04	4E-09	3E-08			
		Arsenic	4.0E+00	0.60	9.0E-07	2.1E-06	3.0E-04	3E-03	7E-03	1E-07	7E-07	2E+00	2E-07	1E-06
		Barium	2.3E+02	1.00	8.5E-05	1.9E-04	2.0E-01	4E-04	1E-03	1E-05	7E-05			
		Cadmium	1.3E-01	1.00	4.9E-08	1.1E-07	1.0E-03	5E-05	1E-04	6E-09	4E-08			
		Chromium	1.1E+01	1.00	4.0E-06	9.1E-06	3.0E-03	1E-03	3E-03	5E-07	3E-06	5E-01	3E-07	2E-06
		Cobalt	4.2E+00	1.00	1.6E-06	3.6E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06			
		Iron	1.2E+04	1.00	4.3E-03	9.8E-03	7.0E-01	6E-03	1E-02	6E-04	4E-03			
		Manganese	3.9E+02	1.00	1.5E-04	3.3E-04	2.4E-02	6E-03	1E-02	2E-05	1E-04			
		Mercury	1.7E-02	1.00	6.4E-09	1.5E-08	3.0E-04	2E-05	5E-05	8E-10	5E-09			
		Thallium	1.3E-01	1.00	4.9E-08	1.1E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	1.7E+01	1.00	6.2E-06	1.4E-05	5.0E-03	1E-03	3E-03	8E-07	5E-06			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	1.00	3.1E-13	7.1E-13	7.0E-10	4E-04	1E-03	4E-14	3E-13	1E+05	5E-09	3E-08
		Aluminum	7.2E+03	1.00	2.7E-03	6.1E-03	1.0E+00	3E-03	6E-03	3E-04	2E-03			
		Antimony	8.5E-02	1.00	3.2E-08	7.3E-08	4.0E-04	8E-05	2E-04	4E-09	3E-08			
		Arsenic	1.6E+00	0.60	3.6E-07	8.2E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07	2E+00	7E-08	4E-07
		Barium	2.0E+02	1.00	7.5E-05	1.7E-04	2.0E-01	4E-04	9E-04	1E-05	6E-05			
		Cadmium	9.3E-02	1.00	3.5E-08	8.0E-08	1.0E-03	3E-05	8E-05	4E-09	3E-08			
		Chromium	8.2E+00	1.00	3.1E-06	7.0E-06	3.0E-03	1E-03	2E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	3.2E+00	1.00	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	2E-07	1E-06			
		Iron	8.8E+03	1.00	3.3E-03	7.5E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	1.6E+02	1.00	5.9E-05	1.3E-04	2.4E-02	2E-03	6E-03	8E-06	5E-05			
		Mercury	1.3E-02	1.00	4.9E-09	1.1E-08	3.0E-04	2E-05	4E-05	6E-10	4E-09			
		Thallium	9.9E-02	1.00	3.7E-08	8.5E-08	1.0E-05	4E-03	8E-03	5E-09	3E-08			
		Vanadium	1.1E+01	1.00	4.0E-06	9.2E-06	5.0E-03	8E-04	2E-03	5E-07	3E-06			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	1.00	2.7E-13	6.2E-13	7.0E-10	4E-04	9E-04	4E-14	2E-13	1E+05	5E-09	3E-08
		Aluminum	9.5E+03	1.00	3.6E-03	8.2E-03	1.0E+00	4E-03	8E-03	5E-04	3E-03			
		Antimony	2.3E-01	1.00	8.6E-08	2.0E-07	4.0E-04	2E-04	5E-04	1E-08	7E-08			
		Arsenic	2.1E+00	0.60	4.7E-07	1.1E-06	3.0E-04	2E-03	4E-03	6E-08	4E-07	2E+00	9E-08	6E-07
		Barium	2.3E+02	1.00	8.5E-05	1.9E-04	2.0E-01	4E-04	1E-03	1E-05	7E-05			
		Cadmium	1.9E-01	1.00	7.1E-08	1.6E-07	1.0E-03	7E-05	2E-04	9E-09	6E-08			
		Chromium	8.9E+00	1.00	3.3E-06	7.6E-06	3.0E-03	1E-03	3E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	4.5E+00	1.00	1.7E-06	3.9E-06	3.0E-04	6E-03	1E-02	2E-07	1E-06			
		Iron	1.1E+04	1.00	4.2E-03	9.7E-03	7.0E-01	6E-03	1E-02	5E-04	3E-03			
		Manganese	4.9E+02	1.00	1.8E-04	4.2E-04	2.4E-02	8E-03	2E-02	2E-05	1E-04			
		Mercury	1.8E-02	1.00	6.8E-09	1.5E-08	3.0E-04	2E-05	5E-05	9E-10	6E-09			
		Thallium	1.2E-01	1.00	4.5E-08	1.0E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	1.2E+01	1.00	4.4E-06	9.9E-06	5.0E-03	9E-04	2E-03	6E-07	4E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	1.00	3.4E-12	7.8E-12	7.0E-10	5E-03	1E-02	4E-13	3E-12	1E+05	6E-08	4E-07
		Aluminum	1.3E+04	1.00	4.7E-03	1.1E-02	1.0E+00	5E-03	1E-02	6E-04	4E-03			
		Antimony	8.0E-01	1.00	3.0E-07	6.8E-07	4.0E-04	8E-04	2E-03	4E-08	2E-07			
		Arsenic	5.1E+00	0.60	1.1E-06	2.6E-06	3.0E-04	4E-03	9E-03	1E-07	9E-07	2E+00	2E-07	1E-06
		Barium	4.9E+02	1.00	1.8E-04	4.2E-04	2.0E-01	9E-04	2E-03	2E-05	2E-04			
		Cadmium	8.5E-01	1.00	3.2E-07	7.3E-07	1.0E-03	3E-04	7E-04	4E-08	3E-07			
		Chromium	1.8E+01	1.00	6.6E-06	1.5E-05	3.0E-03	2E-03	5E-03	8E-07	5E-06	5E-01	4E-07	3E-06
		Cobalt	4.9E+00	1.00	1.8E-06	4.2E-06	3.0E-04	6E-03	1E-02	2E-07	1E-06			
		Iron	1.3E+04	1.00	4.8E-03	1.1E-02	7.0E-01	7E-03	2E-02	6E-04	4E-03			
		Manganese	4.1E+02	1.00	1.5E-04	3.5E-04	2.4E-02	6E-03	1E-02	2E-05	1E-04			
		Mercury	2.7E-01	1.00	1.0E-07	2.3E-07	3.0E-04	3E-04	8E-04	1E-08	8E-08			
		Thallium	1.4E-01	1.00	5.3E-08	1.2E-07	1.0E-05	5E-03	1E-02	7E-09	4E-08			
		Vanadium	3.1E+01	1.00	1.2E-05	2.7E-05	5.0E-03	2E-03	5E-03	1E-06	9E-06			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	1.00	5.7E-13	1.3E-12	7.0E-10	8E-04	2E-03	7E-14	5E-13	1E+05	1E-08	6E-08
		Aluminum	7.9E+03	1.00	3.0E-03	6.8E-03	1.0E+00	3E-03	7E-03	4E-04	2E-03			
		Antimony	3.3E-01	1.00	1.2E-07	2.8E-07	4.0E-04	3E-04	7E-04	2E-08	1E-07			
		Arsenic	2.5E+00	0.60	5.7E-07	1.3E-06	3.0E-04	2E-03	4E-03	7E-08	5E-07	2E+00	1E-07	7E-07
		Barium	2.0E+02	1.00	7.6E-05	1.7E-04	2.0E-01	4E-04	9E-04	1E-05	6E-05			
		Cadmium	2.6E-01	1.00	9.6E-08	2.2E-07	1.0E-03	1E-04	2E-04	1E-08	8E-08			
		Chromium	1.0E+01	1.00	3.8E-06	8.6E-06	3.0E-03	1E-03	3E-03	5E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	3.5E+00	1.00	1.3E-06	3.0E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06			
		Iron	9.9E+03	1.00	3.7E-03	8.5E-03	7.0E-01	5E-03	1E-02	5E-04	3E-03			
		Manganese	2.6E+02	1.00	9.9E-05	2.3E-04	2.4E-02	4E-03	9E-03	1E-05	8E-05			
		Mercury	4.0E-02	1.00	1.5E-08	3.4E-08	3.0E-04	5E-05	1E-04	2E-09	1E-08			
		Thallium	8.7E-02	1.00	3.3E-08	7.5E-08	1.0E-05	3E-03	7E-03	4E-09	3E-08			
		Vanadium	1.1E+01	1.00	4.3E-06	9.8E-06	5.0E-03	9E-04	2E-03	6E-07	4E-06			
Upland	38[a]	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	1.00	7.9E-13	1.8E-12	7.0E-10	1E-03	3E-03	1E-13	6E-13	1E+05	1E-08	8E-08
		Aluminum	2.7E+03	1.00	1.0E-03	2.3E-03	1.0E+00	1E-03	2E-03	1E-04	8E-04			
		Antimony	8.5E-02	1.00	3.2E-08	7.3E-08	4.0E-04	8E-05	2E-04	4E-09	3E-08			
		Arsenic	1.0E+00	0.60	2.3E-07	5.1E-07	3.0E-04	8E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	4.4E+01	1.00	1.7E-05	3.8E-05	2.0E-01	8E-05	2E-04	2E-06	1E-05			
		Cadmium	1.6E-02	1.00	6.0E-09	1.4E-08	1.0E-03	6E-06	1E-05	8E-10	5E-09			
		Chromium	3.8E+00	1.00	1.4E-06	3.3E-06	3.0E-03	5E-04	1E-03	2E-07	1E-06	5E-01	9E-08	6E-07
		Cobalt	1.5E+00	1.00	5.6E-07	1.3E-06	3.0E-04	2E-03	4E-03	7E-08	5E-07			
		Iron	5.2E+03	1.00	2.0E-03	4.5E-03	7.0E-01	3E-03	6E-03	3E-04	2E-03			
		Manganese	3.9E+01	1.00	1.4E-05	3.3E-05	2.4E-02	6E-04	1E-03	2E-06	1E-05			
		Mercury	4.6E-03	1.00	1.7E-09	3.9E-09	3.0E-04	6E-06	1E-05	2E-10	1E-09			
		Thallium	1.7E-02	1.00	6.2E-09	1.4E-08	1.0E-05	6E-04	1E-03	8E-10	5E-09			
		Vanadium	5.3E+00	1.00	2.0E-06	4.5E-06	5.0E-03	4E-04	9E-04	3E-07	2E-06			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	1.0E-12	2.4E-12	7.0E-10	1E-03	3E-03	1E-13	8E-13	1E+05	2E-08	1E-07
		Aluminum	9.7E+03	1.00	3.6E-03	8.3E-03	1.0E+00	4E-03	8E-03	5E-04	3E-03			
		Antimony	4.3E-01	1.00	1.6E-07	3.6E-07	4.0E-04	4E-04	9E-04	2E-08	1E-07			
		Arsenic	2.2E+00	0.60	4.9E-07	1.1E-06	3.0E-04	2E-03	4E-03	6E-08	4E-07	2E+00	9E-08	6E-07
		Barium	4.3E+02	1.00	1.6E-04	3.6E-04	2.0E-01	8E-04	2E-03	2E-05	1E-04			
		Cadmium	3.3E-01	1.00	1.2E-07	2.8E-07	1.0E-03	1E-04	3E-04	2E-08	1E-07			
		Chromium	1.2E+01	1.00	4.5E-06	1.0E-05	3.0E-03	1E-03	3E-03	6E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	3.3E+00	1.00	1.2E-06	2.8E-06	3.0E-04	4E-03	9E-03	2E-07	1E-06			
		Iron	9.9E+03	1.00	3.7E-03	8.5E-03	7.0E-01	5E-03	1E-02	5E-04	3E-03			
		Manganese	1.3E+02	1.00	5.0E-05	1.1E-04	2.4E-02	2E-03	5E-03	6E-06	4E-05			
		Mercury	7.4E-02	1.00	2.8E-08	6.3E-08	3.0E-04	9E-05	2E-04	4E-09	2E-08			
		Thallium	1.3E-01	1.00	5.0E-08	1.1E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	1.8E+01	1.00	6.8E-06	1.5E-05	5.0E-03	1E-03	3E-03	9E-07	6E-06			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	1.00	1.3E-12	3.0E-12	7.0E-10	2E-03	4E-03	2E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	6.0E+03	1.00	2.2E-03	5.1E-03	1.0E+00	2E-03	5E-03	3E-04	2E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.4E+00	0.60	3.2E-07	7.2E-07	3.0E-04	1E-03	2E-03	4E-08	3E-07	2E+00	6E-08	4E-07
		Barium	2.1E+02	1.00	7.7E-05	1.8E-04	2.0E-01	4E-04	9E-04	1E-05	6E-05			
		Cadmium	2.8E-01	1.00	1.1E-07	2.4E-07	1.0E-03	1E-04	2E-04	1E-08	9E-08			
		Chromium	1.1E+01	1.00	4.2E-06	9.5E-06	3.0E-03	1E-03	3E-03	5E-07	3E-06	5E-01	3E-07	2E-06
		Cobalt	2.2E+00	1.00	8.3E-07	1.9E-06	3.0E-04	3E-03	6E-03	1E-07	7E-07			
		Iron	6.3E+03	1.00	2.3E-03	5.4E-03	7.0E-01	3E-03	8E-03	3E-04	2E-03			
		Manganese	9.2E+01	1.00	3.4E-05	7.9E-05	2.4E-02	1E-03	3E-03	4E-06	3E-05			
		Mercury	4.0E-02	1.00	1.5E-08	3.4E-08	3.0E-04	5E-05	1E-04	2E-09	1E-08			
		Thallium	6.8E-02	1.00	2.6E-08	5.8E-08	1.0E-05	3E-03	6E-03	3E-09	2E-08			
		Vanadium	7.6E+00	1.00	2.9E-06	6.5E-06	5.0E-03	6E-04	1E-03	4E-07	2E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	1.5E-12	3.4E-12	7.0E-10	2E-03	5E-03	2E-13	1E-12	1E+05	2E-08	2E-07
		Aluminum	5.7E+03	1.00	2.1E-03	4.9E-03	1.0E+00	2E-03	5E-03	3E-04	2E-03			
		Antimony	4.2E-02	1.00	1.6E-08	3.6E-08	4.0E-04	4E-05	9E-05	2E-09	1E-08			
		Arsenic	1.3E+00	0.60	2.9E-07	6.7E-07	3.0E-04	1E-03	2E-03	4E-08	2E-07	2E+00	6E-08	4E-07
		Barium	3.2E+02	1.00	1.2E-04	2.7E-04	2.0E-01	6E-04	1E-03	2E-05	1E-04			
		Cadmium	2.8E-01	1.00	1.1E-07	2.4E-07	1.0E-03	1E-04	2E-04	1E-08	9E-08			
		Chromium	8.3E+00	1.00	3.1E-06	7.1E-06	3.0E-03	1E-03	2E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	1.6E+00	1.00	6.0E-07	1.4E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07			
		Iron	4.7E+03	1.00	1.8E-03	4.1E-03	7.0E-01	3E-03	6E-03	2E-04	1E-03			
		Manganese	1.3E+02	1.00	4.8E-05	1.1E-04	2.4E-02	2E-03	5E-03	6E-06	4E-05			
		Mercury	5.7E-02	1.00	2.1E-08	4.9E-08	3.0E-04	7E-05	2E-04	3E-09	2E-08			
		Thallium	6.5E-03	1.00	2.4E-09	5.6E-09	1.0E-05	2E-04	6E-04	3E-10	2E-09			
		Vanadium	5.3E+00	1.00	2.0E-06	4.5E-06	5.0E-03	4E-04	9E-04	3E-07	2E-06			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	1.00	2.8E-12	6.4E-12	7.0E-10	4E-03	9E-03	4E-13	2E-12	1E+05	5E-08	3E-07
		Aluminum	1.3E+04	1.00	4.8E-03	1.1E-02	1.0E+00	5E-03	1E-02	6E-04	4E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.1E+00	0.60	7.0E-07	1.6E-06	3.0E-04	2E-03	5E-03	9E-08	6E-07	2E+00	1E-07	9E-07
		Barium	3.0E+02	1.00	1.1E-04	2.6E-04	2.0E-01	6E-04	1E-03	1E-05	9E-05			
		Cadmium	3.2E-01	1.00	1.2E-07	2.7E-07	1.0E-03	1E-04	3E-04	2E-08	1E-07			
		Chromium	2.1E+01	1.00	7.7E-06	1.8E-05	3.0E-03	3E-03	6E-03	1E-06	6E-06	5E-01	5E-07	3E-06
		Cobalt	4.9E+00	1.00	1.8E-06	4.2E-06	3.0E-04	6E-03	1E-02	2E-07	1E-06			
		Iron	1.6E+04	1.00	6.0E-03	1.4E-02	7.0E-01	9E-03	2E-02	8E-04	5E-03			
		Manganese	3.0E+02	1.00	1.1E-04	2.5E-04	2.4E-02	5E-03	1E-02	1E-05	9E-05			
		Mercury	1.6E-01	1.00	6.0E-08	1.4E-07	3.0E-04	2E-04	5E-04	8E-09	5E-08			
		Thallium	1.7E-01	1.00	6.4E-08	1.5E-07	1.0E-05	6E-03	1E-02	8E-09	5E-08			
		Vanadium	1.8E+01	1.00	6.8E-06	1.6E-05	5.0E-03	1E-03	3E-03	9E-07	6E-06			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	1.5E-12	3.3E-12	7.0E-10	2E-03	5E-03	2E-13	1E-12	1E+05	2E-08	2E-07
		Aluminum	9.1E+03	1.00	3.4E-03	7.8E-03	1.0E+00	3E-03	8E-03	4E-04	3E-03			
		Antimony	7.6E-01	1.00	2.9E-07	6.5E-07	4.0E-04	7E-04	2E-03	4E-08	2E-07			
		Arsenic	2.8E+00	0.60	6.3E-07	1.4E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07	2E+00	1E-07	8E-07
		Barium	5.8E+02	1.00	2.2E-04	4.9E-04	2.0E-01	1E-03	2E-03	3E-05	2E-04			
		Cadmium	4.7E-01	1.00	1.8E-07	4.0E-07	1.0E-03	2E-04	4E-04	2E-08	1E-07			
		Chromium	1.3E+01	1.00	5.0E-06	1.1E-05	3.0E-03	2E-03	4E-03	6E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	2.8E+00	1.00	1.1E-06	2.4E-06	3.0E-04	4E-03	8E-03	1E-07	9E-07			
		Iron	7.8E+03	1.00	2.9E-03	6.7E-03	7.0E-01	4E-03	1E-02	4E-04	2E-03			
		Manganese	1.5E+02	1.00	5.6E-05	1.3E-04	2.4E-02	2E-03	5E-03	7E-06	5E-05			
		Mercury	1.2E-01	1.00	4.5E-08	1.0E-07	3.0E-04	2E-04	3E-04	6E-09	4E-08			
		Thallium	9.6E-02	1.00	3.6E-08	8.2E-08	1.0E-05	4E-03	8E-03	5E-09	3E-08			
		Vanadium	2.7E+01	1.00	1.0E-05	2.3E-05	5.0E-03	2E-03	5E-03	1E-06	8E-06			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	8.1E-13	1.8E-12	7.0E-10	1E-03	3E-03	1E-13	7E-13	1E+05	1E-08	9E-08
		Aluminum	9.9E+03	1.00	3.7E-03	8.5E-03	1.0E+00	4E-03	8E-03	5E-04	3E-03			
		Antimony	1.2E+00	1.00	4.4E-07	1.0E-06	4.0E-04	1E-03	2E-03	6E-08	4E-07			
		Arsenic	4.4E+00	0.60	9.9E-07	2.3E-06	3.0E-04	3E-03	8E-03	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	2.9E+02	1.00	1.1E-04	2.5E-04	2.0E-01	5E-04	1E-03	1E-05	9E-05			
		Cadmium	8.0E-01	1.00	3.0E-07	6.8E-07	1.0E-03	3E-04	7E-04	4E-08	2E-07			
		Chromium	1.2E+01	1.00	4.5E-06	1.0E-05	3.0E-03	1E-03	3E-03	6E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	3.0E+00	1.00	1.1E-06	2.6E-06	3.0E-04	4E-03	9E-03	1E-07	9E-07			
		Iron	8.1E+03	1.00	3.0E-03	6.9E-03	7.0E-01	4E-03	1E-02	4E-04	2E-03			
		Manganese	3.3E+02	1.00	1.3E-04	2.9E-04	2.4E-02	5E-03	1E-02	2E-05	1E-04			
		Mercury	1.6E-01	1.00	5.9E-08	1.3E-07	3.0E-04	2E-04	4E-04	8E-09	5E-08			
		Thallium	9.5E-02	1.00	3.5E-08	8.1E-08	1.0E-05	4E-03	8E-03	5E-09	3E-08			
		Vanadium	3.4E+01	1.00	1.3E-05	2.9E-05	5.0E-03	3E-03	6E-03	2E-06	1E-05			
Upland	45[a]	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	1.00	1.4E-13	3.2E-13	7.0E-10	2E-04	5E-04	2E-14	1E-13	1E+05	2E-09	1E-08
		Aluminum	2.1E+04	1.00	7.9E-03	1.8E-02	1.0E+00	8E-03	2E-02	1E-03	6E-03			
		Antimony	2.3E-01	1.00	8.6E-08	2.0E-07	4.0E-04	2E-04	5E-04	1E-08	7E-08			
		Arsenic	3.1E+00	0.60	7.0E-07	1.6E-06	3.0E-04	2E-03	5E-03	9E-08	6E-07	2E+00	1E-07	9E-07
		Barium	3.1E+02	1.00	1.2E-04	2.7E-04	2.0E-01	6E-04	1E-03	2E-05	1E-04			
		Cadmium	8.0E-02	1.00	3.0E-08	6.8E-08	1.0E-03	3E-05	7E-05	4E-09	2E-08			
		Chromium	1.8E+01	1.00	6.9E-06	1.6E-05	3.0E-03	2E-03	5E-03	9E-07	6E-06	5E-01	4E-07	3E-06
		Cobalt	6.9E+00	1.00	2.6E-06	5.9E-06	3.0E-04	9E-03	2E-02	3E-07	2E-06			
		Iron	2.0E+04	1.00	7.6E-03	1.7E-02	7.0E-01	1E-02	2E-02	1E-03	6E-03			
		Manganese	1.8E+02	1.00	6.6E-05	1.5E-04	2.4E-02	3E-03	6E-03	8E-06	5E-05			
		Mercury	1.9E-02	1.00	7.1E-09	1.6E-08	3.0E-04	2E-05	5E-05	9E-10	6E-09			
		Thallium	2.1E-01	1.00	7.9E-08	1.8E-07	1.0E-05	8E-03	2E-02	1E-08	6E-08			
		Vanadium	1.9E+01	1.00	7.1E-06	1.6E-05	5.0E-03	1E-03	3E-03	9E-07	6E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-06	1.00	1.1E-12	2.6E-12	7.0E-10	2E-03	4E-03	1E-13	9E-13	1E+05	2E-08	1E-07
		Aluminum	1.2E+04	1.00	4.4E-03	1.0E-02	1.0E+00	4E-03	1E-02	6E-04	4E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.3E+00	0.60	5.2E-07	1.2E-06	3.0E-04	2E-03	4E-03	7E-08	4E-07	2E+00	1E-07	6E-07
		Barium	4.2E+02	1.00	1.6E-04	3.6E-04	2.0E-01	8E-04	2E-03	2E-05	1E-04			
		Cadmium	2.4E-01	1.00	9.0E-08	2.1E-07	1.0E-03	9E-05	2E-04	1E-08	7E-08			
		Chromium	1.7E+01	1.00	6.5E-06	1.5E-05	3.0E-03	2E-03	5E-03	8E-07	5E-06	5E-01	4E-07	3E-06
		Cobalt	4.9E+00	1.00	1.8E-06	4.2E-06	3.0E-04	6E-03	1E-02	2E-07	1E-06			
		Iron	1.4E+04	1.00	5.3E-03	1.2E-02	7.0E-01	8E-03	2E-02	7E-04	4E-03			
		Manganese	2.4E+02	1.00	8.8E-05	2.0E-04	2.4E-02	4E-03	8E-03	1E-05	7E-05			
		Mercury	4.1E-02	1.00	1.5E-08	3.5E-08	3.0E-04	5E-05	1E-04	2E-09	1E-08			
		Thallium	1.6E-01	1.00	6.0E-08	1.4E-07	1.0E-05	6E-03	1E-02	8E-09	5E-08			
		Vanadium	1.8E+01	1.00	6.6E-06	1.5E-05	5.0E-03	1E-03	3E-03	9E-07	5E-06			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	6.1E-12	1.4E-11	7.0E-10	9E-03	2E-02	8E-13	5E-12	1E+05	1E-07	6E-07
		Aluminum	1.8E+04	1.00	6.6E-03	1.5E-02	1.0E+00	7E-03	2E-02	8E-04	5E-03			
		Antimony	1.6E+00	1.00	6.0E-07	1.4E-06	4.0E-04	2E-03	3E-03	8E-08	5E-07			
		Arsenic	1.3E+01	0.60	2.9E-06	6.6E-06	3.0E-04	1E-02	2E-02	4E-07	2E-06	2E+00	6E-07	4E-06
		Barium	5.6E+02	1.00	2.1E-04	4.8E-04	2.0E-01	1E-03	2E-03	3E-05	2E-04			
		Cadmium	5.2E+00	1.00	2.0E-06	4.5E-06	1.0E-03	2E-03	4E-03	3E-07	2E-06			
		Chromium	2.2E+01	1.00	8.3E-06	1.9E-05	3.0E-03	3E-03	6E-03	1E-06	7E-06	5E-01	5E-07	3E-06
		Cobalt	2.0E+00	1.00	7.5E-07	1.7E-06	3.0E-04	3E-03	6E-03	1E-07	6E-07			
		Iron	2.9E+03	1.00	1.1E-03	2.5E-03	7.0E-01	2E-03	4E-03	1E-04	9E-04			
		Manganese	1.1E+03	1.00	4.3E-04	9.8E-04	2.4E-02	2E-02	4E-02	5E-05	3E-04			
		Mercury	8.1E-01	1.00	3.0E-07	6.9E-07	3.0E-04	1E-03	2E-03	4E-08	2E-07			
		Thallium	2.1E-01	1.00	7.9E-08	1.8E-07	1.0E-05	8E-03	2E-02	1E-08	6E-08			
		Vanadium	5.1E+01	1.00	1.9E-05	4.3E-05	5.0E-03	4E-03	9E-03	2E-06	2E-05			
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	1.00	1.8E-11	4.2E-11	7.0E-10	3E-02	6E-02	2E-12	2E-11	1E+05	3E-07	2E-06
		Aluminum	1.9E+04	1.00	7.0E-03	1.6E-02	1.0E+00	7E-03	2E-02	9E-04	6E-03			
		Antimony	2.4E+00	1.00	9.0E-07	2.1E-06	4.0E-04	2E-03	5E-03	1E-07	7E-07			
		Arsenic	1.4E+01	0.60	3.2E-06	7.3E-06	3.0E-04	1E-02	2E-02	4E-07	3E-06	2E+00	6E-07	4E-06
		Barium	8.0E+02	1.00	3.0E-04	6.8E-04	2.0E-01	1E-03	3E-03	4E-05	2E-04			
		Cadmium	8.3E+00	1.00	3.1E-06	7.1E-06	1.0E-03	3E-03	7E-03	4E-07	3E-06			
		Chromium	5.8E+01	1.00	2.2E-05	5.0E-05	3.0E-03	7E-03	2E-02	3E-06	2E-05	5E-01	1E-06	9E-06
		Cobalt	2.0E+00	1.00	7.5E-07	1.7E-06	3.0E-04	3E-03	6E-03	1E-07	6E-07			
		Iron	3.6E+03	1.00	1.3E-03	3.1E-03	7.0E-01	2E-03	4E-03	2E-04	1E-03			
		Manganese	1.7E+03	1.00	6.2E-04	1.4E-03	2.4E-02	3E-02	6E-02	8E-05	5E-04			
		Mercury	2.5E+00	1.00	9.4E-07	2.1E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07			
		Thallium	3.3E-01	1.00	1.2E-07	2.8E-07	1.0E-05	1E-02	3E-02	2E-08	1E-07			
		Vanadium	7.1E+01	1.00	2.6E-05	6.0E-05	5.0E-03	5E-03	1E-02	3E-06	2E-05			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	1.00	1.5E-11	3.4E-11	7.0E-10	2E-02	5E-02	2E-12	1E-11	1E+05	2E-07	2E-06
		Aluminum	1.4E+04	1.00	5.4E-03	1.2E-02	1.0E+00	5E-03	1E-02	7E-04	4E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.6E+00	0.60	8.1E-07	1.8E-06	3.0E-04	3E-03	6E-03	1E-07	7E-07	2E+00	2E-07	1E-06
		Barium	1.0E+03	1.00	3.8E-04	8.6E-04	2.0E-01	2E-03	4E-03	5E-05	3E-04			
		Cadmium	2.0E+00	1.00	7.5E-07	1.7E-06	1.0E-03	8E-04	2E-03	1E-07	6E-07			
		Chromium	2.9E+01	1.00	1.1E-05	2.5E-05	3.0E-03	4E-03	8E-03	1E-06	9E-06	5E-01	7E-07	4E-06
		Cobalt	4.5E+00	1.00	1.7E-06	3.9E-06	3.0E-04	6E-03	1E-02	2E-07	1E-06			
		Iron	1.5E+04	1.00	5.6E-03	1.3E-02	7.0E-01	8E-03	2E-02	7E-04	5E-03			
		Manganese	5.8E+02	1.00	2.2E-04	4.9E-04	2.4E-02	9E-03	2E-02	3E-05	2E-04			
		Mercury	8.0E+00	1.00	3.0E-06	6.8E-06	3.0E-04	1E-02	2E-02	4E-07	2E-06			
		Thallium	1.6E-01	1.00	6.0E-08	1.4E-07	1.0E-05	6E-03	1E-02	8E-09	5E-08			
		Vanadium	2.2E+01	1.00	8.2E-06	1.9E-05	5.0E-03	2E-03	4E-03	1E-06	7E-06			
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	1.00	9.1E-12	2.1E-11	7.0E-10	1E-02	3E-02	1E-12	7E-12	1E+05	2E-07	1E-06
		Aluminum	1.2E+04	1.00	4.3E-03	9.9E-03	1.0E+00	4E-03	1E-02	6E-04	4E-03			
		Antimony	1.2E+00	1.00	4.3E-07	9.8E-07	4.0E-04	1E-03	2E-03	6E-08	4E-07			
		Arsenic	7.9E+00	0.60	1.8E-06	4.0E-06	3.0E-04	6E-03	1E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	5.2E+02	1.00	1.9E-04	4.4E-04	2.0E-01	1E-03	2E-03	3E-05	2E-04			
		Cadmium	3.9E+00	1.00	1.5E-06	3.3E-06	1.0E-03	1E-03	3E-03	2E-07	1E-06			
		Chromium	2.4E+01	1.00	9.1E-06	2.1E-05	3.0E-03	3E-03	7E-03	1E-06	7E-06	5E-01	6E-07	4E-06
		Cobalt	2.2E+00	1.00	8.3E-07	1.9E-06	3.0E-04	3E-03	6E-03	1E-07	7E-07			
		Iron	4.4E+03	1.00	1.6E-03	3.7E-03	7.0E-01	2E-03	5E-03	2E-04	1E-03			
		Manganese	1.3E+03	1.00	4.7E-04	1.1E-03	2.4E-02	2E-02	4E-02	6E-05	4E-04			
		Mercury	7.5E-01	1.00	2.8E-07	6.4E-07	3.0E-04	9E-04	2E-03	4E-08	2E-07			
		Thallium	1.9E-01	1.00	7.1E-08	1.6E-07	1.0E-05	7E-03	2E-02	9E-09	6E-08			
		Vanadium	2.9E+01	1.00	1.1E-05	2.4E-05	5.0E-03	2E-03	5E-03	1E-06	9E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	1.00	1.2E-12	2.7E-12	7.0E-10	2E-03	4E-03	2E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	3.2E+03	1.00	1.2E-03	2.7E-03	1.0E+00	1E-03	3E-03	2E-04	1E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.2E+00	0.60	5.0E-07	1.1E-06	3.0E-04	2E-03	4E-03	6E-08	4E-07	2E+00	1E-07	6E-07
		Barium	1.1E+02	1.00	4.1E-05	9.2E-05	2.0E-01	2E-04	5E-04	5E-06	3E-05			
		Cadmium	5.2E-01	1.00	2.0E-07	4.5E-07	1.0E-03	2E-04	4E-04	3E-08	2E-07			
		Chromium	9.0E+00	1.00	3.4E-06	7.7E-06	3.0E-03	1E-03	3E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	2.0E+00	1.00	7.5E-07	1.7E-06	3.0E-04	3E-03	6E-03	1E-07	6E-07			
		Iron	5.2E+03	1.00	1.9E-03	4.4E-03	7.0E-01	3E-03	6E-03	2E-04	2E-03			
		Manganese	2.2E+02	1.00	8.3E-05	1.9E-04	2.4E-02	3E-03	8E-03	1E-05	7E-05			
		Mercury	1.6E-01	1.00	6.0E-08	1.4E-07	3.0E-04	2E-04	5E-04	8E-09	5E-08			
		Thallium	5.2E-02	1.00	2.0E-08	4.5E-08	1.0E-05	2E-03	4E-03	3E-09	2E-08			
		Vanadium	9.2E+00	1.00	3.5E-06	7.9E-06	5.0E-03	7E-04	2E-03	4E-07	3E-06			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	8.1E-13	1.8E-12	7.0E-10	1E-03	3E-03	1E-13	7E-13	1E+05	1E-08	9E-08
		Aluminum	4.9E+03	1.00	1.8E-03	4.2E-03	1.0E+00	2E-03	4E-03	2E-04	1E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.8E+00	0.60	4.0E-07	9.1E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07	2E+00	8E-08	5E-07
		Barium	9.6E+01	1.00	3.6E-05	8.3E-05	2.0E-01	2E-04	4E-04	5E-06	3E-05			
		Cadmium	1.6E-01	1.00	6.0E-08	1.4E-07	1.0E-03	6E-05	1E-04	8E-09	5E-08			
		Chromium	6.8E+00	1.00	2.6E-06	5.9E-06	3.0E-03	9E-04	2E-03	3E-07	2E-06	5E-01	2E-07	1E-06
		Cobalt	2.7E+00	1.00	1.0E-06	2.3E-06	3.0E-04	3E-03	8E-03	1E-07	8E-07			
		Iron	6.8E+03	1.00	2.6E-03	5.9E-03	7.0E-01	4E-03	8E-03	3E-04	2E-03			
		Manganese	1.3E+02	1.00	5.0E-05	1.1E-04	2.4E-02	2E-03	5E-03	6E-06	4E-05			
		Mercury	5.5E-02	1.00	2.1E-08	4.7E-08	3.0E-04	7E-05	2E-04	3E-09	2E-08			
		Thallium	6.6E-02	1.00	2.5E-08	5.6E-08	1.0E-05	2E-03	6E-03	3E-09	2E-08			
		Vanadium	7.7E+00	1.00	2.9E-06	6.6E-06	5.0E-03	6E-04	1E-03	4E-07	2E-06			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	8.5E-12	1.9E-11	7.0E-10	1E-02	3E-02	1E-12	7E-12	1E+05	1E-07	9E-07
		Aluminum	1.2E+04	1.00	4.5E-03	1.0E-02	1.0E+00	5E-03	1E-02	6E-04	4E-03			
		Antimony	4.6E-01	1.00	1.7E-07	3.9E-07	4.0E-04	4E-04	1E-03	2E-08	1E-07			
		Arsenic	2.6E+00	0.60	5.9E-07	1.3E-06	3.0E-04	2E-03	4E-03	8E-08	5E-07	2E+00	1E-07	7E-07
		Barium	5.7E+02	1.00	2.1E-04	4.9E-04	2.0E-01	1E-03	2E-03	3E-05	2E-04			
		Cadmium	1.2E+00	1.00	4.5E-07	1.0E-06	1.0E-03	5E-04	1E-03	6E-08	4E-07			
		Chromium	2.2E+01	1.00	8.1E-06	1.8E-05	3.0E-03	3E-03	6E-03	1E-06	7E-06	5E-01	5E-07	3E-06
		Cobalt	3.8E+00	1.00	1.4E-06	3.3E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06			
		Iron	1.2E+04	1.00	4.5E-03	1.0E-02	7.0E-01	6E-03	1E-02	6E-04	4E-03			
		Manganese	4.4E+02	1.00	1.6E-04	3.8E-04	2.4E-02	7E-03	2E-02	2E-05	1E-04			
		Mercury	4.3E+00	1.00	1.6E-06	3.7E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06			
		Thallium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02	7E-09	5E-08			
		Vanadium	1.4E+01	1.00	5.2E-06	1.2E-05	5.0E-03	1E-03	2E-03	7E-07	4E-06			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	5.4E-12	1.2E-11	7.0E-10	8E-03	2E-02	7E-13	4E-12	1E+05	9E-08	6E-07
		Aluminum	1.1E+04	1.00	4.0E-03	9.2E-03	1.0E+00	4E-03	9E-03	5E-04	3E-03			
		Antimony	1.9E+00	1.00	7.1E-07	1.6E-06	4.0E-04	2E-03	4E-03	9E-08	6E-07			
		Arsenic	1.1E+01	0.60	2.4E-06	5.5E-06	3.0E-04	8E-03	2E-02	3E-07	2E-06	2E+00	5E-07	3E-06
		Barium	7.1E+02	1.00	2.6E-04	6.0E-04	2.0E-01	1E-03	3E-03	3E-05	2E-04			
		Cadmium	4.7E+00	1.00	1.8E-06	4.0E-06	1.0E-03	2E-03	4E-03	2E-07	1E-06			
		Chromium	2.4E+01	1.00	8.8E-06	2.0E-05	3.0E-03	3E-03	7E-03	1E-06	7E-06	5E-01	6E-07	4E-06
		Cobalt	2.3E+00	1.00	8.6E-07	2.0E-06	3.0E-04	3E-03	7E-03	1E-07	7E-07			
		Iron	3.7E+03	1.00	1.4E-03	3.1E-03	7.0E-01	2E-03	4E-03	2E-04	1E-03			
		Manganese	2.0E+03	1.00	7.4E-04	1.7E-03	2.4E-02	3E-02	7E-02	1E-04	6E-04			
		Mercury	7.2E-01	1.00	2.7E-07	6.2E-07	3.0E-04	9E-04	2E-03	3E-08	2E-07			
		Thallium	1.9E-01	1.00	7.1E-08	1.6E-07	1.0E-05	7E-03	2E-02	9E-09	6E-08			
		Vanadium	1.4E+01	1.00	5.2E-06	1.2E-05	5.0E-03	1E-03	2E-03	7E-07	4E-06			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	2.1E-11	4.7E-11	7.0E-10	3E-02	7E-02	3E-12	2E-11	1E+05	3E-07	2E-06
		Aluminum	1.5E+04	1.00	5.8E-03	1.3E-02	1.0E+00	6E-03	1E-02	7E-04	5E-03			
		Antimony	1.2E+00	1.00	4.5E-07	1.0E-06	4.0E-04	1E-03	3E-03	6E-08	4E-07			
		Arsenic	1.4E+01	0.60	3.0E-06	6.9E-06	3.0E-04	1E-02	2E-02	4E-07	2E-06	2E+00	6E-07	4E-06
		Barium	1.1E+03	1.00	4.2E-04	9.6E-04	2.0E-01	2E-03	5E-03	5E-05	3E-04			
		Cadmium	5.6E+00	1.00	2.1E-06	4.8E-06	1.0E-03	2E-03	5E-03	3E-07	2E-06			
		Chromium	4.2E+01	1.00	1.6E-05	3.6E-05	3.0E-03	5E-03	1E-02	2E-06	1E-05	5E-01	1E-06	6E-06
		Cobalt	1.6E+00	1.00	6.0E-07	1.4E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07			
		Iron	2.7E+03	1.00	1.0E-03	2.3E-03	7.0E-01	1E-03	3E-03	1E-04	8E-04			
		Manganese	2.7E+03	1.00	1.0E-03	2.3E-03	2.4E-02	4E-02	1E-01	1E-04	8E-04			
		Mercury	1.1E+00	1.00	4.1E-07	9.4E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07			
		Thallium	2.7E-01	1.00	1.0E-07	2.3E-07	1.0E-05	1E-02	2E-02	1E-08	8E-08			
		Vanadium	4.9E+01	1.00	1.8E-05	4.2E-05	5.0E-03	4E-03	8E-03	2E-06	1E-05			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.9E-05	1.00	2.2E-11	5.0E-11	7.0E-10	3E-02	7E-02	3E-12	2E-11	1E+05	4E-07	2E-06
		Aluminum	1.6E+04	1.00	6.0E-03	1.4E-02	1.0E+00	6E-03	1E-02	8E-04	5E-03			
		Antimony	1.7E+00	1.00	6.4E-07	1.5E-06	4.0E-04	2E-03	4E-03	8E-08	5E-07			
		Arsenic	1.2E+01	0.60	2.8E-06	6.3E-06	3.0E-04	9E-03	2E-02	4E-07	2E-06	2E+00	5E-07	3E-06
		Barium	7.8E+02	1.00	2.9E-04	6.7E-04	2.0E-01	1E-03	3E-03	4E-05	2E-04			
		Cadmium	6.7E+00	1.00	2.5E-06	5.7E-06	1.0E-03	2E-03	6E-03	3E-07	2E-06			
		Chromium	4.9E+01	1.00	1.8E-05	4.2E-05	3.0E-03	6E-03	1E-02	2E-06	1E-05	5E-01	1E-06	7E-06
		Cobalt	2.4E+00	1.00	9.1E-07	2.1E-06	3.0E-04	3E-03	7E-03	1E-07	7E-07			
		Iron	5.2E+03	1.00	2.0E-03	4.5E-03	7.0E-01	3E-03	6E-03	3E-04	2E-03			
		Manganese	1.8E+03	1.00	6.9E-04	1.6E-03	2.4E-02	3E-02	7E-02	9E-05	6E-04			
		Mercury	1.3E+00	1.00	4.8E-07	1.1E-06	3.0E-04	2E-03	4E-03	6E-08	4E-07			
		Thallium	3.5E-01	1.00	1.3E-07	3.0E-07	1.0E-05	1E-02	3E-02	2E-08	1E-07			
		Vanadium	5.8E+01	1.00	2.2E-05	4.9E-05	5.0E-03	4E-03	1E-02	3E-06	2E-05			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	3.1E-11	7.1E-11	7.0E-10	4E-02	1E-01	4E-12	3E-11	1E+05	5E-07	3E-06
		Aluminum	1.6E+04	1.00	6.0E-03	1.4E-02	1.0E+00	6E-03	1E-02	8E-04	5E-03			
		Antimony	2.3E+00	1.00	8.6E-07	2.0E-06	4.0E-04	2E-03	5E-03	1E-07	7E-07			
		Arsenic	1.2E+01	0.60	2.7E-06	6.1E-06	3.0E-04	9E-03	2E-02	3E-07	2E-06	2E+00	5E-07	3E-06
		Barium	8.0E+02	1.00	3.0E-04	6.8E-04	2.0E-01	1E-03	3E-03	4E-05	2E-04			
		Cadmium	4.8E+00	1.00	1.8E-06	4.1E-06	1.0E-03	2E-03	4E-03	2E-07	1E-06			
		Chromium	4.0E+01	1.00	1.5E-05	3.4E-05	3.0E-03	5E-03	1E-02	2E-06	1E-05	5E-01	1E-06	6E-06
		Cobalt	2.6E+00	1.00	9.8E-07	2.2E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07			
		Iron	8.0E+03	1.00	3.0E-03	6.9E-03	7.0E-01	4E-03	1E-02	4E-04	2E-03			
		Manganese	1.5E+03	1.00	5.7E-04	1.3E-03	2.4E-02	2E-02	5E-02	7E-05	5E-04			
		Mercury	1.2E+00	1.00	4.5E-07	1.0E-06	3.0E-04	2E-03	3E-03	6E-08	4E-07			
		Thallium	2.0E-01	1.00	7.5E-08	1.7E-07	1.0E-05	8E-03	2E-02	1E-08	6E-08			
		Vanadium	4.7E+01	1.00	1.8E-05	4.1E-05	5.0E-03	4E-03	8E-03	2E-06	1E-05			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	5.9E-12	1.4E-11	7.0E-10	8E-03	2E-02	8E-13	5E-12	1E+05	1E-07	6E-07
		Aluminum	8.6E+03	1.00	3.2E-03	7.4E-03	1.0E+00	3E-03	7E-03	4E-04	3E-03			
		Antimony	8.2E-01	1.00	3.1E-07	7.0E-07	4.0E-04	8E-04	2E-03	4E-08	3E-07			
		Arsenic	6.2E+00	0.60	1.4E-06	3.2E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	7.4E+02	1.00	2.8E-04	6.4E-04	2.0E-01	1E-03	3E-03	4E-05	2E-04			
		Cadmium	3.3E+00	1.00	1.2E-06	2.8E-06	1.0E-03	1E-03	3E-03	2E-07	1E-06			
		Chromium	2.1E+01	1.00	7.9E-06	1.8E-05	3.0E-03	3E-03	6E-03	1E-06	6E-06	5E-01	5E-07	3E-06
		Cobalt	2.1E+00	1.00	8.0E-07	1.8E-06	3.0E-04	3E-03	6E-03	1E-07	7E-07			
		Iron	5.1E+03	1.00	1.9E-03	4.3E-03	7.0E-01	3E-03	6E-03	2E-04	2E-03			
		Manganese	1.6E+03	1.00	6.1E-04	1.4E-03	2.4E-02	3E-02	6E-02	8E-05	5E-04			
		Mercury	1.0E+00	1.00	3.7E-07	8.5E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07			
		Thallium	1.6E-01	1.00	6.1E-08	1.4E-07	1.0E-05	6E-03	1E-02	8E-09	5E-08			
		Vanadium	1.5E+01	1.00	5.5E-06	1.3E-05	5.0E-03	1E-03	3E-03	7E-07	4E-06			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.7E-06	1.00	3.3E-12	7.4E-12	7.0E-10	5E-03	1E-02	4E-13	3E-12	1E+05	5E-08	3E-07
		Aluminum	8.0E+03	1.00	3.0E-03	6.9E-03	1.0E+00	3E-03	7E-03	4E-04	2E-03			
		Antimony	3.1E-01	1.00	1.2E-07	2.7E-07	4.0E-04	3E-04	7E-04	1E-08	9E-08			
		Arsenic	4.6E+00	0.60	1.0E-06	2.4E-06	3.0E-04	3E-03	8E-03	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	2.8E+02	1.00	1.1E-04	2.4E-04	2.0E-01	5E-04	1E-03	1E-05	9E-05			
		Cadmium	1.7E+00	1.00	6.4E-07	1.5E-06	1.0E-03	6E-04	1E-03	8E-08	5E-07			
		Chromium	1.5E+01	1.00	5.6E-06	1.3E-05	3.0E-03	2E-03	4E-03	7E-07	5E-06	5E-01	4E-07	2E-06
		Cobalt	3.4E+00	1.00	1.3E-06	2.9E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06			
		Iron	8.4E+03	1.00	3.1E-03	7.1E-03	7.0E-01	4E-03	1E-02	4E-04	3E-03			
		Manganese	8.5E+02	1.00	3.2E-04	7.3E-04	2.4E-02	1E-02	3E-02	4E-05	3E-04			
		Mercury	1.9E-01	1.00	7.1E-08	1.6E-07	3.0E-04	2E-04	5E-04	9E-09	6E-08			
		Thallium	1.1E-01	1.00	4.1E-08	9.4E-08	1.0E-05	4E-03	9E-03	5E-09	3E-08			
		Vanadium	1.4E+01	1.00	5.2E-06	1.2E-05	5.0E-03	1E-03	2E-03	7E-07	4E-06			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	1.00	2.2E-12	5.0E-12	7.0E-10	3E-03	7E-03	3E-13	2E-12	1E+05	4E-08	2E-07
		Aluminum	8.2E+03	1.00	3.1E-03	7.0E-03	1.0E+00	3E-03	7E-03	4E-04	3E-03			
		Antimony	2.0E-01	1.00	7.5E-08	1.7E-07	4.0E-04	2E-04	4E-04	1E-08	6E-08			
		Arsenic	3.7E+00	0.60	8.3E-07	1.9E-06	3.0E-04	3E-03	6E-03	1E-07	7E-07	2E+00	2E-07	1E-06
		Barium	2.0E+02	1.00	7.3E-05	1.7E-04	2.0E-01	4E-04	8E-04	9E-06	6E-05			
		Cadmium	1.1E+00	1.00	4.1E-07	9.4E-07	1.0E-03	4E-04	9E-04	5E-08	3E-07			
		Chromium	1.2E+01	1.00	4.7E-06	1.1E-05	3.0E-03	2E-03	4E-03	6E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	3.8E+00	1.00	1.4E-06	3.3E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06			
		Iron	9.9E+03	1.00	3.7E-03	8.5E-03	7.0E-01	5E-03	1E-02	5E-04	3E-03			
		Manganese	4.8E+02	1.00	1.8E-04	4.1E-04	2.4E-02	7E-03	2E-02	2E-05	1E-04			
		Mercury	1.1E-01	1.00	4.1E-08	9.4E-08	3.0E-04	1E-04	3E-04	5E-09	3E-08			
		Thallium	1.1E-01	1.00	4.1E-08	9.4E-08	1.0E-05	4E-03	9E-03	5E-09	3E-08			
		Vanadium	1.3E+01	1.00	5.0E-06	1.1E-05	5.0E-03	1E-03	2E-03	6E-07	4E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	1.00	4.1E-13	9.4E-13	7.0E-10	6E-04	1E-03	5E-14	3E-13	1E+05	7E-09	4E-08
		Aluminum	7.7E+03	1.00	2.9E-03	6.6E-03	1.0E+00	3E-03	7E-03	4E-04	2E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.6E+00	0.60	5.9E-07	1.3E-06	3.0E-04	2E-03	4E-03	8E-08	5E-07	2E+00	1E-07	7E-07
		Barium	1.6E+02	1.00	6.1E-05	1.4E-04	2.0E-01	3E-04	7E-04	8E-06	5E-05			
		Cadmium	3.7E-01	1.00	1.4E-07	3.2E-07	1.0E-03	1E-04	3E-04	2E-08	1E-07			
		Chromium	1.1E+01	1.00	4.1E-06	9.2E-06	3.0E-03	1E-03	3E-03	5E-07	3E-06	5E-01	3E-07	2E-06
		Cobalt	4.0E+00	1.00	1.5E-06	3.4E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06			
		Iron	1.1E+04	1.00	4.0E-03	9.1E-03	7.0E-01	6E-03	1E-02	5E-04	3E-03			
		Manganese	2.7E+02	1.00	1.0E-04	2.3E-04	2.4E-02	4E-03	1E-02	1E-05	8E-05			
		Mercury	9.6E-02	1.00	3.6E-08	8.2E-08	3.0E-04	1E-04	3E-04	5E-09	3E-08			
		Thallium	1.2E-01	1.00	4.5E-08	1.0E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	1.1E+01	1.00	4.2E-06	9.7E-06	5.0E-03	8E-04	2E-03	5E-07	3E-06			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	6.2E-12	1.4E-11	7.0E-10	9E-03	2E-02	8E-13	5E-12	1E+05	1E-07	7E-07
		Aluminum	7.6E+03	1.00	2.9E-03	6.5E-03	1.0E+00	3E-03	7E-03	4E-04	2E-03			
		Antimony	1.1E-01	1.00	3.9E-08	9.0E-08	4.0E-04	1E-04	2E-04	5E-09	3E-08			
		Arsenic	3.0E+00	0.60	6.8E-07	1.5E-06	3.0E-04	2E-03	5E-03	9E-08	6E-07	2E+00	1E-07	8E-07
		Barium	2.7E+02	1.00	1.0E-04	2.3E-04	2.0E-01	5E-04	1E-03	1E-05	8E-05			
		Cadmium	7.9E-01	1.00	3.0E-07	6.8E-07	1.0E-03	3E-04	7E-04	4E-08	2E-07			
		Chromium	1.2E+01	1.00	4.4E-06	1.0E-05	3.0E-03	1E-03	3E-03	6E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	3.4E+00	1.00	1.3E-06	2.9E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06			
		Iron	9.9E+03	1.00	3.7E-03	8.5E-03	7.0E-01	5E-03	1E-02	5E-04	3E-03			
		Manganese	5.2E+02	1.00	2.0E-04	4.5E-04	2.4E-02	8E-03	2E-02	3E-05	2E-04			
		Mercury	3.6E+00	1.00	1.4E-06	3.1E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06			
		Thallium	1.0E-01	1.00	3.8E-08	8.6E-08	1.0E-05	4E-03	9E-03	5E-09	3E-08			
		Vanadium	1.2E+01	1.00	4.4E-06	9.9E-06	5.0E-03	9E-04	2E-03	6E-07	4E-06			
Upland	65[a]	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	1.00	4.9E-12	1.1E-11	7.0E-10	7E-03	2E-02	6E-13	4E-12	1E+05	8E-08	5E-07
		Aluminum	8.7E+03	1.00	3.3E-03	7.5E-03	1.0E+00	3E-03	7E-03	4E-04	3E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.3E+00	0.60	9.7E-07	2.2E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	4.5E+02	1.00	1.7E-04	3.9E-04	2.0E-01	8E-04	2E-03	2E-05	1E-04			
		Cadmium	2.5E+00	1.00	9.4E-07	2.1E-06	1.0E-03	9E-04	2E-03	1E-07	8E-07			
		Chromium	2.7E+01	1.00	1.0E-05	2.3E-05	3.0E-03	3E-03	8E-03	1E-06	8E-06	5E-01	6E-07	4E-06
		Cobalt	3.1E+00	1.00	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	1E-07	9E-07			
		Iron	9.6E+03	1.00	3.6E-03	8.2E-03	7.0E-01	5E-03	1E-02	5E-04	3E-03			
		Manganese	1.4E+03	1.00	5.1E-04	1.2E-03	2.4E-02	2E-02	5E-02	7E-05	4E-04			
		Mercury	3.0E-01	1.00	1.1E-07	2.6E-07	3.0E-04	4E-04	9E-04	1E-08	9E-08			
		Thallium	1.2E-01	1.00	4.5E-08	1.0E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	1.3E+01	1.00	5.0E-06	1.1E-05	5.0E-03	1E-03	2E-03	6E-07	4E-06			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	1.00	5.8E-13	1.3E-12	7.0E-10	8E-04	2E-03	7E-14	5E-13	1E+05	1E-08	6E-08
		Aluminum	4.6E+03	1.00	1.7E-03	4.0E-03	1.0E+00	2E-03	4E-03	2E-04	1E-03			
		Antimony	2.2E-01	1.00	8.2E-08	1.9E-07	4.0E-04	2E-04	5E-04	1E-08	7E-08			
		Arsenic	3.2E+00	0.60	7.2E-07	1.6E-06	3.0E-04	2E-03	5E-03	9E-08	6E-07	2E+00	1E-07	9E-07
		Barium	2.6E+02	1.00	9.8E-05	2.2E-04	2.0E-01	5E-04	1E-03	1E-05	8E-05			
		Cadmium	9.0E-01	1.00	3.4E-07	7.7E-07	1.0E-03	3E-04	8E-04	4E-08	3E-07			
		Chromium	1.2E+01	1.00	4.5E-06	1.0E-05	3.0E-03	2E-03	3E-03	6E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	2.4E+00	1.00	9.1E-07	2.1E-06	3.0E-04	3E-03	7E-03	1E-07	7E-07			
		Iron	6.3E+03	1.00	2.4E-03	5.4E-03	7.0E-01	3E-03	8E-03	3E-04	2E-03			
		Manganese	5.1E+02	1.00	1.9E-04	4.4E-04	2.4E-02	8E-03	2E-02	2E-05	2E-04			
		Mercury	6.6E-02	1.00	2.5E-08	5.7E-08	3.0E-04	8E-05	2E-04	3E-09	2E-08			
		Thallium	7.1E-02	1.00	2.6E-08	6.0E-08	1.0E-05	3E-03	6E-03	3E-09	2E-08			
		Vanadium	7.5E+00	1.00	2.8E-06	6.5E-06	5.0E-03	6E-04	1E-03	4E-07	2E-06			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	3.1E-11	7.1E-11	7.0E-10	4E-02	1E-01	4E-12	3E-11	1E+05	5E-07	3E-06
		Aluminum	6.0E+03	1.00	2.2E-03	5.1E-03	1.0E+00	2E-03	5E-03	3E-04	2E-03			
		Antimony	1.6E+00	1.00	6.0E-07	1.4E-06	4.0E-04	2E-03	3E-03	8E-08	5E-07			
		Arsenic	1.5E+01	0.60	3.4E-06	7.7E-06	3.0E-04	1E-02	3E-02	4E-07	3E-06	2E+00	7E-07	4E-06
		Barium	6.1E+02	1.00	2.3E-04	5.2E-04	2.0E-01	1E-03	3E-03	3E-05	2E-04			
		Cadmium	4.8E+00	1.00	1.8E-06	4.1E-06	1.0E-03	2E-03	4E-03	2E-07	1E-06			
		Chromium	1.9E+01	1.00	7.0E-06	1.6E-05	3.0E-03	2E-03	5E-03	9E-07	6E-06	5E-01	4E-07	3E-06
		Cobalt	2.2E+00	1.00	8.3E-07	1.9E-06	3.0E-04	3E-03	6E-03	1E-07	7E-07			
		Iron	3.5E+03	1.00	1.3E-03	3.0E-03	7.0E-01	2E-03	4E-03	2E-04	1E-03			
		Manganese	2.0E+03	1.00	7.7E-04	1.7E-03	2.4E-02	3E-02	7E-02	1E-04	6E-04			
		Mercury	1.0E-02	1.00	3.8E-09	8.6E-09	3.0E-04	1E-05	3E-05	5E-10	3E-09			
		Thallium	3.8E-01	1.00	1.4E-07	3.3E-07	1.0E-05	1E-02	3E-02	2E-08	1E-07			
		Vanadium	5.6E+00	1.00	2.1E-06	4.8E-06	5.0E-03	4E-04	1E-03	3E-07	2E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	3.1E-11	7.1E-11	7.0E-10	4E-02	1E-01	4E-12	3E-11	1E+05	5E-07	3E-06
		Aluminum	6.0E+03	1.00	2.2E-03	5.1E-03	1.0E+00	2E-03	5E-03	3E-04	2E-03			
		Antimony	1.6E+00	1.00	6.0E-07	1.4E-06	4.0E-04	2E-03	3E-03	8E-08	5E-07			
		Arsenic	1.5E+01	0.60	3.4E-06	7.7E-06	3.0E-04	1E-02	3E-02	4E-07	3E-06	2E+00	7E-07	4E-06
		Barium	6.1E+02	1.00	2.3E-04	5.2E-04	2.0E-01	1E-03	3E-03	3E-05	2E-04			
		Cadmium	4.8E+00	1.00	1.8E-06	4.1E-06	1.0E-03	2E-03	4E-03	2E-07	1E-06			
		Chromium	1.9E+01	1.00	7.0E-06	1.6E-05	3.0E-03	2E-03	5E-03	9E-07	6E-06	5E-01	4E-07	3E-06
		Cobalt	2.2E+00	1.00	8.3E-07	1.9E-06	3.0E-04	3E-03	6E-03	1E-07	7E-07			
		Iron	3.5E+03	1.00	1.3E-03	3.0E-03	7.0E-01	2E-03	4E-03	2E-04	1E-03			
		Manganese	2.0E+03	1.00	7.7E-04	1.7E-03	2.4E-02	3E-02	7E-02	1E-04	6E-04			
		Mercury	1.0E-02	1.00	3.8E-09	8.6E-09	3.0E-04	1E-05	3E-05	5E-10	3E-09			
		Thallium	3.8E-01	1.00	1.4E-07	3.3E-07	1.0E-05	1E-02	3E-02	2E-08	1E-07			
		Vanadium	5.6E+00	1.00	2.1E-06	4.8E-06	5.0E-03	4E-04	1E-03	3E-07	2E-06			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.1E-06	1.00	1.5E-12	3.5E-12	7.0E-10	2E-03	5E-03	2E-13	1E-12	1E+05	3E-08	2E-07
		Aluminum	3.4E+03	1.00	1.3E-03	2.9E-03	1.0E+00	1E-03	3E-03	2E-04	1E-03			
		Antimony	4.7E-01	1.00	1.8E-07	4.0E-07	4.0E-04	4E-04	1E-03	2E-08	1E-07			
		Arsenic	6.0E+00	0.60	1.4E-06	3.1E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	4.5E+02	1.00	1.7E-04	3.9E-04	2.0E-01	8E-04	2E-03	2E-05	1E-04			
		Cadmium	1.8E+00	1.00	6.8E-07	1.5E-06	1.0E-03	7E-04	2E-03	9E-08	6E-07			
		Chromium	1.4E+01	1.00	5.3E-06	1.2E-05	3.0E-03	2E-03	4E-03	7E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	1.7E+00	1.00	6.4E-07	1.5E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07			
		Iron	3.8E+03	1.00	1.4E-03	3.2E-03	7.0E-01	2E-03	5E-03	2E-04	1E-03			
		Manganese	1.0E+03	1.00	3.7E-04	8.5E-04	2.4E-02	2E-02	4E-02	5E-05	3E-04			
		Mercury	1.1E-01	1.00	4.1E-08	9.4E-08	3.0E-04	1E-04	3E-04	5E-09	3E-08			
		Thallium	1.4E-01	1.00	5.3E-08	1.2E-07	1.0E-05	5E-03	1E-02	7E-09	4E-08			
		Vanadium	1.2E+01	1.00	4.3E-06	9.8E-06	5.0E-03	9E-04	2E-03	6E-07	4E-06			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	1.00	9.0E-13	2.0E-12	7.0E-10	1E-03	3E-03	1E-13	7E-13	1E+05	1E-08	9E-08
		Aluminum	1.1E+03	1.00	4.1E-04	9.3E-04	1.0E+00	4E-04	9E-04	5E-05	3E-04			
		Antimony	7.5E-02	1.00	2.8E-08	6.4E-08	4.0E-04	7E-05	2E-04	4E-09	2E-08			
		Arsenic	5.8E+00	0.60	1.3E-06	3.0E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	5.0E+02	1.00	1.9E-04	4.3E-04	2.0E-01	9E-04	2E-03	2E-05	2E-04			
		Cadmium	1.3E+00	1.00	4.9E-07	1.1E-06	1.0E-03	5E-04	1E-03	6E-08	4E-07			
		Chromium	3.4E+01	1.00	1.3E-05	2.9E-05	3.0E-03	4E-03	1E-02	2E-06	1E-05	5E-01	8E-07	5E-06
		Cobalt	2.5E+00	1.00	9.4E-07	2.1E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07			
		Iron	3.0E+03	1.00	1.1E-03	2.6E-03	7.0E-01	2E-03	4E-03	1E-04	9E-04			
		Manganese	7.2E+02	1.00	2.7E-04	6.1E-04	2.4E-02	1E-02	3E-02	3E-05	2E-04			
		Mercury	5.0E-03	1.00	1.9E-09	4.3E-09	3.0E-04	6E-06	1E-05	2E-10	2E-09			
		Thallium	8.3E-02	1.00	3.1E-08	7.1E-08	1.0E-05	3E-03	7E-03	4E-09	3E-08			
		Vanadium	3.5E+00	1.00	1.3E-06	3.0E-06	5.0E-03	3E-04	6E-04	2E-07	1E-06			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	8.8E-12	2.0E-11	7.0E-10	1E-02	3E-02	1E-12	7E-12	1E+05	1E-07	9E-07
		Aluminum	2.3E+03	1.00	8.5E-04	1.9E-03	1.0E+00	9E-04	2E-03	1E-04	7E-04			
		Antimony	2.4E-01	1.00	9.0E-08	2.1E-07	4.0E-04	2E-04	5E-04	1E-08	7E-08			
		Arsenic	7.0E+00	0.60	1.6E-06	3.6E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	5.4E+02	1.00	2.0E-04	4.6E-04	2.0E-01	1E-03	2E-03	3E-05	2E-04			
		Cadmium	2.2E+00	1.00	8.3E-07	1.9E-06	1.0E-03	8E-04	2E-03	1E-07	7E-07			
		Chromium	1.9E+01	1.00	7.2E-06	1.6E-05	3.0E-03	2E-03	5E-03	9E-07	6E-06	5E-01	5E-07	3E-06
		Cobalt	1.3E+00	1.00	4.9E-07	1.1E-06	3.0E-04	2E-03	4E-03	6E-08	4E-07			
		Iron	1.3E+03	1.00	4.7E-04	1.1E-03	7.0E-01	7E-04	2E-03	6E-05	4E-04			
		Manganese	2.3E+03	1.00	8.4E-04	1.9E-03	2.4E-02	4E-02	8E-02	1E-04	7E-04			
		Mercury	4.9E-03	1.00	1.8E-09	4.2E-09	3.0E-04	6E-06	1E-05	2E-10	1E-09			
		Thallium	6.6E-02	1.00	2.5E-08	5.7E-08	1.0E-05	2E-03	6E-03	3E-09	2E-08			
		Vanadium	4.7E+00	1.00	1.8E-06	4.0E-06	5.0E-03	4E-04	8E-04	2E-07	1E-06			
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-04	1.00	1.2E-10	2.6E-10	7.0E-10	2E-01	4E-01	1E-11	9E-11	1E+05	2E-06	1E-05
		Aluminum	1.8E+04	1.00	6.8E-03	1.6E-02	1.0E+00	7E-03	2E-02	9E-04	6E-03			
		Antimony	2.4E+00	1.00	8.9E-07	2.0E-06	4.0E-04	2E-03	5E-03	1E-07	7E-07			
		Arsenic	4.1E+01	0.60	9.1E-06	2.1E-05	3.0E-04	3E-02	7E-02	1E-06	7E-06	2E+00	2E-06	1E-05
		Barium	8.3E+02	1.00	3.1E-04	7.1E-04	2.0E-01	2E-03	4E-03	4E-05	3E-04			
		Cadmium	6.4E+00	1.00	2.4E-06	5.5E-06	1.0E-03	2E-03	5E-03	3E-07	2E-06			
		Chromium	3.0E+01	1.00	1.1E-05	2.6E-05	3.0E-03	4E-03	9E-03	1E-06	9E-06	5E-01	7E-07	5E-06
		Cobalt	7.3E+00	1.00	2.7E-06	6.2E-06	3.0E-04	9E-03	2E-02	4E-07	2E-06			
		Iron	1.3E+04	1.00	5.0E-03	1.1E-02	7.0E-01	7E-03	2E-02	6E-04	4E-03			
		Manganese	2.3E+03	1.00	8.8E-04	2.0E-03	2.4E-02	4E-02	8E-02	1E-04	7E-04			
		Mercury	2.2E-01	1.00	8.4E-08	1.9E-07	3.0E-04	3E-04	6E-04	1E-08	7E-08			
		Thallium	7.7E-01	1.00	2.9E-07	6.6E-07	1.0E-05	3E-02	7E-02	4E-08	2E-07			
		Vanadium	2.2E+01	1.00	8.4E-06	1.9E-05	5.0E-03	2E-03	4E-03	1E-06	7E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	1.3E-13	2.9E-13	7.0E-10	2E-04	4E-04	2E-14	1E-13	1E+05	2E-09	1E-08
		Aluminum	1.2E+04	1.00	4.7E-03	1.1E-02	1.0E+00	5E-03	1E-02	6E-04	4E-03			
		Antimony	9.5E-02	1.00	3.6E-08	8.1E-08	4.0E-04	9E-05	2E-04	5E-09	3E-08			
		Arsenic	4.3E+00	0.60	9.7E-07	2.2E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	2.1E+02	1.00	7.7E-05	1.8E-04	2.0E-01	4E-04	9E-04	1E-05	6E-05			
		Cadmium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-03	6E-05	1E-04	7E-09	5E-08			
		Chromium	1.3E+01	1.00	5.0E-06	1.1E-05	3.0E-03	2E-03	4E-03	6E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	6.4E+00	1.00	2.4E-06	5.5E-06	3.0E-04	8E-03	2E-02	3E-07	2E-06			
		Iron	1.6E+04	1.00	5.9E-03	1.3E-02	7.0E-01	8E-03	2E-02	8E-04	5E-03			
		Manganese	3.7E+02	1.00	1.4E-04	3.2E-04	2.4E-02	6E-03	1E-02	2E-05	1E-04			
		Mercury	1.4E-02	1.00	5.3E-09	1.2E-08	3.0E-04	2E-05	4E-05	7E-10	4E-09			
		Thallium	1.8E-01	1.00	6.8E-08	1.5E-07	1.0E-05	7E-03	2E-02	9E-09	6E-08			
		Vanadium	1.7E+01	1.00	6.5E-06	1.5E-05	5.0E-03	1E-03	3E-03	8E-07	5E-06			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	7.6E-13	1.7E-12	7.0E-10	1E-03	2E-03	1E-13	6E-13	1E+05	1E-08	8E-08
		Aluminum	6.8E+03	1.00	2.6E-03	5.8E-03	1.0E+00	3E-03	6E-03	3E-04	2E-03			
		Antimony	1.2E-01	1.00	4.5E-08	1.0E-07	4.0E-04	1E-04	3E-04	6E-09	4E-08			
		Arsenic	2.9E+00	0.60	6.4E-07	1.5E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07	2E+00	1E-07	8E-07
		Barium	1.5E+02	1.00	5.5E-05	1.3E-04	2.0E-01	3E-04	6E-04	7E-06	5E-05			
		Cadmium	1.2E-01	1.00	4.6E-08	1.0E-07	1.0E-03	5E-05	1E-04	6E-09	4E-08			
		Chromium	9.3E+00	1.00	3.5E-06	7.9E-06	3.0E-03	1E-03	3E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	3.3E+00	1.00	1.2E-06	2.9E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06			
		Iron	8.8E+03	1.00	3.3E-03	7.5E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	1.7E+02	1.00	6.5E-05	1.5E-04	2.4E-02	3E-03	6E-03	8E-06	5E-05			
		Mercury	2.2E-02	1.00	8.2E-09	1.9E-08	3.0E-04	3E-05	6E-05	1E-09	7E-09			
		Thallium	8.5E-02	1.00	3.2E-08	7.3E-08	1.0E-05	3E-03	7E-03	4E-09	3E-08			
		Vanadium	1.0E+01	1.00	3.9E-06	8.9E-06	5.0E-03	8E-04	2E-03	5E-07	3E-06			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	7.6E-13	1.7E-12	7.0E-10	1E-03	2E-03	1E-13	6E-13	1E+05	1E-08	8E-08
		Aluminum	6.8E+03	1.00	2.6E-03	5.8E-03	1.0E+00	3E-03	6E-03	3E-04	2E-03			
		Antimony	1.2E-01	1.00	4.5E-08	1.0E-07	4.0E-04	1E-04	3E-04	6E-09	4E-08			
		Arsenic	2.9E+00	0.60	6.4E-07	1.5E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07	2E+00	1E-07	8E-07
		Barium	1.5E+02	1.00	5.5E-05	1.3E-04	2.0E-01	3E-04	6E-04	7E-06	5E-05			
		Cadmium	1.2E-01	1.00	4.6E-08	1.0E-07	1.0E-03	5E-05	1E-04	6E-09	4E-08			
		Chromium	9.3E+00	1.00	3.5E-06	7.9E-06	3.0E-03	1E-03	3E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	3.3E+00	1.00	1.2E-06	2.9E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06			
		Iron	8.8E+03	1.00	3.3E-03	7.5E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	1.7E+02	1.00	6.5E-05	1.5E-04	2.4E-02	3E-03	6E-03	8E-06	5E-05			
		Mercury	2.2E-02	1.00	8.2E-09	1.9E-08	3.0E-04	3E-05	6E-05	1E-09	7E-09			
		Thallium	8.5E-02	1.00	3.2E-08	7.3E-08	1.0E-05	3E-03	7E-03	4E-09	3E-08			
		Vanadium	1.0E+01	1.00	3.9E-06	8.9E-06	5.0E-03	8E-04	2E-03	5E-07	3E-06			
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	1.3E-13	2.9E-13	7.0E-10	2E-04	4E-04	2E-14	1E-13	1E+05	2E-09	1E-08
		Aluminum	1.2E+04	1.00	4.7E-03	1.1E-02	1.0E+00	5E-03	1E-02	6E-04	4E-03			
		Antimony	9.5E-02	1.00	3.6E-08	8.1E-08	4.0E-04	9E-05	2E-04	5E-09	3E-08			
		Arsenic	4.3E+00	0.60	9.7E-07	2.2E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	2.1E+02	1.00	7.7E-05	1.8E-04	2.0E-01	4E-04	9E-04	1E-05	6E-05			
		Cadmium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-03	6E-05	1E-04	7E-09	5E-08			
		Chromium	1.3E+01	1.00	5.0E-06	1.1E-05	3.0E-03	2E-03	4E-03	6E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	6.4E+00	1.00	2.4E-06	5.5E-06	3.0E-04	8E-03	2E-02	3E-07	2E-06			
		Iron	1.6E+04	1.00	5.9E-03	1.3E-02	7.0E-01	8E-03	2E-02	8E-04	5E-03			
		Manganese	3.7E+02	1.00	1.4E-04	3.2E-04	2.4E-02	6E-03	1E-02	2E-05	1E-04			
		Mercury	1.4E-02	1.00	5.3E-09	1.2E-08	3.0E-04	2E-05	4E-05	7E-10	4E-09			
		Thallium	1.8E-01	1.00	6.8E-08	1.5E-07	1.0E-05	7E-03	2E-02	9E-09	6E-08			
		Vanadium	1.7E+01	1.00	6.5E-06	1.5E-05	5.0E-03	1E-03	3E-03	8E-07	5E-06			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	7.6E-13	1.7E-12	7.0E-10	1E-03	2E-03	1E-13	6E-13	1E+05	1E-08	8E-08
		Aluminum	6.8E+03	1.00	2.6E-03	5.8E-03	1.0E+00	3E-03	6E-03	3E-04	2E-03			
		Antimony	1.2E-01	1.00	4.5E-08	1.0E-07	4.0E-04	1E-04	3E-04	6E-09	4E-08			
		Arsenic	2.9E+00	0.60	6.4E-07	1.5E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07	2E+00	1E-07	8E-07
		Barium	1.5E+02	1.00	5.5E-05	1.3E-04	2.0E-01	3E-04	6E-04	7E-06	5E-05			
		Cadmium	1.2E-01	1.00	4.6E-08	1.0E-07	1.0E-03	5E-05	1E-04	6E-09	4E-08			
		Chromium	9.3E+00	1.00	3.5E-06	7.9E-06	3.0E-03	1E-03	3E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	3.3E+00	1.00	1.2E-06	2.9E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06			
		Iron	8.8E+03	1.00	3.3E-03	7.5E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	1.7E+02	1.00	6.5E-05	1.5E-04	2.4E-02	3E-03	6E-03	8E-06	5E-05			
		Mercury	2.2E-02	1.00	8.2E-09	1.9E-08	3.0E-04	3E-05	6E-05	1E-09	7E-09			
		Thallium	8.5E-02	1.00	3.2E-08	7.3E-08	1.0E-05	3E-03	7E-03	4E-09	3E-08			
		Vanadium	1.0E+01	1.00	3.9E-06	8.9E-06	5.0E-03	8E-04	2E-03	5E-07	3E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	7.6E-13	1.7E-12	7.0E-10	1E-03	2E-03	1E-13	6E-13	1E+05	1E-08	8E-08
		Aluminum	6.8E+03	1.00	2.6E-03	5.8E-03	1.0E+00	3E-03	6E-03	3E-04	2E-03			
		Antimony	1.2E-01	1.00	4.5E-08	1.0E-07	4.0E-04	1E-04	3E-04	6E-09	4E-08			
		Arsenic	2.9E+00	0.60	6.4E-07	1.5E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07	2E+00	1E-07	8E-07
		Barium	1.5E+02	1.00	5.5E-05	1.3E-04	2.0E-01	3E-04	6E-04	7E-06	5E-05			
		Cadmium	1.2E-01	1.00	4.6E-08	1.0E-07	1.0E-03	5E-05	1E-04	6E-09	4E-08			
		Chromium	9.3E+00	1.00	3.5E-06	7.9E-06	3.0E-03	1E-03	3E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	3.3E+00	1.00	1.2E-06	2.9E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06			
		Iron	8.8E+03	1.00	3.3E-03	7.5E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	1.7E+02	1.00	6.5E-05	1.5E-04	2.4E-02	3E-03	6E-03	8E-06	5E-05			
		Mercury	2.2E-02	1.00	8.2E-09	1.9E-08	3.0E-04	3E-05	6E-05	1E-09	7E-09			
		Thallium	8.5E-02	1.00	3.2E-08	7.3E-08	1.0E-05	3E-03	7E-03	4E-09	3E-08			
		Vanadium	1.0E+01	1.00	3.9E-06	8.9E-06	5.0E-03	8E-04	2E-03	5E-07	3E-06			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	1.00	2.3E-13	5.1E-13	7.0E-10	3E-04	7E-04	3E-14	2E-13	1E+05	4E-09	2E-08
		Aluminum	7.0E+03	1.00	2.6E-03	6.0E-03	1.0E+00	3E-03	6E-03	3E-04	2E-03			
		Antimony	1.0E-01	1.00	3.8E-08	8.6E-08	4.0E-04	9E-05	2E-04	5E-09	3E-08			
		Arsenic	4.5E+00	0.60	1.0E-06	2.3E-06	3.0E-04	3E-03	8E-03	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	1.9E+02	1.00	7.1E-05	1.6E-04	2.0E-01	4E-04	8E-04	9E-06	6E-05			
		Cadmium	3.2E-01	1.00	1.2E-07	2.7E-07	1.0E-03	1E-04	3E-04	2E-08	1E-07			
		Chromium	8.4E+00	1.00	3.2E-06	7.2E-06	3.0E-03	1E-03	2E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	3.9E+00	1.00	1.5E-06	3.3E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06			
		Iron	9.6E+03	1.00	3.6E-03	8.2E-03	7.0E-01	5E-03	1E-02	5E-04	3E-03			
		Manganese	2.8E+02	1.00	1.1E-04	2.4E-04	2.4E-02	4E-03	1E-02	1E-05	9E-05			
		Mercury	3.3E-02	1.00	1.2E-08	2.8E-08	3.0E-04	4E-05	9E-05	2E-09	1E-08			
		Thallium	1.1E-01	1.00	4.1E-08	9.4E-08	1.0E-05	4E-03	9E-03	5E-09	3E-08			
		Vanadium	1.3E+01	1.00	4.7E-06	1.1E-05	5.0E-03	9E-04	2E-03	6E-07	4E-06			
Floodplain	85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	1.00	1.5E-13	3.4E-13	7.0E-10	2E-04	5E-04	2E-14	1E-13	1E+05	3E-09	2E-08
		Aluminum	2.9E+03	1.00	1.1E-03	2.5E-03	1.0E+00	1E-03	3E-03	1E-04	9E-04			
		Antimony	8.5E-02	1.00	3.2E-08	7.3E-08	4.0E-04	8E-05	2E-04	4E-09	3E-08			
		Arsenic	1.9E+00	0.60	4.3E-07	9.8E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07	2E+00	8E-08	5E-07
		Barium	2.9E+01	1.00	1.1E-05	2.5E-05	2.0E-01	5E-05	1E-04	1E-06	9E-06			
		Cadmium	1.6E-02	1.00	6.0E-09	1.4E-08	1.0E-03	6E-06	1E-05	8E-10	5E-09			
		Chromium	3.9E+00	1.00	1.5E-06	3.3E-06	3.0E-03	5E-04	1E-03	2E-07	1E-06	5E-01	9E-08	6E-07
		Cobalt	1.8E+00	1.00	6.8E-07	1.5E-06	3.0E-04	2E-03	5E-03	9E-08	6E-07			
		Iron	5.2E+03	1.00	1.9E-03	4.4E-03	7.0E-01	3E-03	6E-03	2E-04	2E-03			
		Manganese	6.4E+01	1.00	2.4E-05	5.5E-05	2.4E-02	1E-03	2E-03	3E-06	2E-05			
		Mercury	4.4E-03	1.00	1.6E-09	3.7E-09	3.0E-04	5E-06	1E-05	2E-10	1E-09			
		Thallium	4.4E-02	1.00	1.7E-08	3.8E-08	1.0E-05	2E-03	4E-03	2E-09	1E-08			
		Vanadium	5.1E+00	1.00	1.9E-06	4.4E-06	5.0E-03	4E-04	9E-04	2E-07	2E-06			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	1.00	6.9E-12	1.6E-11	7.0E-10	1E-02	2E-02	9E-13	6E-12	1E+05	1E-07	7E-07
		Aluminum	2.0E+04	1.00	7.4E-03	1.7E-02	1.0E+00	7E-03	2E-02	9E-04	6E-03			
		Antimony	4.5E-01	1.00	1.7E-07	3.9E-07	4.0E-04	4E-04	1E-03	2E-08	1E-07			
		Arsenic	4.6E+00	0.60	1.0E-06	2.4E-06	3.0E-04	3E-03	8E-03	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	4.6E+02	1.00	1.7E-04	3.9E-04	2.0E-01	9E-04	2E-03	2E-05	1E-04			
		Cadmium	5.4E-01	1.00	2.0E-07	4.6E-07	1.0E-03	2E-04	5E-04	3E-08	2E-07			
		Chromium	2.0E+01	1.00	7.3E-06	1.7E-05	3.0E-03	2E-03	6E-03	9E-07	6E-06	5E-01	5E-07	3E-06
		Cobalt	5.6E+00	1.00	2.1E-06	4.8E-06	3.0E-04	7E-03	2E-02	3E-07	2E-06			
		Iron	2.3E+04	1.00	8.6E-03	2.0E-02	7.0E-01	1E-02	3E-02	1E-03	7E-03			
		Manganese	5.6E+02	1.00	2.1E-04	4.8E-04	2.4E-02	9E-03	2E-02	3E-05	2E-04			
		Mercury	5.3E-01	1.00	2.0E-07	4.5E-07	3.0E-04	7E-04	2E-03	3E-08	2E-07			
		Thallium	2.0E-01	1.00	7.5E-08	1.7E-07	1.0E-05	8E-03	2E-02	1E-08	6E-08			
		Vanadium	2.1E+01	1.00	8.0E-06	1.8E-05	5.0E-03	2E-03	4E-03	1E-06	7E-06			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	1.00	2.6E-12	5.8E-12	7.0E-10	4E-03	8E-03	3E-13	2E-12	1E+05	4E-08	3E-07
		Aluminum	1.1E+04	1.00	4.1E-03	9.2E-03	1.0E+00	4E-03	9E-03	5E-04	3E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.7E+00	0.60	1.1E-06	2.4E-06	3.0E-04	4E-03	8E-03	1E-07	9E-07	2E+00	2E-07	1E-06
		Barium	7.7E+02	1.00	2.9E-04	6.6E-04	2.0E-01	1E-03	3E-03	4E-05	2E-04			
		Cadmium	7.9E-01	1.00	3.0E-07	6.8E-07	1.0E-03	3E-04	7E-04	4E-08	2E-07			
		Chromium	1.6E+01	1.00	5.8E-06	1.3E-05	3.0E-03	2E-03	4E-03	7E-07	5E-06	5E-01	4E-07	2E-06
		Cobalt	4.0E+00	1.00	1.5E-06	3.4E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06			
		Iron	1.2E+04	1.00	4.6E-03	1.0E-02	7.0E-01	7E-03	1E-02	6E-04	4E-03			
		Manganese	2.7E+02	1.00	1.0E-04	2.3E-04	2.4E-02	4E-03	1E-02	1E-05	8E-05			
		Mercury	1.0E-01	1.00	3.8E-08	8.6E-08	3.0E-04	1E-04	3E-04	5E-09	3E-08			
		Thallium	2.0E-01	1.00	7.5E-08	1.7E-07	1.0E-05	8E-03	2E-02	1E-08	6E-08			
		Vanadium	2.1E+01	1.00	7.7E-06	1.8E-05	5.0E-03	2E-03	4E-03	1E-06	6E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	1.00	2.1E-11	4.8E-11	7.0E-10	3E-02	7E-02	3E-12	2E-11	1E+05	3E-07	2E-06
		Aluminum	1.2E+04	1.00	4.4E-03	1.0E-02	1.0E+00	4E-03	1E-02	6E-04	4E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.5E+00	0.60	1.2E-06	2.8E-06	3.0E-04	4E-03	9E-03	2E-07	1E-06	2E+00	2E-07	2E-06
		Barium	1.5E+03	1.00	5.4E-04	1.2E-03	2.0E-01	3E-03	6E-03	7E-05	4E-04			
		Cadmium	1.8E+00	1.00	6.8E-07	1.5E-06	1.0E-03	7E-04	2E-03	9E-08	6E-07			
		Chromium	2.6E+01	1.00	9.9E-06	2.3E-05	3.0E-03	3E-03	8E-03	1E-06	8E-06	5E-01	6E-07	4E-06
		Cobalt	2.6E+00	1.00	9.8E-07	2.2E-06	3.0E-04	3E-03	7E-03	1E-07	8E-07			
		Iron	8.7E+03	1.00	3.3E-03	7.4E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	5.3E+02	1.00	2.0E-04	4.5E-04	2.4E-02	8E-03	2E-02	3E-05	2E-04			
		Mercury	6.9E-01	1.00	2.6E-07	5.9E-07	3.0E-04	9E-04	2E-03	3E-08	2E-07			
		Thallium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02	7E-09	5E-08			
		Vanadium	1.4E+01	1.00	5.1E-06	1.2E-05	5.0E-03	1E-03	2E-03	7E-07	4E-06			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	1.00	3.6E-12	8.3E-12	7.0E-10	5E-03	1E-02	5E-13	3E-12	1E+05	6E-08	4E-07
		Aluminum	1.1E+04	1.00	4.2E-03	9.6E-03	1.0E+00	4E-03	1E-02	5E-04	3E-03			
		Antimony	3.7E-01	1.00	1.4E-07	3.2E-07	4.0E-04	3E-04	8E-04	2E-08	1E-07			
		Arsenic	4.8E+00	0.60	1.1E-06	2.4E-06	3.0E-04	4E-03	8E-03	1E-07	9E-07	2E+00	2E-07	1E-06
		Barium	5.0E+02	1.00	1.9E-04	4.3E-04	2.0E-01	9E-04	2E-03	2E-05	2E-04			
		Cadmium	5.5E-01	1.00	2.1E-07	4.7E-07	1.0E-03	2E-04	5E-04	3E-08	2E-07			
		Chromium	1.7E+01	1.00	6.5E-06	1.5E-05	3.0E-03	2E-03	5E-03	8E-07	5E-06	5E-01	4E-07	3E-06
		Cobalt	4.5E+00	1.00	1.7E-06	3.8E-06	3.0E-04	6E-03	1E-02	2E-07	1E-06			
		Iron	1.3E+04	1.00	4.7E-03	1.1E-02	7.0E-01	7E-03	2E-02	6E-04	4E-03			
		Manganese	3.7E+02	1.00	1.4E-04	3.1E-04	2.4E-02	6E-03	1E-02	2E-05	1E-04			
		Mercury	1.8E-01	1.00	6.7E-08	1.5E-07	3.0E-04	2E-04	5E-04	9E-09	5E-08			
		Thallium	1.6E-01	1.00	5.9E-08	1.3E-07	1.0E-05	6E-03	1E-02	8E-09	5E-08			
		Vanadium	1.9E+01	1.00	7.0E-06	1.6E-05	5.0E-03	1E-03	3E-03	9E-07	6E-06			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	2.1E-11	4.7E-11	7.0E-10	3E-02	7E-02	3E-12	2E-11	1E+05	3E-07	2E-06
		Aluminum	1.1E+04	1.00	4.2E-03	9.5E-03	1.0E+00	4E-03	1E-02	5E-04	3E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.0E+01	0.60	2.3E-06	5.1E-06	3.0E-04	8E-03	2E-02	3E-07	2E-06	2E+00	4E-07	3E-06
		Barium	7.6E+02	1.00	2.9E-04	6.5E-04	2.0E-01	1E-03	3E-03	4E-05	2E-04			
		Cadmium	2.8E+00	1.00	1.1E-06	2.4E-06	1.0E-03	1E-03	2E-03	1E-07	9E-07			
		Chromium	2.8E+01	1.00	1.0E-05	2.4E-05	3.0E-03	3E-03	8E-03	1E-06	9E-06	5E-01	7E-07	4E-06
		Cobalt	3.1E+00	1.00	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	1E-07	9E-07			
		Iron	9.3E+03	1.00	3.5E-03	7.9E-03	7.0E-01	5E-03	1E-02	4E-04	3E-03			
		Manganese	1.1E+03	1.00	4.2E-04	9.6E-04	2.4E-02	2E-02	4E-02	5E-05	3E-04			
		Mercury	1.5E+00	1.00	5.6E-07	1.3E-06	3.0E-04	2E-03	4E-03	7E-08	5E-07			
		Thallium	1.6E-01	1.00	5.8E-08	1.3E-07	1.0E-05	6E-03	1E-02	7E-09	5E-08			
		Vanadium	3.1E+01	1.00	1.2E-05	2.7E-05	5.0E-03	2E-03	5E-03	2E-06	1E-05			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	8.5E-12	1.9E-11	7.0E-10	1E-02	3E-02	1E-12	7E-12	1E+05	1E-07	9E-07
		Aluminum	1.5E+04	1.00	5.5E-03	1.3E-02	1.0E+00	6E-03	1E-02	7E-04	4E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	6.3E+00	0.60	1.4E-06	3.2E-06	3.0E-04	5E-03	1E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	9.2E+02	1.00	3.4E-04	7.9E-04	2.0E-01	2E-03	4E-03	4E-05	3E-04			
		Cadmium	1.7E+00	1.00	6.4E-07	1.5E-06	1.0E-03	6E-04	1E-03	8E-08	5E-07			
		Chromium	2.6E+01	1.00	9.9E-06	2.3E-05	3.0E-03	3E-03	8E-03	1E-06	8E-06	5E-01	6E-07	4E-06
		Cobalt	5.3E+00	1.00	2.0E-06	4.5E-06	3.0E-04	7E-03	2E-02	3E-07	2E-06			
		Iron	1.4E+04	1.00	5.3E-03	1.2E-02	7.0E-01	8E-03	2E-02	7E-04	4E-03			
		Manganese	4.0E+02	1.00	1.5E-04	3.4E-04	2.4E-02	6E-03	1E-02	2E-05	1E-04			
		Mercury	8.3E-01	1.00	3.1E-07	7.1E-07	3.0E-04	1E-03	2E-03	4E-08	3E-07			
		Thallium	1.9E-01	1.00	7.1E-08	1.6E-07	1.0E-05	7E-03	2E-02	9E-09	6E-08			
		Vanadium	2.6E+01	1.00	9.9E-06	2.3E-05	5.0E-03	2E-03	5E-03	1E-06	8E-06			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	1.00	1.7E-11	3.9E-11	7.0E-10	2E-02	6E-02	2E-12	1E-11	1E+05	3E-07	2E-06
		Aluminum	1.5E+04	1.00	5.7E-03	1.3E-02	1.0E+00	6E-03	1E-02	7E-04	5E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	7.8E+00	0.60	1.8E-06	4.0E-06	3.0E-04	6E-03	1E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	4.3E+02	1.00	1.6E-04	3.7E-04	2.0E-01	8E-04	2E-03	2E-05	1E-04			
		Cadmium	2.1E+00	1.00	8.0E-07	1.8E-06	1.0E-03	8E-04	2E-03	1E-07	6E-07			
		Chromium	2.5E+01	1.00	9.4E-06	2.1E-05	3.0E-03	3E-03	7E-03	1E-06	8E-06	5E-01	6E-07	4E-06
		Cobalt	3.2E+00	1.00	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	2E-07	1E-06			
		Iron	7.9E+03	1.00	3.0E-03	6.8E-03	7.0E-01	4E-03	1E-02	4E-04	2E-03			
		Manganese	8.8E+02	1.00	3.3E-04	7.5E-04	2.4E-02	1E-02	3E-02	4E-05	3E-04			
		Mercury	3.2E+00	1.00	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	2E-07	1E-06			
		Thallium	1.2E-01	1.00	4.6E-08	1.0E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	2.9E+01	1.00	1.1E-05	2.4E-05	5.0E-03	2E-03	5E-03	1E-06	9E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	1.00	8.4E-12	1.9E-11	7.0E-10	1E-02	3E-02	1E-12	7E-12	1E+05	1E-07	9E-07
		Aluminum	1.0E+04	1.00	3.9E-03	8.9E-03	1.0E+00	4E-03	9E-03	5E-04	3E-03			
		Antimony	4.7E-01	1.00	1.8E-07	4.0E-07	4.0E-04	4E-04	1E-03	2E-08	1E-07			
		Arsenic	4.0E+00	0.60	9.0E-07	2.1E-06	3.0E-04	3E-03	7E-03	1E-07	7E-07	2E+00	2E-07	1E-06
		Barium	4.1E+02	1.00	1.6E-04	3.5E-04	2.0E-01	8E-04	2E-03	2E-05	1E-04			
		Cadmium	1.2E+00	1.00	4.3E-07	9.9E-07	1.0E-03	4E-04	1E-03	6E-08	4E-07			
		Chromium	2.0E+01	1.00	7.5E-06	1.7E-05	3.0E-03	2E-03	6E-03	1E-06	6E-06	5E-01	5E-07	3E-06
		Cobalt	3.2E+00	1.00	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	2E-07	1E-06			
		Iron	9.5E+03	1.00	3.5E-03	8.1E-03	7.0E-01	5E-03	1E-02	5E-04	3E-03			
		Manganese	4.0E+02	1.00	1.5E-04	3.5E-04	2.4E-02	6E-03	1E-02	2E-05	1E-04			
		Mercury	9.4E-01	1.00	3.5E-07	8.0E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07			
		Thallium	1.5E-01	1.00	5.7E-08	1.3E-07	1.0E-05	6E-03	1E-02	7E-09	5E-08			
		Vanadium	1.8E+01	1.00	6.7E-06	1.5E-05	5.0E-03	1E-03	3E-03	9E-07	5E-06			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	1.00	7.9E-12	1.8E-11	7.0E-10	1E-02	3E-02	1E-12	6E-12	1E+05	1E-07	8E-07
		Aluminum	9.8E+03	1.00	3.7E-03	8.4E-03	1.0E+00	4E-03	8E-03	5E-04	3E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.6E+00	0.60	1.3E-06	2.9E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06	2E+00	2E-07	2E-06
		Barium	3.9E+02	1.00	1.5E-04	3.4E-04	2.0E-01	7E-04	2E-03	2E-05	1E-04			
		Cadmium	1.2E+00	1.00	4.6E-07	1.1E-06	1.0E-03	5E-04	1E-03	6E-08	4E-07			
		Chromium	1.8E+01	1.00	6.7E-06	1.5E-05	3.0E-03	2E-03	5E-03	9E-07	5E-06	5E-01	4E-07	3E-06
		Cobalt	3.5E+00	1.00	1.3E-06	3.0E-06	3.0E-04	4E-03	1E-02	2E-07	1E-06			
		Iron	9.7E+03	1.00	3.6E-03	8.3E-03	7.0E-01	5E-03	1E-02	5E-04	3E-03			
		Manganese	7.4E+02	1.00	2.8E-04	6.3E-04	2.4E-02	1E-02	3E-02	4E-05	2E-04			
		Mercury	1.0E+00	1.00	3.9E-07	8.9E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07			
		Thallium	1.2E-01	1.00	4.6E-08	1.0E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	2.3E+01	1.00	8.7E-06	2.0E-05	5.0E-03	2E-03	4E-03	1E-06	7E-06			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	1.0E-12	2.4E-12	7.0E-10	1E-03	3E-03	1E-13	9E-13	1E+05	2E-08	1E-07
		Aluminum	6.9E+03	1.00	2.6E-03	5.9E-03	1.0E+00	3E-03	6E-03	3E-04	2E-03			
		Antimony	4.8E-02	1.00	1.8E-08	4.1E-08	4.0E-04	4E-05	1E-04	2E-09	1E-08			
		Arsenic	1.7E+00	0.60	3.8E-07	8.7E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07	2E+00	7E-08	5E-07
		Barium	2.4E+02	1.00	9.0E-05	2.0E-04	2.0E-01	4E-04	1E-03	1E-05	7E-05			
		Cadmium	2.6E-01	1.00	9.8E-08	2.2E-07	1.0E-03	1E-04	2E-04	1E-08	8E-08			
		Chromium	9.3E+00	1.00	3.5E-06	8.0E-06	3.0E-03	1E-03	3E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	1.7E+00	1.00	6.4E-07	1.5E-06	3.0E-04	2E-03	5E-03	8E-08	5E-07			
		Iron	5.5E+03	1.00	2.1E-03	4.7E-03	7.0E-01	3E-03	7E-03	3E-04	2E-03			
		Manganese	9.3E+01	1.00	3.5E-05	7.9E-05	2.4E-02	1E-03	3E-03	4E-06	3E-05			
		Mercury	4.1E-02	1.00	1.5E-08	3.5E-08	3.0E-04	5E-05	1E-04	2E-09	1E-08			
		Thallium	7.5E-03	1.00	2.8E-09	6.4E-09	1.0E-05	3E-04	6E-04	4E-10	2E-09			
		Vanadium	8.7E+00	1.00	3.3E-06	7.4E-06	5.0E-03	7E-04	1E-03	4E-07	3E-06			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	5.4E-12	1.2E-11	7.0E-10	8E-03	2E-02	7E-13	4E-12	1E+05	9E-08	6E-07
		Aluminum	1.5E+04	1.00	5.7E-03	1.3E-02	1.0E+00	6E-03	1E-02	7E-04	5E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.9E+00	0.60	1.1E-06	2.5E-06	3.0E-04	4E-03	8E-03	1E-07	9E-07	2E+00	2E-07	1E-06
		Barium	2.2E+03	1.00	8.2E-04	1.9E-03	2.0E-01	4E-03	9E-03	1E-04	7E-04			
		Cadmium	1.2E+00	1.00	4.6E-07	1.0E-06	1.0E-03	5E-04	1E-03	6E-08	4E-07			
		Chromium	1.9E+01	1.00	7.3E-06	1.7E-05	3.0E-03	2E-03	6E-03	9E-07	6E-06	5E-01	5E-07	3E-06
		Cobalt	3.2E+00	1.00	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	2E-07	1E-06			
		Iron	1.1E+04	1.00	3.9E-03	9.0E-03	7.0E-01	6E-03	1E-02	5E-04	3E-03			
		Manganese	2.9E+02	1.00	1.1E-04	2.5E-04	2.4E-02	5E-03	1E-02	1E-05	9E-05			
		Mercury	3.1E-01	1.00	1.1E-07	2.6E-07	3.0E-04	4E-04	9E-04	1E-08	9E-08			
		Thallium	1.3E-01	1.00	4.7E-08	1.1E-07	1.0E-05	5E-03	1E-02	6E-09	4E-08			
		Vanadium	2.1E+01	1.00	8.0E-06	1.8E-05	5.0E-03	2E-03	4E-03	1E-06	6E-06			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	1.85E-06	3.62E-06
Cancer	2.38E-07	1.29E-06

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-06	0.03	2.1E-13	4.0E-13	7.0E-10	3E-04	6E-04	3E-14	1E-13	1E+05	3E-09	2E-08
		Arsenic	9.3E+00	0.03	5.2E-07	1.0E-06	3.0E-04	2E-03	3E-03	7E-08	4E-07	2E+00	1E-07	5E-07
		Cadmium	7.0E-01	0.001	1.3E-09	2.5E-09	2.5E-05	5E-05	1E-04	2E-10	9E-10			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	0.03	1.4E-13	2.7E-13	7.0E-10	2E-04	4E-04	2E-14	1E-13	1E+05	2E-09	1E-08
		Arsenic	1.0E+00	0.03	5.6E-08	1.1E-07	3.0E-04	2E-04	4E-04	7E-09	4E-08	2E+00	1E-08	6E-08
		Cadmium	6.4E-02	0.001	1.2E-10	2.3E-10	2.5E-05	5E-06	9E-06	2E-11	8E-11			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	0.03	3.6E-14	7.1E-14	7.0E-10	5E-05	1E-04	5E-15	3E-14	1E+05	6E-10	3E-09
		Arsenic	9.5E-01	0.03	5.3E-08	1.0E-07	3.0E-04	2E-04	3E-04	7E-09	4E-08	2E+00	1E-08	6E-08
		Cadmium	7.3E-02	0.001	1.4E-10	2.6E-10	2.5E-05	5E-06	1E-05	2E-11	9E-11			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	0.03	1.6E-13	3.2E-13	7.0E-10	2E-04	5E-04	2E-14	1E-13	1E+05	3E-09	1E-08
		Arsenic	1.7E+00	0.03	9.4E-08	1.8E-07	3.0E-04	3E-04	6E-04	1E-08	7E-08	2E+00	2E-08	1E-07
		Cadmium	1.4E-01	0.001	2.6E-10	5.1E-10	2.5E-05	1E-05	2E-05	3E-11	2E-10			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	0.03	9.5E-14	1.9E-13	7.0E-10	1E-04	3E-04	1E-14	7E-14	1E+05	2E-09	9E-09
		Arsenic	1.2E+00	0.03	6.7E-08	1.3E-07	3.0E-04	2E-04	4E-04	9E-09	5E-08	2E+00	1E-08	7E-08
		Cadmium	1.3E-01	0.001	2.4E-10	4.7E-10	2.5E-05	1E-05	2E-05	3E-11	2E-10			
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	7.1E-07	0.03	4.0E-14	7.8E-14	7.0E-10	6E-05	1E-04	5E-15	3E-14	1E+05	7E-10	4E-09
		Arsenic	1.9E+00	0.03	1.0E-07	2.0E-07	3.0E-04	3E-04	7E-04	1E-08	7E-08	2E+00	2E-08	1E-07
		Cadmium	4.4E-02	0.001	8.1E-11	1.6E-10	2.5E-05	3E-06	6E-06	1E-11	6E-11			
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	0.03	2.9E-14	5.8E-14	7.0E-10	4E-05	8E-05	4E-15	2E-14	1E+05	5E-10	3E-09
		Arsenic	1.1E+00	0.03	6.1E-08	1.2E-07	3.0E-04	2E-04	4E-04	8E-09	4E-08	2E+00	1E-08	6E-08
		Cadmium	4.6E-02	0.001	8.5E-11	1.7E-10	2.5E-05	3E-06	7E-06	1E-11	6E-11			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	1.0E-06	0.03	5.7E-14	1.1E-13	7.0E-10	8E-05	2E-04	7E-15	4E-14	1E+05	9E-10	5E-09
		Arsenic	4.0E+00	0.03	2.2E-07	4.3E-07	3.0E-04	7E-04	1E-03	3E-08	2E-07	2E+00	4E-08	2E-07
		Cadmium	1.3E-01	0.001	2.4E-10	4.7E-10	2.5E-05	1E-05	2E-05	3E-11	2E-10			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	0.03	4.6E-14	9.1E-14	7.0E-10	7E-05	1E-04	6E-15	3E-14	1E+05	8E-10	4E-09
		Arsenic	1.6E+00	0.03	8.9E-08	1.7E-07	3.0E-04	3E-04	6E-04	1E-08	6E-08	2E+00	2E-08	9E-08
		Cadmium	9.3E-02	0.001	1.7E-10	3.4E-10	2.5E-05	7E-06	1E-05	2E-11	1E-10			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	0.03	4.0E-14	7.9E-14	7.0E-10	6E-05	1E-04	5E-15	3E-14	1E+05	7E-10	4E-09
		Arsenic	2.1E+00	0.03	1.2E-07	2.3E-07	3.0E-04	4E-04	8E-04	1E-08	8E-08	2E+00	2E-08	1E-07
		Cadmium	1.9E-01	0.001	3.5E-10	6.9E-10	2.5E-05	1E-05	3E-05	5E-11	2E-10			
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	0.03	5.1E-13	1.0E-12	7.0E-10	7E-04	1E-03	7E-14	4E-13	1E+05	8E-09	5E-08
		Arsenic	5.1E+00	0.03	2.8E-07	5.5E-07	3.0E-04	9E-04	2E-03	4E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	8.5E-01	0.001	1.6E-09	3.1E-09	2.5E-05	6E-05	1E-04	2E-10	1E-09			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	8.5E-14	1.7E-13	7.0E-10	1E-04	2E-04	1E-14	6E-14	1E+05	1E-09	8E-09
		Arsenic	2.5E+00	0.03	1.4E-07	2.7E-07	3.0E-04	5E-04	9E-04	2E-08	1E-07	2E+00	3E-08	1E-07
		Cadmium	2.6E-01	0.001	4.7E-10	9.3E-10	2.5E-05	2E-05	4E-05	6E-11	3E-10			
Upland	38[a]	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	0.03	1.2E-13	2.3E-13	7.0E-10	2E-04	3E-04	2E-14	8E-14	1E+05	2E-09	1E-08
		Arsenic	1.0E+00	0.03	5.6E-08	1.1E-07	3.0E-04	2E-04	4E-04	7E-09	4E-08	2E+00	1E-08	6E-08
		Cadmium	1.6E-02	0.001	3.0E-11	5.8E-11	2.5E-05	1E-06	2E-06	4E-12	2E-11			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	1.5E-13	3.0E-13	7.0E-10	2E-04	4E-04	2E-14	1E-13	1E+05	3E-09	1E-08
		Arsenic	2.2E+00	0.03	1.2E-07	2.3E-07	3.0E-04	4E-04	8E-04	2E-08	8E-08	2E+00	2E-08	1E-07
		Cadmium	3.3E-01	0.001	6.1E-10	1.2E-09	2.5E-05	2E-05	5E-05	8E-11	4E-10			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	0.03	2.0E-13	3.9E-13	7.0E-10	3E-04	6E-04	3E-14	1E-13	1E+05	3E-09	2E-08
		Arsenic	1.4E+00	0.03	7.8E-08	1.5E-07	3.0E-04	3E-04	5E-04	1E-08	5E-08	2E+00	1E-08	8E-08
		Cadmium	2.8E-01	0.001	5.2E-10	1.0E-09	2.5E-05	2E-05	4E-05	7E-11	4E-10			
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	2.2E-13	4.3E-13	7.0E-10	3E-04	6E-04	3E-14	2E-13	1E+05	4E-09	2E-08
		Arsenic	1.3E+00	0.03	7.2E-08	1.4E-07	3.0E-04	2E-04	5E-04	9E-09	5E-08	2E+00	1E-08	8E-08
		Cadmium	2.8E-01	0.001	5.2E-10	1.0E-09	2.5E-05	2E-05	4E-05	7E-11	4E-10			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	0.03	4.2E-13	8.1E-13	7.0E-10	6E-04	1E-03	5E-14	3E-13	1E+05	7E-09	4E-08
		Arsenic	3.1E+00	0.03	1.7E-07	3.4E-07	3.0E-04	6E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	3.2E-01	0.001	5.9E-10	1.2E-09	2.5E-05	2E-05	5E-05	8E-11	4E-10			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	2.2E-13	4.2E-13	7.0E-10	3E-04	6E-04	3E-14	2E-13	1E+05	4E-09	2E-08
		Arsenic	2.8E+00	0.03	1.6E-07	3.0E-07	3.0E-04	5E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	4.7E-01	0.001	8.7E-10	1.7E-09	2.5E-05	3E-05	7E-05	1E-10	6E-10			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	1.2E-13	2.3E-13	7.0E-10	2E-04	3E-04	2E-14	8E-14	1E+05	2E-09	1E-08
		Arsenic	4.4E+00	0.03	2.4E-07	4.8E-07	3.0E-04	8E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	8.0E-01	0.001	1.5E-09	2.9E-09	2.5E-05	6E-05	1E-04	2E-10	1E-09			
Upland	45[a]	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	0.03	2.0E-14	4.0E-14	7.0E-10	3E-05	6E-05	3E-15	1E-14	1E+05	3E-10	2E-09
		Arsenic	3.1E+00	0.03	1.7E-07	3.4E-07	3.0E-04	6E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	8.0E-02	0.001	1.5E-10	2.9E-10	2.5E-05	6E-06	1E-05	2E-11	1E-10			
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-06	0.03	1.7E-13	3.3E-13	7.0E-10	2E-04	5E-04	2E-14	1E-13	1E+05	3E-09	2E-08
		Arsenic	2.3E+00	0.03	1.3E-07	2.5E-07	3.0E-04	4E-04	8E-04	2E-08	9E-08	2E+00	2E-08	1E-07
		Cadmium	2.4E-01	0.001	4.4E-10	8.7E-10	2.5E-05	2E-05	3E-05	6E-11	3E-10			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	9.0E-13	1.8E-12	7.0E-10	1E-03	3E-03	1E-13	6E-13	1E+05	2E-08	8E-08
		Arsenic	1.3E+01	0.03	7.1E-07	1.4E-06	3.0E-04	2E-03	5E-03	9E-08	5E-07	2E+00	1E-07	7E-07
		Cadmium	5.2E+00	0.001	9.6E-09	1.9E-08	2.5E-05	4E-04	8E-04	1E-09	7E-09			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	1.85E-06	3.62E-06
Cancer	2.38E-07	1.29E-06

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	0.03	2.7E-12	5.4E-12	7.0E-10	4E-03	8E-03	4E-13	2E-12	1E+05	5E-08	2E-07
		Arsenic	1.4E+01	0.03	7.9E-07	1.5E-06	3.0E-04	3E-03	5E-03	1E-07	6E-07	2E+00	2E-07	8E-07
		Cadmium	8.3E+00	0.001	1.5E-08	3.0E-08	2.5E-05	6E-04	1E-03	2E-09	1E-08			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	0.03	2.2E-12	4.3E-12	7.0E-10	3E-03	6E-03	3E-13	2E-12	1E+05	4E-08	2E-07
		Arsenic	3.6E+00	0.03	2.0E-07	3.9E-07	3.0E-04	7E-04	1E-03	3E-08	1E-07	2E+00	4E-08	2E-07
		Cadmium	2.0E+00	0.001	3.7E-09	7.2E-09	2.5E-05	1E-04	3E-04	5E-10	3E-09			
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	0.03	1.4E-12	2.6E-12	7.0E-10	2E-03	4E-03	2E-13	9E-13	1E+05	2E-08	1E-07
		Arsenic	7.9E+00	0.03	4.4E-07	8.5E-07	3.0E-04	1E-03	3E-03	6E-08	3E-07	2E+00	8E-08	5E-07
		Cadmium	3.9E+00	0.001	7.2E-09	1.4E-08	2.5E-05	3E-04	6E-04	9E-10	5E-09			
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	0.03	1.7E-13	3.4E-13	7.0E-10	2E-04	5E-04	2E-14	1E-13	1E+05	3E-09	2E-08
		Arsenic	2.2E+00	0.03	1.2E-07	2.4E-07	3.0E-04	4E-04	8E-04	2E-08	9E-08	2E+00	2E-08	1E-07
		Cadmium	5.2E-01	0.001	9.6E-10	1.9E-09	2.5E-05	4E-05	8E-05	1E-10	7E-10			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	1.2E-13	2.3E-13	7.0E-10	2E-04	3E-04	2E-14	8E-14	1E+05	2E-09	1E-08
		Arsenic	1.8E+00	0.03	9.8E-08	1.9E-07	3.0E-04	3E-04	6E-04	1E-08	7E-08	2E+00	2E-08	1E-07
		Cadmium	1.6E-01	0.001	2.9E-10	5.7E-10	2.5E-05	1E-05	2E-05	4E-11	2E-10			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	1.3E-12	2.5E-12	7.0E-10	2E-03	4E-03	2E-13	9E-13	1E+05	2E-08	1E-07
		Arsenic	2.6E+00	0.03	1.4E-07	2.8E-07	3.0E-04	5E-04	9E-04	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	1.2E+00	0.001	2.2E-09	4.3E-09	2.5E-05	9E-05	2E-04	3E-10	2E-09			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	8.0E-13	1.6E-12	7.0E-10	1E-03	2E-03	1E-13	6E-13	1E+05	1E-08	7E-08
		Arsenic	1.1E+01	0.03	5.9E-07	1.2E-06	3.0E-04	2E-03	4E-03	8E-08	4E-07	2E+00	1E-07	6E-07
		Cadmium	4.7E+00	0.001	8.7E-09	1.7E-08	2.5E-05	3E-04	7E-04	1E-09	6E-09			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	3.1E-12	6.0E-12	7.0E-10	4E-03	9E-03	4E-13	2E-12	1E+05	5E-08	3E-07
		Arsenic	1.4E+01	0.03	7.5E-07	1.5E-06	3.0E-04	2E-03	5E-03	1E-07	5E-07	2E+00	1E-07	8E-07
		Cadmium	5.6E+00	0.001	1.0E-08	2.0E-08	2.5E-05	4E-04	8E-04	1E-09	7E-09			
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.9E-05	0.03	3.3E-12	6.4E-12	7.0E-10	5E-03	9E-03	4E-13	2E-12	1E+05	5E-08	3E-07
		Arsenic	1.2E+01	0.03	6.8E-07	1.3E-06	3.0E-04	2E-03	4E-03	9E-08	5E-07	2E+00	1E-07	7E-07
		Cadmium	6.7E+00	0.001	1.2E-08	2.4E-08	2.5E-05	5E-04	1E-03	2E-09	9E-09			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	4.6E-12	9.1E-12	7.0E-10	7E-03	1E-02	6E-13	3E-12	1E+05	8E-08	4E-07
		Arsenic	1.2E+01	0.03	6.6E-07	1.3E-06	3.0E-04	2E-03	4E-03	8E-08	5E-07	2E+00	1E-07	7E-07
		Cadmium	4.8E+00	0.001	8.9E-09	1.7E-08	2.5E-05	4E-04	7E-04	1E-09	6E-09			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	8.8E-13	1.7E-12	7.0E-10	1E-03	2E-03	1E-13	6E-13	1E+05	1E-08	8E-08
		Arsenic	6.2E+00	0.03	3.5E-07	6.8E-07	3.0E-04	1E-03	2E-03	4E-08	2E-07	2E+00	7E-08	4E-07
		Cadmium	3.3E+00	0.001	6.2E-09	1.2E-08	2.5E-05	2E-04	5E-04	8E-10	4E-09			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.7E-06	0.03	4.8E-13	9.4E-13	7.0E-10	7E-04	1E-03	6E-14	3E-13	1E+05	8E-09	4E-08
		Arsenic	4.6E+00	0.03	2.6E-07	5.0E-07	3.0E-04	9E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	1.7E+00	0.001	3.1E-09	6.2E-09	2.5E-05	1E-04	2E-04	4E-10	2E-09			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	0.03	3.2E-13	6.3E-13	7.0E-10	5E-04	9E-04	4E-14	2E-13	1E+05	5E-09	3E-08
		Arsenic	3.7E+00	0.03	2.1E-07	4.0E-07	3.0E-04	7E-04	1E-03	3E-08	1E-07	2E+00	4E-08	2E-07
		Cadmium	1.1E+00	0.001	2.0E-09	4.0E-09	2.5E-05	8E-05	2E-04	3E-10	1E-09			
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	0.03	6.1E-14	1.2E-13	7.0E-10	9E-05	2E-04	8E-15	4E-14	1E+05	1E-09	6E-09
		Arsenic	2.6E+00	0.03	1.4E-07	2.8E-07	3.0E-04	5E-04	9E-04	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	3.7E-01	0.001	6.9E-10	1.3E-09	2.5E-05	3E-05	5E-05	9E-11	5E-10			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	9.1E-13	1.8E-12	7.0E-10	1E-03	3E-03	1E-13	6E-13	1E+05	2E-08	8E-08
		Arsenic	3.0E+00	0.03	1.7E-07	3.3E-07	3.0E-04	6E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	7.9E-01	0.001	1.5E-09	2.9E-09	2.5E-05	6E-05	1E-04	2E-10	1E-09			
Upland	65[a]	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	0.03	7.2E-13	1.4E-12	7.0E-10	1E-03	2E-03	9E-14	5E-13	1E+05	1E-08	7E-08
		Arsenic	4.3E+00	0.03	2.4E-07	4.7E-07	3.0E-04	8E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	2.5E+00	0.001	4.6E-09	9.1E-09	2.5E-05	2E-04	4E-04	6E-10	3E-09			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	8.6E-14	1.7E-13	7.0E-10	1E-04	2E-04	1E-14	6E-14	1E+05	1E-09	8E-09
		Arsenic	3.2E+00	0.03	1.8E-07	3.5E-07	3.0E-04	6E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	9.0E-01	0.001	1.7E-09	3.3E-09	2.5E-05	7E-05	1E-04	2E-10	1E-09			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	4.6E-12	9.0E-12	7.0E-10	7E-03	1E-02	6E-13	3E-12	1E+05	8E-08	4E-07
		Arsenic	1.5E+01	0.03	8.3E-07	1.6E-06	3.0E-04	3E-03	5E-03	1E-07	6E-07	2E+00	2E-07	9E-07
		Cadmium	4.8E+00	0.001	8.9E-09	1.7E-08	2.5E-05	4E-04	7E-04	1E-09	6E-09			
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	4.6E-12	9.0E-12	7.0E-10	7E-03	1E-02	6E-13	3E-12	1E+05	8E-08	4E-07
		Arsenic	1.5E+01	0.03	8.3E-07	1.6E-06	3.0E-04	3E-03	5E-03	1E-07	6E-07	2E+00	2E-07	9E-07
		Cadmium	4.8E+00	0.001	8.9E-09	1.7E-08	2.5E-05	4E-04	7E-04	1E-09	6E-09			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.1E-06	0.03	2.3E-13	4.4E-13	7.0E-10	3E-04	6E-04	3E-14	2E-13	1E+05	4E-09	2E-08
		Arsenic	6.0E+00	0.03	3.3E-07	6.5E-07	3.0E-04	1E-03	2E-03	4E-08	2E-07	2E+00	6E-08	3E-07
		Cadmium	1.8E+00	0.001	3.3E-09	6.5E-09	2.5E-05	1E-04	3E-04	4E-10	2E-09			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	0.03	1.3E-13	2.6E-13	7.0E-10	2E-04	4E-04	2E-14	9E-14	1E+05	2E-09	1E-08
		Arsenic	5.8E+00	0.03	3.2E-07	6.3E-07	3.0E-04	1E-03	2E-03	4E-08	2E-07	2E+00	6E-08	3E-07
		Cadmium	1.3E+00	0.001	2.4E-09	4.7E-09	2.5E-05	1E-04	2E-04	3E-10	2E-09			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	1.3E-12	2.5E-12	7.0E-10	2E-03	4E-03	2E-13	9E-13	1E+05	2E-08	1E-07
		Arsenic	7.0E+00	0.03	3.9E-07	7.6E-07	3.0E-04	1E-03	3E-03	5E-08	3E-07	2E+00	7E-08	4E-07
		Cadmium	2.2E+00	0.001	4.1E-09	8.0E-09	2.5E-05	2E-04	3E-04	5E-10	3E-09			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	1.85E-06	3.62E-06
Cancer	2.38E-07	1.29E-06

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-04	0.03	1.7E-11	3.3E-11	7.0E-10	2E-02	5E-02	2E-12	1E-11	1E+05	3E-07	2E-06
		Arsenic	4.1E+01	0.03	2.3E-06	4.4E-06	3.0E-04	8E-03	1E-02	3E-07	2E-06	2E+00	4E-07	2E-06
		Cadmium	6.4E+00	0.001	1.2E-08	2.3E-08	2.5E-05	5E-04	9E-04	2E-09	8E-09			
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	1.9E-14	3.7E-14	7.0E-10	3E-05	5E-05	2E-15	1E-14	1E+05	3E-10	2E-09
		Arsenic	4.3E+00	0.03	2.4E-07	4.7E-07	3.0E-04	8E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	1.5E-01	0.001	2.8E-10	5.4E-10	2.5E-05	1E-05	2E-05	4E-11	2E-10			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	1.1E-13	2.2E-13	7.0E-10	2E-04	3E-04	1E-14	8E-14	1E+05	2E-09	1E-08
		Arsenic	2.9E+00	0.03	1.6E-07	3.1E-07	3.0E-04	5E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	1.2E-01	0.001	2.2E-10	4.4E-10	2.5E-05	9E-06	2E-05	3E-11	2E-10			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	1.1E-13	2.2E-13	7.0E-10	2E-04	3E-04	1E-14	8E-14	1E+05	2E-09	1E-08
		Arsenic	2.9E+00	0.03	1.6E-07	3.1E-07	3.0E-04	5E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	1.2E-01	0.001	2.2E-10	4.4E-10	2.5E-05	9E-06	2E-05	3E-11	2E-10			
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	1.9E-14	3.7E-14	7.0E-10	3E-05	5E-05	2E-15	1E-14	1E+05	3E-10	2E-09
		Arsenic	4.3E+00	0.03	2.4E-07	4.7E-07	3.0E-04	8E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	1.5E-01	0.001	2.8E-10	5.4E-10	2.5E-05	1E-05	2E-05	4E-11	2E-10			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	1.1E-13	2.2E-13	7.0E-10	2E-04	3E-04	1E-14	8E-14	1E+05	2E-09	1E-08
		Arsenic	2.9E+00	0.03	1.6E-07	3.1E-07	3.0E-04	5E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	1.2E-01	0.001	2.2E-10	4.4E-10	2.5E-05	9E-06	2E-05	3E-11	2E-10			
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	1.1E-13	2.2E-13	7.0E-10	2E-04	3E-04	1E-14	8E-14	1E+05	2E-09	1E-08
		Arsenic	2.9E+00	0.03	1.6E-07	3.1E-07	3.0E-04	5E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Cadmium	1.2E-01	0.001	2.2E-10	4.4E-10	2.5E-05	9E-06	2E-05	3E-11	2E-10			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	0.03	3.3E-14	6.5E-14	7.0E-10	5E-05	9E-05	4E-15	2E-14	1E+05	6E-10	3E-09
		Arsenic	4.5E+00	0.03	2.5E-07	4.9E-07	3.0E-04	8E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	3.2E-01	0.001	5.9E-10	1.2E-09	2.5E-05	2E-05	5E-05	8E-11	4E-10			
Floodplain	85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	0.03	2.2E-14	4.4E-14	7.0E-10	3E-05	6E-05	3E-15	2E-14	1E+05	4E-10	2E-09
		Arsenic	1.9E+00	0.03	1.1E-07	2.1E-07	3.0E-04	4E-04	7E-04	1E-08	7E-08	2E+00	2E-08	1E-07
		Cadmium	1.6E-02	0.001	3.0E-11	5.8E-11	2.5E-05	1E-06	2E-06	4E-12	2E-11			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	0.03	1.0E-12	2.0E-12	7.0E-10	1E-03	3E-03	1E-13	7E-13	1E+05	2E-08	9E-08
		Arsenic	4.6E+00	0.03	2.6E-07	5.0E-07	3.0E-04	9E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	5.4E-01	0.001	1.0E-09	2.0E-09	2.5E-05	4E-05	8E-05	1E-10	7E-10			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	0.03	3.8E-13	7.4E-13	7.0E-10	5E-04	1E-03	5E-14	3E-13	1E+05	6E-09	3E-08
		Arsenic	4.7E+00	0.03	2.6E-07	5.1E-07	3.0E-04	9E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	7.9E-01	0.001	1.5E-09	2.9E-09	2.5E-05	6E-05	1E-04	2E-10	1E-09			
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	0.03	3.1E-12	6.1E-12	7.0E-10	4E-03	9E-03	4E-13	2E-12	1E+05	5E-08	3E-07
		Arsenic	5.5E+00	0.03	3.1E-07	6.0E-07	3.0E-04	1E-03	2E-03	4E-08	2E-07	2E+00	6E-08	3E-07
		Cadmium	1.8E+00	0.001	3.3E-09	6.5E-09	2.5E-05	1E-04	3E-04	4E-10	2E-09			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	0.03	5.4E-13	1.1E-12	7.0E-10	8E-04	2E-03	7E-14	4E-13	1E+05	9E-09	5E-08
		Arsenic	4.8E+00	0.03	2.6E-07	5.2E-07	3.0E-04	9E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	5.5E-01	0.001	1.0E-09	2.0E-09	2.5E-05	4E-05	8E-05	1E-10	7E-10			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	3.1E-12	6.0E-12	7.0E-10	4E-03	9E-03	4E-13	2E-12	1E+05	5E-08	3E-07
		Arsenic	1.0E+01	0.03	5.6E-07	1.1E-06	3.0E-04	2E-03	4E-03	7E-08	4E-07	2E+00	1E-07	6E-07
		Cadmium	2.8E+00	0.001	5.2E-09	1.0E-08	2.5E-05	2E-04	4E-04	7E-10	4E-09			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	1.3E-12	2.5E-12	7.0E-10	2E-03	4E-03	2E-13	9E-13	1E+05	2E-08	1E-07
		Arsenic	6.3E+00	0.03	3.5E-07	6.8E-07	3.0E-04	1E-03	2E-03	4E-08	2E-07	2E+00	7E-08	4E-07
		Cadmium	1.7E+00	0.001	3.1E-09	6.1E-09	2.5E-05	1E-04	2E-04	4E-10	2E-09			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	0.03	2.6E-12	5.0E-12	7.0E-10	4E-03	7E-03	3E-13	2E-12	1E+05	4E-08	2E-07
		Arsenic	7.8E+00	0.03	4.3E-07	8.5E-07	3.0E-04	1E-03	3E-03	6E-08	3E-07	2E+00	8E-08	5E-07
		Cadmium	2.1E+00	0.001	3.9E-09	7.7E-09	2.5E-05	2E-04	3E-04	5E-10	3E-09			
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	0.03	1.2E-12	2.4E-12	7.0E-10	2E-03	3E-03	2E-13	9E-13	1E+05	2E-08	1E-07
		Arsenic	4.0E+00	0.03	2.2E-07	4.4E-07	3.0E-04	7E-04	1E-03	3E-08	2E-07	2E+00	4E-08	2E-07
		Cadmium	1.2E+00	0.001	2.1E-09	4.2E-09	2.5E-05	9E-05	2E-04	3E-10	1E-09			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	0.03	1.2E-12	2.3E-12	7.0E-10	2E-03	3E-03	2E-13	8E-13	1E+05	2E-08	1E-07
		Arsenic	5.6E+00	0.03	3.1E-07	6.1E-07	3.0E-04	1E-03	2E-03	4E-08	2E-07	2E+00	6E-08	3E-07
		Cadmium	1.2E+00	0.001	2.3E-09	4.5E-09	2.5E-05	9E-05	2E-04	3E-10	2E-09			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	1.5E-13	3.0E-13	7.0E-10	2E-04	4E-04	2E-14	1E-13	1E+05	3E-09	1E-08
		Arsenic	1.7E+00	0.03	9.4E-08	1.8E-07	3.0E-04	3E-04	6E-04	1E-08	7E-08	2E+00	2E-08	1E-07
		Cadmium	2.6E-01	0.001	4.8E-10	9.4E-10	2.5E-05	2E-05	4E-05	6E-11	3E-10			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	8.0E-13	1.6E-12	7.0E-10	1E-03	2E-03	1E-13	6E-13	1E+05	1E-08	7E-08
		Arsenic	4.9E+00	0.03	2.7E-07	5.3E-07	3.0E-04	9E-04	2E-03	3E-08	2E-07	2E+00	5E-08	3E-07
		Cadmium	1.2E+00	0.001	2.3E-09	4.4E-09	2.5E-05	9E-05	2E-04	3E-10	2E-09			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	1.00	1.1E-12	4.4E-12	2.0E-08	5E-05	2E-04	8E-15	6E-14	1E+05	1E-09	8E-09
		Aluminum	1.6E+04	1.00	5.7E-03	2.3E-02	1.0E+00	6E-03	2E-02	4E-05	3E-04			
		Antimony	1.3E+00	1.00	4.4E-07	1.8E-06	4.0E-04	1E-03	4E-03	3E-09	3E-08			
		Arsenic	7.9E+00	0.60	1.7E-06	6.6E-06	3.0E-04	6E-03	2E-02	1E-08	9E-08	2E+00	2E-08	1E-07
		Barium	8.7E+02	1.00	3.1E-04	1.2E-03	2.0E-01	2E-03	6E-03	2E-06	2E-05			
		Cadmium	5.9E-01	1.00	2.1E-07	8.2E-07	5.0E-04	4E-04	2E-03	1E-09	1E-08			
		Chromium	1.8E+01	1.00	6.2E-06	2.5E-05	5.0E-03	1E-03	5E-03	4E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	4.9E+00	1.00	1.7E-06	6.8E-06	3.0E-03	6E-04	2E-03	1E-08	1E-07			
		Iron	1.5E+04	1.00	5.4E-03	2.2E-02	7.0E-01	8E-03	3E-02	4E-05	3E-04			
		Manganese	4.2E+02	1.00	1.5E-04	5.8E-04	2.4E-02	6E-03	2E-02	1E-06	8E-06			
		Mercury	1.2E-01	1.00	4.1E-08	1.6E-07	2.0E-03	2E-05	8E-05	3E-10	2E-09			
		Thallium	1.8E-01	1.00	6.4E-08	2.6E-07	4.0E-05	2E-03	6E-03	5E-10	4E-09			
		Vanadium	3.5E+01	1.00	1.2E-05	5.0E-05	1.0E-02	1E-03	5E-03	9E-08	7E-07			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	1.00	8.8E-13	3.5E-12	2.0E-08	4E-05	2E-04	6E-15	5E-14	1E+05	8E-10	7E-09
		Aluminum	6.7E+03	1.00	2.4E-03	9.4E-03	1.0E+00	2E-03	9E-03	2E-05	1E-04			
		Antimony	9.0E-02	1.00	3.2E-08	1.3E-07	4.0E-04	8E-05	3E-04	2E-10	2E-09			
		Arsenic	1.0E+00	0.60	2.1E-07	8.4E-07	3.0E-04	7E-04	3E-03	2E-09	1E-08	2E+00	2E-09	2E-08
		Barium	2.0E+02	1.00	7.0E-05	2.8E-04	2.0E-01	4E-04	1E-03	5E-07	4E-06			
		Cadmium	6.4E-02	1.00	2.2E-08	9.0E-08	5.0E-04	4E-05	2E-04	2E-10	1E-09			
		Chromium	8.7E+00	1.00	3.0E-06	1.2E-05	5.0E-03	6E-04	2E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	2.6E+00	1.00	9.1E-07	3.6E-06	3.0E-03	3E-04	1E-03	7E-09	5E-08			
		Iron	8.1E+03	1.00	2.8E-03	1.1E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.1E+02	1.00	3.8E-05	1.5E-04	2.4E-02	2E-03	6E-03	3E-07	2E-06			
		Mercury	1.2E-02	1.00	4.2E-09	1.7E-08	2.0E-03	2E-06	8E-06	3E-11	2E-10			
		Thallium	8.5E-02	1.00	3.0E-08	1.2E-07	4.0E-05	7E-04	3E-03	2E-10	2E-09			
		Vanadium	9.4E+00	1.00	3.3E-06	1.3E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	1.00	2.3E-13	9.2E-13	2.0E-08	1E-05	5E-05	2E-15	1E-14	1E+05	2E-10	2E-09
		Aluminum	6.4E+03	1.00	2.2E-03	8.9E-03	1.0E+00	2E-03	9E-03	2E-05	1E-04			
		Antimony	9.0E-02	1.00	3.2E-08	1.3E-07	4.0E-04	8E-05	3E-04	2E-10	2E-09			
		Arsenic	9.5E-01	0.60	2.0E-07	8.0E-07	3.0E-04	7E-04	3E-03	1E-09	1E-08	2E+00	2E-09	2E-08
		Barium	2.0E+02	1.00	7.0E-05	2.8E-04	2.0E-01	4E-04	1E-03	5E-07	4E-06			
		Cadmium	7.3E-02	1.00	2.6E-08	1.0E-07	5.0E-04	5E-05	2E-04	2E-10	1E-09			
		Chromium	7.2E+00	1.00	2.5E-06	1.0E-05	5.0E-03	5E-04	2E-03	2E-08	1E-07	5E-01	9E-09	7E-08
		Cobalt	2.4E+00	1.00	8.4E-07	3.4E-06	3.0E-03	3E-04	1E-03	6E-09	5E-08			
		Iron	7.5E+03	1.00	2.6E-03	1.0E-02	7.0E-01	4E-03	1E-02	2E-05	1E-04			
		Manganese	8.4E+01	1.00	3.0E-05	1.2E-04	2.4E-02	1E-03	5E-03	2E-07	2E-06			
		Mercury	1.6E-02	1.00	5.6E-09	2.2E-08	2.0E-03	3E-06	1E-05	4E-11	3E-10			
		Thallium	8.5E-02	1.00	3.0E-08	1.2E-07	4.0E-05	7E-04	3E-03	2E-10	2E-09			
		Vanadium	8.7E+00	1.00	3.0E-06	1.2E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	1.00	1.0E-12	4.0E-12	2.0E-08	5E-05	2E-04	7E-15	6E-14	1E+05	9E-10	7E-09
		Aluminum	7.8E+03	1.00	2.7E-03	1.1E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	1.9E-01	1.00	6.5E-08	2.6E-07	4.0E-04	2E-04	7E-04	5E-10	4E-09			
		Arsenic	1.7E+00	0.60	3.6E-07	1.5E-06	3.0E-04	1E-03	5E-03	3E-09	2E-08	2E+00	4E-09	3E-08
		Barium	1.9E+02	1.00	6.8E-05	2.7E-04	2.0E-01	3E-04	1E-03	5E-07	4E-06			
		Cadmium	1.4E-01	1.00	4.8E-08	1.9E-07	5.0E-04	1E-04	4E-04	3E-10	3E-09			
		Chromium	1.1E+01	1.00	3.8E-06	1.5E-05	5.0E-03	8E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	3.2E+00	1.00	1.1E-06	4.5E-06	3.0E-03	4E-04	1E-03	8E-09	6E-08			
		Iron	8.8E+03	1.00	3.1E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.6E+02	1.00	5.5E-05	2.2E-04	2.4E-02	2E-03	9E-03	4E-07	3E-06			
		Mercury	3.2E-02	1.00	1.1E-08	4.5E-08	2.0E-03	6E-06	2E-05	8E-11	6E-10			
		Thallium	1.1E-01	1.00	4.0E-08	1.6E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	1.9E+01	1.00	6.6E-06	2.6E-05	1.0E-02	7E-04	3E-03	5E-08	4E-07			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	1.00	6.0E-13	2.4E-12	2.0E-08	3E-05	1E-04	4E-15	3E-14	1E+05	6E-10	4E-09
		Aluminum	8.2E+03	1.00	2.9E-03	1.2E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	2.0E-01	1.00	7.0E-08	2.8E-07	4.0E-04	2E-04	7E-04	5E-10	4E-09			
		Arsenic	1.2E+00	0.60	2.5E-07	1.0E-06	3.0E-04	8E-04	3E-03	2E-09	1E-08	2E+00	3E-09	2E-08
		Barium	3.6E+02	1.00	1.3E-04	5.0E-04	2.0E-01	6E-04	3E-03	9E-07	7E-06			
		Cadmium	1.3E-01	1.00	4.6E-08	1.8E-07	5.0E-04	9E-05	4E-04	3E-10	3E-09			
		Chromium	1.0E+01	1.00	3.5E-06	1.4E-05	5.0E-03	7E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	2.6E+00	1.00	9.1E-07	3.6E-06	3.0E-03	3E-04	1E-03	7E-09	5E-08			
		Iron	8.7E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.1E+02	1.00	3.8E-05	1.5E-04	2.4E-02	2E-03	6E-03	3E-07	2E-06			
		Mercury	2.4E-02	1.00	8.4E-09	3.4E-08	2.0E-03	4E-06	2E-05	6E-11	5E-10			
		Thallium	1.2E-01	1.00	4.2E-08	1.7E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	1.2E+01	1.00	4.1E-06	1.7E-05	1.0E-02	4E-04	2E-03	3E-08	2E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	6.9E-07	1.00	2.4E-13	9.6E-13	2.0E-08	1E-05	5E-05	2E-15	1E-14	1E+05	2E-10	2E-09
		Aluminum	6.0E+03	1.00	2.1E-03	8.4E-03	1.0E+00	2E-03	8E-03	1E-05	1E-04			
		Antimony	4.2E-02	1.00	1.5E-08	5.9E-08	4.0E-04	4E-05	1E-04	1E-10	8E-10			
		Arsenic	1.7E+00	0.60	3.7E-07	1.5E-06	3.0E-04	1E-03	5E-03	3E-09	2E-08	2E+00	4E-09	3E-08
		Barium	7.5E+01	1.00	2.6E-05	1.0E-04	2.0E-01	1E-04	5E-04	2E-07	1E-06			
		Cadmium	4.1E-02	1.00	1.4E-08	5.7E-08	5.0E-04	3E-05	1E-04	1E-10	8E-10			
		Chromium	9.2E+00	1.00	3.2E-06	1.3E-05	5.0E-03	6E-04	3E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	2.6E+00	1.00	9.3E-07	3.7E-06	3.0E-03	3E-04	1E-03	7E-09	5E-08			
		Iron	7.2E+03	1.00	2.5E-03	1.0E-02	7.0E-01	4E-03	1E-02	2E-05	1E-04			
		Manganese	1.1E+02	1.00	3.9E-05	1.6E-04	2.4E-02	2E-03	6E-03	3E-07	2E-06			
		Mercury	3.4E-03	1.00	1.2E-09	4.8E-09	2.0E-03	6E-07	2E-06	9E-12	7E-11			
		Thallium	8.9E-02	1.00	3.1E-08	1.2E-07	4.0E-05	8E-04	3E-03	2E-10	2E-09			
		Vanadium	8.5E+00	1.00	3.0E-06	1.2E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	1.00	1.9E-13	7.4E-13	2.0E-08	9E-06	4E-05	1E-15	1E-14	1E+05	2E-10	1E-09
		Aluminum	4.8E+03	1.00	1.7E-03	6.8E-03	1.0E+00	2E-03	7E-03	1E-05	1E-04			
		Antimony	1.5E-01	1.00	5.3E-08	2.1E-07	4.0E-04	1E-04	5E-04	4E-10	3E-09			
		Arsenic	1.1E+00	0.60	2.3E-07	9.2E-07	3.0E-04	8E-04	3E-03	2E-09	1E-08	2E+00	2E-09	2E-08
		Barium	1.2E+02	1.00	4.2E-05	1.7E-04	2.0E-01	2E-04	8E-04	3E-07	2E-06			
		Cadmium	4.6E-02	1.00	1.6E-08	6.4E-08	5.0E-04	3E-05	1E-04	1E-10	9E-10			
		Chromium	6.3E+00	1.00	2.2E-06	8.8E-06	5.0E-03	4E-04	2E-03	2E-08	1E-07	5E-01	8E-09	6E-08
		Cobalt	2.2E+00	1.00	7.7E-07	3.1E-06	3.0E-03	3E-04	1E-03	6E-09	4E-08			
		Iron	7.6E+03	1.00	2.6E-03	1.1E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	9.1E+01	1.00	3.2E-05	1.3E-04	2.4E-02	1E-03	5E-03	2E-07	2E-06			
		Mercury	3.1E-03	1.00	1.1E-09	4.3E-09	2.0E-03	5E-07	2E-06	8E-12	6E-11			
		Thallium	6.9E-02	1.00	2.4E-08	9.7E-08	4.0E-05	6E-04	2E-03	2E-10	1E-09			
		Vanadium	8.3E+00	1.00	2.9E-06	1.2E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	9.9E-07	1.00	3.5E-13	1.4E-12	2.0E-08	2E-05	7E-05	2E-15	2E-14	1E+05	3E-10	3E-09
		Aluminum	8.7E+03	1.00	3.0E-03	1.2E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	9.1E-02	1.00	3.2E-08	1.3E-07	4.0E-04	8E-05	3E-04	2E-10	2E-09			
		Arsenic	4.0E+00	0.60	8.4E-07	3.4E-06	3.0E-04	3E-03	1E-02	6E-09	5E-08	2E+00	9E-09	7E-08
		Barium	2.2E+02	1.00	7.8E-05	3.1E-04	2.0E-01	4E-04	2E-03	6E-07	4E-06			
		Cadmium	1.3E-01	1.00	4.4E-08	1.8E-07	5.0E-04	9E-05	4E-04	3E-10	3E-09			
		Chromium	1.1E+01	1.00	3.7E-06	1.5E-05	5.0E-03	7E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	4.2E+00	1.00	1.5E-06	5.9E-06	3.0E-03	5E-04	2E-03	1E-08	8E-08			
		Iron	1.1E+04	1.00	4.0E-03	1.6E-02	7.0E-01	6E-03	2E-02	3E-05	2E-04			
		Manganese	3.8E+02	1.00	1.3E-04	5.3E-04	2.4E-02	6E-03	2E-02	1E-06	8E-06			
		Mercury	1.7E-02	1.00	5.9E-09	2.3E-08	2.0E-03	3E-06	1E-05	4E-11	3E-10			
		Thallium	1.3E-01	1.00	4.5E-08	1.8E-07	4.0E-05	1E-03	5E-03	3E-10	3E-09			
		Vanadium	1.6E+01	1.00	5.8E-06	2.3E-05	1.0E-02	6E-04	2E-03	4E-08	3E-07			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	1.00	2.9E-13	1.2E-12	2.0E-08	1E-05	6E-05	2E-15	2E-14	1E+05	3E-10	2E-09
		Aluminum	7.2E+03	1.00	2.5E-03	1.0E-02	1.0E+00	3E-03	1E-02	2E-05	1E-04			
		Antimony	8.5E-02	1.00	3.0E-08	1.2E-07	4.0E-04	7E-05	3E-04	2E-10	2E-09			
		Arsenic	1.6E+00	0.60	3.4E-07	1.3E-06	3.0E-04	1E-03	4E-03	2E-09	2E-08	2E+00	4E-09	3E-08
		Barium	2.0E+02	1.00	7.0E-05	2.8E-04	2.0E-01	3E-04	1E-03	5E-07	4E-06			
		Cadmium	9.3E-02	1.00	3.3E-08	1.3E-07	5.0E-04	7E-05	3E-04	2E-10	2E-09			
		Chromium	8.2E+00	1.00	2.9E-06	1.1E-05	5.0E-03	6E-04	2E-03	2E-08	2E-07	5E-01	1E-08	8E-08
		Cobalt	3.2E+00	1.00	1.1E-06	4.5E-06	3.0E-03	4E-04	1E-03	8E-09	6E-08			
		Iron	8.8E+03	1.00	3.1E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.6E+02	1.00	5.5E-05	2.2E-04	2.4E-02	2E-03	9E-03	4E-07	3E-06			
		Mercury	1.3E-02	1.00	4.6E-09	1.8E-08	2.0E-03	2E-06	9E-06	3E-11	3E-10			
		Thallium	9.9E-02	1.00	3.5E-08	1.4E-07	4.0E-05	9E-04	3E-03	2E-10	2E-09			
		Vanadium	1.1E+01	1.00	3.7E-06	1.5E-05	1.0E-02	4E-04	1E-03	3E-08	2E-07			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	1.00	2.5E-13	1.0E-12	2.0E-08	1E-05	5E-05	2E-15	1E-14	1E+05	2E-10	2E-09
		Aluminum	9.5E+03	1.00	3.3E-03	1.3E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	2.3E-01	1.00	8.1E-08	3.2E-07	4.0E-04	2E-04	8E-04	6E-10	5E-09			
		Arsenic	2.1E+00	0.60	4.4E-07	1.8E-06	3.0E-04	1E-03	6E-03	3E-09	3E-08	2E+00	5E-09	4E-08
		Barium	2.3E+02	1.00	8.0E-05	3.2E-04	2.0E-01	4E-04	2E-03	6E-07	5E-06			
		Cadmium	1.9E-01	1.00	6.7E-08	2.7E-07	5.0E-04	1E-04	5E-04	5E-10	4E-09			
		Chromium	8.9E+00	1.00	3.1E-06	1.2E-05	5.0E-03	6E-04	2E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	4.5E+00	1.00	1.6E-06	6.3E-06	3.0E-03	5E-04	2E-03	1E-08	9E-08			
		Iron	1.1E+04	1.00	4.0E-03	1.6E-02	7.0E-01	6E-03	2E-02	3E-05	2E-04			
		Manganese	4.9E+02	1.00	1.7E-04	6.8E-04	2.4E-02	7E-03	3E-02	1E-06	1E-05			
		Mercury	1.8E-02	1.00	6.3E-09	2.5E-08	2.0E-03	3E-06	1E-05	5E-11	4E-10			
		Thallium	1.2E-01	1.00	4.2E-08	1.7E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	1.2E+01	1.00	4.1E-06	1.6E-05	1.0E-02	4E-04	2E-03	3E-08	2E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	1.00	3.2E-12	1.3E-11	2.0E-08	2E-04	6E-04	2E-14	2E-13	1E+05	3E-09	2E-08
		Aluminum	1.3E+04	1.00	4.4E-03	1.8E-02	1.0E+00	4E-03	2E-02	3E-05	3E-04			
		Antimony	8.0E-01	1.00	2.8E-07	1.1E-06	4.0E-04	7E-04	3E-03	2E-09	2E-08			
		Arsenic	5.1E+00	0.60	1.1E-06	4.3E-06	3.0E-04	4E-03	1E-02	8E-09	6E-08	2E+00	1E-08	9E-08
		Barium	4.9E+02	1.00	1.7E-04	6.9E-04	2.0E-01	9E-04	3E-03	1E-06	1E-05			
		Cadmium	8.5E-01	1.00	3.0E-07	1.2E-06	5.0E-04	6E-04	2E-03	2E-09	2E-08			
		Chromium	1.8E+01	1.00	6.2E-06	2.5E-05	5.0E-03	1E-03	5E-03	4E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	4.9E+00	1.00	1.7E-06	6.9E-06	3.0E-03	6E-04	2E-03	1E-08	1E-07			
		Iron	1.3E+04	1.00	4.5E-03	1.8E-02	7.0E-01	6E-03	3E-02	3E-05	3E-04			
		Manganese	4.1E+02	1.00	1.4E-04	5.7E-04	2.4E-02	6E-03	2E-02	1E-06	8E-06			
		Mercury	2.7E-01	1.00	9.5E-08	3.8E-07	2.0E-03	5E-05	2E-04	7E-10	5E-09			
		Thallium	1.4E-01	1.00	4.9E-08	2.0E-07	4.0E-05	1E-03	5E-03	4E-10	3E-09			
		Vanadium	3.1E+01	1.00	1.1E-05	4.3E-05	1.0E-02	1E-03	4E-03	8E-08	6E-07			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	1.00	5.4E-13	2.1E-12	2.0E-08	3E-05	1E-04	4E-15	3E-14	1E+05	5E-10	4E-09
		Aluminum	7.9E+03	1.00	2.8E-03	1.1E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	3.3E-01	1.00	1.2E-07	4.6E-07	4.0E-04	3E-04	1E-03	8E-10	7E-09			
		Arsenic	2.5E+00	0.60	5.3E-07	2.1E-06	3.0E-04	2E-03	7E-03	4E-09	3E-08	2E+00	6E-09	5E-08
		Barium	2.0E+02	1.00	7.1E-05	2.9E-04	2.0E-01	4E-04	1E-03	5E-07	4E-06			
		Cadmium	2.6E-01	1.00	9.0E-08	3.6E-07	5.0E-04	2E-04	7E-04	6E-10	5E-09			
		Chromium	1.0E+01	1.00	3.5E-06	1.4E-05	5.0E-03	7E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	3.5E+00	1.00	1.2E-06	4.9E-06	3.0E-03	4E-04	2E-03	9E-09	7E-08			
		Iron	9.9E+03	1.00	3.5E-03	1.4E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	2.6E+02	1.00	9.2E-05	3.7E-04	2.4E-02	4E-03	2E-02	7E-07	5E-06			
		Mercury	4.0E-02	1.00	1.4E-08	5.6E-08	2.0E-03	7E-06	3E-05	1E-10	8E-10			
		Thallium	8.7E-02	1.00	3.1E-08	1.2E-07	4.0E-05	8E-04	3E-03	2E-10	2E-09			
		Vanadium	1.1E+01	1.00	4.0E-06	1.6E-05	1.0E-02	4E-04	2E-03	3E-08	2E-07			
Upland	38	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	1.00	7.4E-13	2.9E-12	2.0E-08	4E-05	1E-04	5E-15	4E-14	1E+05	7E-10	5E-09
		Aluminum	2.7E+03	1.00	9.5E-04	3.8E-03	1.0E+00	9E-04	4E-03	7E-06	5E-05			
		Antimony	8.5E-02	1.00	3.0E-08	1.2E-07	4.0E-04	7E-05	3E-04	2E-10	2E-09			
		Arsenic	1.0E+00	0.60	2.1E-07	8.4E-07	3.0E-04	7E-04	3E-03	2E-09	1E-08	2E+00	2E-09	2E-08
		Barium	4.4E+01	1.00	1.5E-05	6.2E-05	2.0E-01	8E-05	3E-04	1E-07	9E-07			
		Cadmium	1.6E-02	1.00	5.6E-09	2.2E-08	5.0E-04	1E-05	4E-05	4E-11	3E-10			
		Chromium	3.8E+00	1.00	1.3E-06	5.3E-06	5.0E-03	3E-04	1E-03	1E-08	8E-08	5E-01	5E-09	4E-08
		Cobalt	1.5E+00	1.00	5.3E-07	2.1E-06	3.0E-03	2E-04	7E-04	4E-09	3E-08			
		Iron	5.2E+03	1.00	1.8E-03	7.3E-03	7.0E-01	3E-03	1E-02	1E-05	1E-04			
		Manganese	3.9E+01	1.00	1.4E-05	5.4E-05	2.4E-02	6E-04	2E-03	1E-07	8E-07			
		Mercury	4.6E-03	1.00	1.6E-09	6.4E-09	2.0E-03	8E-07	3E-06	1E-11	9E-11			
		Thallium	1.7E-02	1.00	5.8E-09	2.3E-08	4.0E-05	1E-04	6E-04	4E-11	3E-10			
		Vanadium	5.3E+00	1.00	1.9E-06	7.4E-06	1.0E-02	2E-04	7E-04	1E-08	1E-07			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.7E-06	1.00	9.4E-13	3.8E-12	2.0E-08	5E-05	2E-04	7E-15	5E-14	1E+05	9E-10	7E-09
		Aluminum	9.5E+03	1.00	3.3E-03	1.3E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	4.1E-01	1.00	1.4E-07	5.8E-07	4.0E-04	4E-04	1E-03	1E-09	8E-09			
		Arsenic	2.1E+00	0.60	4.5E-07	1.8E-06	3.0E-04	1E-03	6E-03	3E-09	3E-08	2E+00	5E-09	4E-08
		Barium	4.1E+02	1.00	1.4E-04	5.8E-04	2.0E-01	7E-04	3E-03	1E-06	8E-06			
		Cadmium	3.2E-01	1.00	1.1E-07	4.5E-07	5.0E-04	2E-04	9E-04	8E-10	6E-09			
		Chromium	1.2E+01	1.00	4.1E-06	1.6E-05	5.0E-03	8E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	3.2E+00	1.00	1.1E-06	4.5E-06	3.0E-03	4E-04	1E-03	8E-09	6E-08			
		Iron	9.7E+03	1.00	3.4E-03	1.4E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	1.3E+02	1.00	4.6E-05	1.8E-04	2.4E-02	2E-03	8E-03	3E-07	3E-06			
		Mercury	7.1E-02	1.00	2.5E-08	1.0E-07	2.0E-03	1E-05	5E-05	2E-10	1E-09			
		Thallium	1.3E-01	1.00	4.5E-08	1.8E-07	4.0E-05	1E-03	5E-03	3E-10	3E-09			
		Vanadium	1.8E+01	1.00	6.1E-06	2.5E-05	1.0E-02	6E-04	2E-03	4E-08	4E-07			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	1.00	1.2E-12	5.0E-12	2.0E-08	6E-05	2E-04	9E-15	7E-14	1E+05	1E-09	9E-09
		Aluminum	6.0E+03	1.00	2.1E-03	8.3E-03	1.0E+00	2E-03	8E-03	1E-05	1E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.4E+00	0.60	2.9E-07	1.2E-06	3.0E-04	1E-03	4E-03	2E-09	2E-08	2E+00	3E-09	3E-08
		Barium	2.1E+02	1.00	7.2E-05	2.9E-04	2.0E-01	4E-04	1E-03	5E-07	4E-06			
		Cadmium	2.8E-01	1.00	9.8E-08	3.9E-07	5.0E-04	2E-04	8E-04	7E-10	6E-09			
		Chromium	1.1E+01	1.00	3.9E-06	1.6E-05	5.0E-03	8E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	2.2E+00	1.00	7.7E-07	3.1E-06	3.0E-03	3E-04	1E-03	6E-09	4E-08			
		Iron	6.3E+03	1.00	2.2E-03	8.8E-03	7.0E-01	3E-03	1E-02	2E-05	1E-04			
		Manganese	9.2E+01	1.00	3.2E-05	1.3E-04	2.4E-02	1E-03	5E-03	2E-07	2E-06			
		Mercury	4.0E-02	1.00	1.4E-08	5.6E-08	2.0E-03	7E-06	3E-05	1E-10	8E-10			
		Thallium	6.8E-02	1.00	2.4E-08	9.5E-08	4.0E-05	6E-04	2E-03	2E-10	1E-09			
		Vanadium	7.6E+00	1.00	2.7E-06	1.1E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-06	1.00	1.2E-12	4.8E-12	2.0E-08	6E-05	2E-04	9E-15	7E-14	1E+05	1E-09	9E-09
		Aluminum	5.2E+03	1.00	1.8E-03	7.3E-03	1.0E+00	2E-03	7E-03	1E-05	1E-04			
		Antimony	4.2E-02	1.00	1.5E-08	5.9E-08	4.0E-04	4E-05	1E-04	1E-10	8E-10			
		Arsenic	1.3E+00	0.60	2.7E-07	1.1E-06	3.0E-04	9E-04	4E-03	2E-09	2E-08	2E+00	3E-09	2E-08
		Barium	2.7E+02	1.00	9.4E-05	3.8E-04	2.0E-01	5E-04	2E-03	7E-07	5E-06			
		Cadmium	2.4E-01	1.00	8.3E-08	3.3E-07	5.0E-04	2E-04	7E-04	6E-10	5E-09			
		Chromium	7.5E+00	1.00	2.6E-06	1.0E-05	5.0E-03	5E-04	2E-03	2E-08	1E-07	5E-01	9E-09	7E-08
		Cobalt	1.5E+00	1.00	5.4E-07	2.2E-06	3.0E-03	2E-04	7E-04	4E-09	3E-08			
		Iron	4.6E+03	1.00	1.6E-03	6.4E-03	7.0E-01	2E-03	9E-03	1E-05	9E-05			
		Manganese	1.1E+02	1.00	3.9E-05	1.6E-04	2.4E-02	2E-03	7E-03	3E-07	2E-06			
		Mercury	4.8E-02	1.00	1.7E-08	6.7E-08	2.0E-03	8E-06	3E-05	1E-10	1E-09			
		Thallium	6.5E-03	1.00	2.3E-09	9.1E-09	4.0E-05	6E-05	2E-04	2E-11	1E-10			
		Vanadium	4.9E+00	1.00	1.7E-06	6.9E-06	1.0E-02	2E-04	7E-04	1E-08	1E-07			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	1.00	2.6E-12	1.0E-11	2.0E-08	1E-04	5E-04	2E-14	1E-13	1E+05	2E-09	2E-08
		Aluminum	1.3E+04	1.00	4.5E-03	1.8E-02	1.0E+00	5E-03	2E-02	3E-05	3E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.1E+00	0.60	6.5E-07	2.6E-06	3.0E-04	2E-03	9E-03	5E-09	4E-08	2E+00	7E-09	6E-08
		Barium	3.0E+02	1.00	1.0E-04	4.2E-04	2.0E-01	5E-04	2E-03	7E-07	6E-06			
		Cadmium	3.2E-01	1.00	1.1E-07	4.5E-07	5.0E-04	2E-04	9E-04	8E-10	6E-09			
		Chromium	2.1E+01	1.00	7.2E-06	2.9E-05	5.0E-03	1E-03	6E-03	5E-08	4E-07	5E-01	3E-08	2E-07
		Cobalt	4.9E+00	1.00	1.7E-06	6.9E-06	3.0E-03	6E-04	2E-03	1E-08	1E-07			
		Iron	1.6E+04	1.00	5.6E-03	2.2E-02	7.0E-01	8E-03	3E-02	4E-05	3E-04			
		Manganese	3.0E+02	1.00	1.0E-04	4.1E-04	2.4E-02	4E-03	2E-02	7E-07	6E-06			
		Mercury	1.6E-01	1.00	5.6E-08	2.2E-07	2.0E-03	3E-05	1E-04	4E-10	3E-09			
		Thallium	1.7E-01	1.00	6.0E-08	2.4E-07	4.0E-05	1E-03	6E-03	4E-10	3E-09			
		Vanadium	1.8E+01	1.00	6.4E-06	2.6E-05	1.0E-02	6E-04	3E-03	5E-08	4E-07			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	1.4E-12	5.5E-12	2.0E-08	7E-05	3E-04	1E-14	8E-14	1E+05	1E-09	1E-08
		Aluminum	9.1E+03	1.00	3.2E-03	1.3E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	7.6E-01	1.00	2.7E-07	1.1E-06	4.0E-04	7E-04	3E-03	2E-09	2E-08			
		Arsenic	2.8E+00	0.60	5.9E-07	2.4E-06	3.0E-04	2E-03	8E-03	4E-09	3E-08	2E+00	6E-09	5E-08
		Barium	5.8E+02	1.00	2.0E-04	8.1E-04	2.0E-01	1E-03	4E-03	1E-06	1E-05			
		Cadmium	4.7E-01	1.00	1.6E-07	6.6E-07	5.0E-04	3E-04	1E-03	1E-09	9E-09			
		Chromium	1.3E+01	1.00	4.7E-06	1.9E-05	5.0E-03	9E-04	4E-03	3E-08	3E-07	5E-01	2E-08	1E-07
		Cobalt	2.8E+00	1.00	9.8E-07	3.9E-06	3.0E-03	3E-04	1E-03	7E-09	6E-08			
		Iron	7.8E+03	1.00	2.7E-03	1.1E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.5E+02	1.00	5.2E-05	2.1E-04	2.4E-02	2E-03	9E-03	4E-07	3E-06			
		Mercury	1.2E-01	1.00	4.2E-08	1.7E-07	2.0E-03	2E-05	8E-05	3E-10	2E-09			
		Thallium	9.6E-02	1.00	3.4E-08	1.3E-07	4.0E-05	8E-04	3E-03	2E-10	2E-09			
		Vanadium	2.7E+01	1.00	9.4E-06	3.8E-05	1.0E-02	9E-04	4E-03	7E-08	5E-07			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	7.5E-13	3.0E-12	2.0E-08	4E-05	2E-04	5E-15	4E-14	1E+05	7E-10	6E-09
		Aluminum	9.9E+03	1.00	3.5E-03	1.4E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	1.2E+00	1.00	4.1E-07	1.6E-06	4.0E-04	1E-03	4E-03	3E-09	2E-08			
		Arsenic	4.4E+00	0.60	9.2E-07	3.7E-06	3.0E-04	3E-03	1E-02	7E-09	5E-08	2E+00	1E-08	8E-08
		Barium	2.9E+02	1.00	1.0E-04	4.1E-04	2.0E-01	5E-04	2E-03	7E-07	6E-06			
		Cadmium	8.0E-01	1.00	2.8E-07	1.1E-06	5.0E-04	6E-04	2E-03	2E-09	2E-08			
		Chromium	1.2E+01	1.00	4.2E-06	1.7E-05	5.0E-03	8E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	3.0E+00	1.00	1.1E-06	4.2E-06	3.0E-03	4E-04	1E-03	8E-09	6E-08			
		Iron	8.1E+03	1.00	2.8E-03	1.1E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	3.3E+02	1.00	1.2E-04	4.7E-04	2.4E-02	5E-03	2E-02	8E-07	7E-06			
		Mercury	1.6E-01	1.00	5.5E-08	2.2E-07	2.0E-03	3E-05	1E-04	4E-10	3E-09			
		Thallium	9.5E-02	1.00	3.3E-08	1.3E-07	4.0E-05	8E-04	3E-03	2E-10	2E-09			
		Vanadium	3.4E+01	1.00	1.2E-05	4.8E-05	1.0E-02	1E-03	5E-03	9E-08	7E-07			
Upland	45	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	1.00	1.3E-13	5.2E-13	2.0E-08	6E-06	3E-05	9E-16	7E-15	1E+05	1E-10	1E-09
		Aluminum	2.1E+04	1.00	7.4E-03	2.9E-02	1.0E+00	7E-03	3E-02	5E-05	4E-04			
		Antimony	2.3E-01	1.00	8.1E-08	3.2E-07	4.0E-04	2E-04	8E-04	6E-10	5E-09			
		Arsenic	3.1E+00	0.60	6.5E-07	2.6E-06	3.0E-04	2E-03	9E-03	5E-09	4E-08	2E+00	7E-09	6E-08
		Barium	3.1E+02	1.00	1.1E-04	4.4E-04	2.0E-01	5E-04	2E-03	8E-07	6E-06			
		Cadmium	8.0E-02	1.00	2.8E-08	1.1E-07	5.0E-04	6E-05	2E-04	2E-10	2E-09			
		Chromium	1.8E+01	1.00	6.4E-06	2.6E-05	5.0E-03	1E-03	5E-03	5E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	6.9E+00	1.00	2.4E-06	9.7E-06	3.0E-03	8E-04	3E-03	2E-08	1E-07			
		Iron	2.0E+04	1.00	7.1E-03	2.8E-02	7.0E-01	1E-02	4E-02	5E-05	4E-04			
		Manganese	1.8E+02	1.00	6.2E-05	2.5E-04	2.4E-02	3E-03	1E-02	4E-07	4E-06			
		Mercury	1.9E-02	1.00	6.7E-09	2.7E-08	2.0E-03	3E-06	1E-05	5E-11	4E-10			
		Thallium	2.1E-01	1.00	7.4E-08	2.9E-07	4.0E-05	2E-03	7E-03	5E-10	4E-09			
		Vanadium	1.9E+01	1.00	6.6E-06	2.6E-05	1.0E-02	7E-04	3E-03	5E-08	4E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	9.8E-13	3.9E-12	2.0E-08	5E-05	2E-04	7E-15	6E-14	1E+05	9E-10	7E-09
		Aluminum	1.0E+04	1.00	3.6E-03	1.4E-02	1.0E+00	4E-03	1E-02	3E-05	2E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.3E+00	0.60	4.8E-07	1.9E-06	3.0E-04	2E-03	6E-03	3E-09	3E-08	2E+00	5E-09	4E-08
		Barium	3.6E+02	1.00	1.3E-04	5.0E-04	2.0E-01	6E-04	3E-03	9E-07	7E-06			
		Cadmium	2.3E-01	1.00	7.9E-08	3.2E-07	5.0E-04	2E-04	6E-04	6E-10	5E-09			
		Chromium	1.5E+01	1.00	5.4E-06	2.2E-05	5.0E-03	1E-03	4E-03	4E-08	3E-07	5E-01	2E-08	2E-07
		Cobalt	4.5E+00	1.00	1.6E-06	6.3E-06	3.0E-03	5E-04	2E-03	1E-08	9E-08			
		Iron	1.3E+04	1.00	4.4E-03	1.8E-02	7.0E-01	6E-03	3E-02	3E-05	3E-04			
		Manganese	2.2E+02	1.00	7.5E-05	3.0E-04	2.4E-02	3E-03	1E-02	5E-07	4E-06			
		Mercury	4.6E-02	1.00	1.6E-08	6.4E-08	2.0E-03	8E-06	3E-05	1E-10	9E-10			
		Thallium	1.4E-01	1.00	4.8E-08	1.9E-07	4.0E-05	1E-03	5E-03	3E-10	3E-09			
		Vanadium	1.6E+01	1.00	5.6E-06	2.2E-05	1.0E-02	6E-04	2E-03	4E-08	3E-07			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	5.4E-12	2.2E-11	2.0E-08	3E-04	1E-03	4E-14	3E-13	1E+05	5E-09	4E-08
		Aluminum	1.7E+04	1.00	6.0E-03	2.4E-02	1.0E+00	6E-03	2E-02	4E-05	3E-04			
		Antimony	1.6E+00	1.00	5.6E-07	2.2E-06	4.0E-04	1E-03	6E-03	4E-09	3E-08			
		Arsenic	1.2E+01	0.60	2.6E-06	1.0E-05	3.0E-04	9E-03	3E-02	2E-08	1E-07	2E+00	3E-08	2E-07
		Barium	5.4E+02	1.00	1.9E-04	7.5E-04	2.0E-01	9E-04	4E-03	1E-06	1E-05			
		Cadmium	5.0E+00	1.00	1.7E-06	7.0E-06	5.0E-04	3E-03	1E-02	1E-08	1E-07			
		Chromium	2.1E+01	1.00	7.5E-06	3.0E-05	5.0E-03	2E-03	6E-03	5E-08	4E-07	5E-01	3E-08	2E-07
		Cobalt	2.0E+00	1.00	7.1E-07	2.8E-06	3.0E-03	2E-04	9E-04	5E-09	4E-08			
		Iron	3.1E+03	1.00	1.1E-03	4.3E-03	7.0E-01	2E-03	6E-03	8E-06	6E-05			
		Manganese	1.1E+03	1.00	3.8E-04	1.5E-03	2.4E-02	2E-02	6E-02	3E-06	2E-05			
		Mercury	7.7E-01	1.00	2.7E-07	1.1E-06	2.0E-03	1E-04	5E-04	2E-09	2E-08			
		Thallium	2.0E-01	1.00	7.1E-08	2.8E-07	4.0E-05	2E-03	7E-03	5E-10	4E-09			
		Vanadium	4.9E+01	1.00	1.7E-05	6.8E-05	1.0E-02	2E-03	7E-03	1E-07	1E-06			
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	1.00	1.7E-11	6.9E-11	2.0E-08	9E-04	3E-03	1E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	1.9E+04	1.00	6.6E-03	2.6E-02	1.0E+00	7E-03	3E-02	5E-05	4E-04			
		Antimony	2.4E+00	1.00	8.4E-07	3.4E-06	4.0E-04	2E-03	8E-03	6E-09	5E-08			
		Arsenic	1.4E+01	0.60	3.0E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-08	2E-07	2E+00	3E-08	3E-07
		Barium	8.0E+02	1.00	2.8E-04	1.1E-03	2.0E-01	1E-03	6E-03	2E-06	2E-05			
		Cadmium	8.3E+00	1.00	2.9E-06	1.2E-05	5.0E-04	6E-03	2E-02	2E-08	2E-07			
		Chromium	5.8E+01	1.00	2.0E-05	8.2E-05	5.0E-03	4E-03	2E-02	1E-07	1E-06	5E-01	7E-08	6E-07
		Cobalt	2.0E+00	1.00	7.0E-07	2.8E-06	3.0E-03	2E-04	9E-04	5E-09	4E-08			
		Iron	3.6E+03	1.00	1.3E-03	5.0E-03	7.0E-01	2E-03	7E-03	9E-06	7E-05			
		Manganese	1.7E+03	1.00	5.8E-04	2.3E-03	2.4E-02	2E-02	1E-01	4E-06	3E-05			
		Mercury	2.5E+00	1.00	8.8E-07	3.5E-06	2.0E-03	4E-04	2E-03	6E-09	5E-08			
		Thallium	3.3E-01	1.00	1.2E-07	4.6E-07	4.0E-05	3E-03	1E-02	8E-10	7E-09			
		Vanadium	7.1E+01	1.00	2.5E-05	9.9E-05	1.0E-02	2E-03	1E-02	2E-07	1E-06			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	1.00	1.4E-11	5.6E-11	2.0E-08	7E-04	3E-03	1E-13	8E-13	1E+05	1E-08	1E-07
		Aluminum	1.4E+04	1.00	5.0E-03	2.0E-02	1.0E+00	5E-03	2E-02	4E-05	3E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.6E+00	0.60	7.6E-07	3.0E-06	3.0E-04	3E-03	1E-02	5E-09	4E-08	2E+00	8E-09	6E-08
		Barium	1.0E+03	1.00	3.5E-04	1.4E-03	2.0E-01	2E-03	7E-03	3E-06	2E-05			
		Cadmium	2.0E+00	1.00	7.0E-07	2.8E-06	5.0E-04	1E-03	6E-03	5E-09	4E-08			
		Chromium	2.9E+01	1.00	1.0E-05	4.0E-05	5.0E-03	2E-03	8E-03	7E-08	6E-07	5E-01	4E-08	3E-07
		Cobalt	4.5E+00	1.00	1.6E-06	6.3E-06	3.0E-03	5E-04	2E-03	1E-08	9E-08			
		Iron	1.5E+04	1.00	5.2E-03	2.1E-02	7.0E-01	7E-03	3E-02	4E-05	3E-04			
		Manganese	5.8E+02	1.00	2.0E-04	8.1E-04	2.4E-02	8E-03	3E-02	1E-06	1E-05			
		Mercury	8.0E+00	1.00	2.8E-06	1.1E-05	2.0E-03	1E-03	6E-03	2E-08	2E-07			
		Thallium	1.6E-01	1.00	5.6E-08	2.2E-07	4.0E-05	1E-03	6E-03	4E-10	3E-09			
		Vanadium	2.2E+01	1.00	7.7E-06	3.1E-05	1.0E-02	8E-04	3E-03	5E-08	4E-07			
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	1.00	8.3E-12	3.3E-11	2.0E-08	4E-04	2E-03	6E-14	5E-13	1E+05	8E-09	6E-08
		Aluminum	1.2E+04	1.00	4.1E-03	1.6E-02	1.0E+00	4E-03	2E-02	3E-05	2E-04			
		Antimony	1.2E+00	1.00	4.0E-07	1.6E-06	4.0E-04	1E-03	4E-03	3E-09	2E-08			
		Arsenic	7.7E+00	0.60	1.6E-06	6.5E-06	3.0E-04	5E-03	2E-02	1E-08	9E-08	2E+00	2E-08	1E-07
		Barium	5.1E+02	1.00	1.8E-04	7.1E-04	2.0E-01	9E-04	4E-03	1E-06	1E-05			
		Cadmium	3.8E+00	1.00	1.3E-06	5.3E-06	5.0E-04	3E-03	1E-02	9E-09	8E-08			
		Chromium	2.4E+01	1.00	8.3E-06	3.3E-05	5.0E-03	2E-03	7E-03	6E-08	5E-07	5E-01	3E-08	2E-07
		Cobalt	2.3E+00	1.00	8.0E-07	3.2E-06	3.0E-03	3E-04	1E-03	6E-09	5E-08			
		Iron	4.7E+03	1.00	1.6E-03	6.5E-03	7.0E-01	2E-03	9E-03	1E-05	9E-05			
		Manganese	1.2E+03	1.00	4.3E-04	1.7E-03	2.4E-02	2E-02	7E-02	3E-06	2E-05			
		Mercury	7.5E-01	1.00	2.6E-07	1.0E-06	2.0E-03	1E-04	5E-04	2E-09	1E-08			
		Thallium	1.9E-01	1.00	6.6E-08	2.6E-07	4.0E-05	2E-03	7E-03	5E-10	4E-09			
		Vanadium	2.8E+01	1.00	9.9E-06	3.9E-05	1.0E-02	1E-03	4E-03	7E-08	6E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	1.00	1.1E-12	4.4E-12	2.0E-08	5E-05	2E-04	8E-15	6E-14	1E+05	1E-09	8E-09
		Aluminum	3.2E+03	1.00	1.1E-03	4.5E-03	1.0E+00	1E-03	4E-03	8E-06	6E-05			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.2E+00	0.60	4.6E-07	1.8E-06	3.0E-04	2E-03	6E-03	3E-09	3E-08	2E+00	5E-09	4E-08
		Barium	1.1E+02	1.00	3.8E-05	1.5E-04	2.0E-01	2E-04	8E-04	3E-07	2E-06			
		Cadmium	5.2E-01	1.00	1.8E-07	7.3E-07	5.0E-04	4E-04	1E-03	1E-09	1E-08			
		Chromium	9.0E+00	1.00	3.2E-06	1.3E-05	5.0E-03	6E-04	3E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	2.0E+00	1.00	7.0E-07	2.8E-06	3.0E-03	2E-04	9E-04	5E-09	4E-08			
		Iron	5.2E+03	1.00	1.8E-03	7.2E-03	7.0E-01	3E-03	1E-02	1E-05	1E-04			
		Manganese	2.2E+02	1.00	7.7E-05	3.1E-04	2.4E-02	3E-03	1E-02	6E-07	4E-06			
		Mercury	1.6E-01	1.00	5.6E-08	2.2E-07	2.0E-03	3E-05	1E-04	4E-10	3E-09			
		Thallium	5.2E-02	1.00	1.8E-08	7.3E-08	4.0E-05	5E-04	2E-03	1E-10	1E-09			
		Vanadium	9.2E+00	1.00	3.2E-06	1.3E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	7.6E-13	3.0E-12	2.0E-08	4E-05	2E-04	5E-15	4E-14	1E+05	7E-10	6E-09
		Aluminum	4.9E+03	1.00	1.7E-03	6.9E-03	1.0E+00	2E-03	7E-03	1E-05	1E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.8E+00	0.60	3.7E-07	1.5E-06	3.0E-04	1E-03	5E-03	3E-09	2E-08	2E+00	4E-09	3E-08
		Barium	9.6E+01	1.00	3.4E-05	1.4E-04	2.0E-01	2E-04	7E-04	2E-07	2E-06			
		Cadmium	1.6E-01	1.00	5.6E-08	2.2E-07	5.0E-04	1E-04	4E-04	4E-10	3E-09			
		Chromium	6.8E+00	1.00	2.4E-06	9.6E-06	5.0E-03	5E-04	2E-03	2E-08	1E-07	5E-01	9E-09	7E-08
		Cobalt	2.7E+00	1.00	9.3E-07	3.7E-06	3.0E-03	3E-04	1E-03	7E-09	5E-08			
		Iron	6.8E+03	1.00	2.4E-03	9.6E-03	7.0E-01	3E-03	1E-02	2E-05	1E-04			
		Manganese	1.3E+02	1.00	4.6E-05	1.8E-04	2.4E-02	2E-03	8E-03	3E-07	3E-06			
		Mercury	5.5E-02	1.00	1.9E-08	7.7E-08	2.0E-03	1E-05	4E-05	1E-10	1E-09			
		Thallium	6.6E-02	1.00	2.3E-08	9.2E-08	4.0E-05	6E-04	2E-03	2E-10	1E-09			
		Vanadium	7.7E+00	1.00	2.7E-06	1.1E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	1.00	7.6E-12	3.0E-11	2.0E-08	4E-04	2E-03	5E-14	4E-13	1E+05	7E-09	6E-08
		Aluminum	1.2E+04	1.00	4.3E-03	1.7E-02	1.0E+00	4E-03	2E-02	3E-05	2E-04			
		Antimony	4.4E-01	1.00	1.5E-07	6.2E-07	4.0E-04	4E-04	2E-03	1E-09	9E-09			
		Arsenic	2.6E+00	0.60	5.4E-07	2.2E-06	3.0E-04	2E-03	7E-03	4E-09	3E-08	2E+00	6E-09	5E-08
		Barium	5.5E+02	1.00	1.9E-04	7.8E-04	2.0E-01	1E-03	4E-03	1E-06	1E-05			
		Cadmium	1.2E+00	1.00	4.0E-07	1.6E-06	5.0E-04	8E-04	3E-03	3E-09	2E-08			
		Chromium	2.1E+01	1.00	7.5E-06	3.0E-05	5.0E-03	1E-03	6E-03	5E-08	4E-07	5E-01	3E-08	2E-07
		Cobalt	4.0E+00	1.00	1.4E-06	5.6E-06	3.0E-03	5E-04	2E-03	1E-08	8E-08			
		Iron	1.2E+04	1.00	4.3E-03	1.7E-02	7.0E-01	6E-03	2E-02	3E-05	2E-04			
		Manganese	4.2E+02	1.00	1.5E-04	5.9E-04	2.4E-02	6E-03	2E-02	1E-06	8E-06			
		Mercury	4.1E+00	1.00	1.4E-06	5.8E-06	2.0E-03	7E-04	3E-03	1E-08	8E-08			
		Thallium	1.5E-01	1.00	5.3E-08	2.1E-07	4.0E-05	1E-03	5E-03	4E-10	3E-09			
		Vanadium	1.3E+01	1.00	4.7E-06	1.9E-05	1.0E-02	5E-04	2E-03	3E-08	3E-07			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.2E-05	1.00	4.3E-12	1.7E-11	2.0E-08	2E-04	9E-04	3E-14	2E-13	1E+05	4E-09	3E-08
		Aluminum	1.0E+04	1.00	3.6E-03	1.4E-02	1.0E+00	4E-03	1E-02	3E-05	2E-04			
		Antimony	1.6E+00	1.00	5.6E-07	2.2E-06	4.0E-04	1E-03	6E-03	4E-09	3E-08			
		Arsenic	9.5E+00	0.60	2.0E-06	7.9E-06	3.0E-04	7E-03	3E-02	1E-08	1E-07	2E+00	2E-08	2E-07
		Barium	6.2E+02	1.00	2.2E-04	8.6E-04	2.0E-01	1E-03	4E-03	2E-06	1E-05			
		Cadmium	4.0E+00	1.00	1.4E-06	5.5E-06	5.0E-04	3E-03	1E-02	1E-08	8E-08			
		Chromium	2.1E+01	1.00	7.4E-06	3.0E-05	5.0E-03	1E-03	6E-03	5E-08	4E-07	5E-01	3E-08	2E-07
		Cobalt	2.6E+00	1.00	9.2E-07	3.7E-06	3.0E-03	3E-04	1E-03	7E-09	5E-08			
		Iron	4.8E+03	1.00	1.7E-03	6.7E-03	7.0E-01	2E-03	1E-02	1E-05	1E-04			
		Manganese	1.7E+03	1.00	5.9E-04	2.4E-03	2.4E-02	2E-02	1E-01	4E-06	3E-05			
		Mercury	6.6E-01	1.00	2.3E-07	9.3E-07	2.0E-03	1E-04	5E-04	2E-09	1E-08			
		Thallium	1.7E-01	1.00	5.9E-08	2.4E-07	4.0E-05	1E-03	6E-03	4E-10	3E-09			
		Vanadium	1.3E+01	1.00	4.7E-06	1.9E-05	1.0E-02	5E-04	2E-03	3E-08	3E-07			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	4.7E-05	1.00	1.6E-11	6.6E-11	2.0E-08	8E-04	3E-03	1E-13	9E-13	1E+05	2E-08	1E-07
		Aluminum	1.4E+04	1.00	4.8E-03	1.9E-02	1.0E+00	5E-03	2E-02	3E-05	3E-04			
		Antimony	1.0E+00	1.00	3.5E-07	1.4E-06	4.0E-04	9E-04	4E-03	3E-09	2E-08			
		Arsenic	1.2E+01	0.60	2.5E-06	9.9E-06	3.0E-04	8E-03	3E-02	2E-08	1E-07	2E+00	3E-08	2E-07
		Barium	9.5E+02	1.00	3.3E-04	1.3E-03	2.0E-01	2E-03	7E-03	2E-06	2E-05			
		Cadmium	4.7E+00	1.00	1.6E-06	6.6E-06	5.0E-04	3E-03	1E-02	1E-08	9E-08			
		Chromium	3.6E+01	1.00	1.2E-05	5.0E-05	5.0E-03	2E-03	1E-02	9E-08	7E-07	5E-01	4E-08	4E-07
		Cobalt	1.8E+00	1.00	6.2E-07	2.5E-06	3.0E-03	2E-04	8E-04	4E-09	4E-08			
		Iron	3.2E+03	1.00	1.1E-03	4.5E-03	7.0E-01	2E-03	6E-03	8E-06	6E-05			
		Manganese	2.3E+03	1.00	8.0E-04	3.2E-03	2.4E-02	3E-02	1E-01	6E-06	5E-05			
		Mercury	9.2E-01	1.00	3.2E-07	1.3E-06	2.0E-03	2E-04	6E-04	2E-09	2E-08			
		Thallium	2.3E-01	1.00	8.2E-08	3.3E-07	4.0E-05	2E-03	8E-03	6E-10	5E-09			
		Vanadium	4.2E+01	1.00	1.5E-05	5.9E-05	1.0E-02	1E-03	6E-03	1E-07	8E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.7E-05	1.00	2.0E-11	8.0E-11	2.0E-08	1E-03	4E-03	1E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	1.6E+04	1.00	5.5E-03	2.2E-02	1.0E+00	6E-03	2E-02	4E-05	3E-04			
		Antimony	1.7E+00	1.00	5.8E-07	2.3E-06	4.0E-04	1E-03	6E-03	4E-09	3E-08			
		Arsenic	1.2E+01	0.60	2.5E-06	1.0E-05	3.0E-04	8E-03	3E-02	2E-08	1E-07	2E+00	3E-08	2E-07
		Barium	7.6E+02	1.00	2.7E-04	1.1E-03	2.0E-01	1E-03	5E-03	2E-06	2E-05			
		Cadmium	6.5E+00	1.00	2.3E-06	9.1E-06	5.0E-04	5E-03	2E-02	2E-08	1E-07			
		Chromium	4.8E+01	1.00	1.7E-05	6.7E-05	5.0E-03	3E-03	1E-02	1E-07	1E-06	5E-01	6E-08	5E-07
		Cobalt	2.5E+00	1.00	8.6E-07	3.5E-06	3.0E-03	3E-04	1E-03	6E-09	5E-08			
		Iron	5.4E+03	1.00	1.9E-03	7.6E-03	7.0E-01	3E-03	1E-02	1E-05	1E-04			
		Manganese	1.8E+03	1.00	6.3E-04	2.5E-03	2.4E-02	3E-02	1E-01	4E-06	4E-05			
		Mercury	1.3E+00	1.00	4.4E-07	1.8E-06	2.0E-03	2E-04	9E-04	3E-09	3E-08			
		Thallium	3.5E-01	1.00	1.2E-07	4.8E-07	4.0E-05	3E-03	1E-02	9E-10	7E-09			
		Vanadium	5.6E+01	1.00	2.0E-05	7.9E-05	1.0E-02	2E-03	8E-03	1E-07	1E-06			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	7.0E-05	1.00	2.4E-11	9.8E-11	2.0E-08	1E-03	5E-03	2E-13	1E-12	1E+05	2E-08	2E-07
		Aluminum	1.5E+04	1.00	5.1E-03	2.1E-02	1.0E+00	5E-03	2E-02	4E-05	3E-04			
		Antimony	1.9E+00	1.00	6.7E-07	2.7E-06	4.0E-04	2E-03	7E-03	5E-09	4E-08			
		Arsenic	1.0E+01	0.60	2.1E-06	8.5E-06	3.0E-04	7E-03	3E-02	2E-08	1E-07	2E+00	2E-08	2E-07
		Barium	6.9E+02	1.00	2.4E-04	9.6E-04	2.0E-01	1E-03	5E-03	2E-06	1E-05			
		Cadmium	4.0E+00	1.00	1.4E-06	5.6E-06	5.0E-04	3E-03	1E-02	1E-08	8E-08			
		Chromium	3.5E+01	1.00	1.2E-05	4.9E-05	5.0E-03	2E-03	1E-02	9E-08	7E-07	5E-01	4E-08	3E-07
		Cobalt	2.6E+00	1.00	9.1E-07	3.6E-06	3.0E-03	3E-04	1E-03	7E-09	5E-08			
		Iron	8.6E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.3E+03	1.00	4.5E-04	1.8E-03	2.4E-02	2E-02	8E-02	3E-06	3E-05			
		Mercury	1.0E+00	1.00	3.5E-07	1.4E-06	2.0E-03	2E-04	7E-04	3E-09	2E-08			
		Thallium	1.9E-01	1.00	6.5E-08	2.6E-07	4.0E-05	2E-03	6E-03	5E-10	4E-09			
		Vanadium	4.1E+01	1.00	1.5E-05	5.8E-05	1.0E-02	1E-03	6E-03	1E-07	8E-07			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-05	1.00	5.4E-12	2.2E-11	2.0E-08	3E-04	1E-03	4E-14	3E-13	1E+05	5E-09	4E-08
		Aluminum	8.7E+03	1.00	3.0E-03	1.2E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	8.2E-01	1.00	2.9E-07	1.1E-06	4.0E-04	7E-04	3E-03	2E-09	2E-08			
		Arsenic	6.1E+00	0.60	1.3E-06	5.2E-06	3.0E-04	4E-03	2E-02	9E-09	7E-08	2E+00	1E-08	1E-07
		Barium	7.3E+02	1.00	2.6E-04	1.0E-03	2.0E-01	1E-03	5E-03	2E-06	1E-05			
		Cadmium	3.2E+00	1.00	1.1E-06	4.5E-06	5.0E-04	2E-03	9E-03	8E-09	6E-08			
		Chromium	2.1E+01	1.00	7.3E-06	2.9E-05	5.0E-03	1E-03	6E-03	5E-08	4E-07	5E-01	3E-08	2E-07
		Cobalt	2.2E+00	1.00	7.8E-07	3.1E-06	3.0E-03	3E-04	1E-03	6E-09	4E-08			
		Iron	5.3E+03	1.00	1.9E-03	7.4E-03	7.0E-01	3E-03	1E-02	1E-05	1E-04			
		Manganese	1.6E+03	1.00	5.5E-04	2.2E-03	2.4E-02	2E-02	9E-02	4E-06	3E-05			
		Mercury	9.8E-01	1.00	3.4E-07	1.4E-06	2.0E-03	2E-04	7E-04	2E-09	2E-08			
		Thallium	1.6E-01	1.00	5.6E-08	2.2E-07	4.0E-05	1E-03	6E-03	4E-10	3E-09			
		Vanadium	1.5E+01	1.00	5.1E-06	2.1E-05	1.0E-02	5E-04	2E-03	4E-08	3E-07			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.6E-06	1.00	3.0E-12	1.2E-11	2.0E-08	2E-04	6E-04	2E-14	2E-13	1E+05	3E-09	2E-08
		Aluminum	8.0E+03	1.00	2.8E-03	1.1E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	3.1E-01	1.00	1.1E-07	4.3E-07	4.0E-04	3E-04	1E-03	8E-10	6E-09			
		Arsenic	4.6E+00	0.60	9.6E-07	3.8E-06	3.0E-04	3E-03	1E-02	7E-09	5E-08	2E+00	1E-08	8E-08
		Barium	2.8E+02	1.00	9.9E-05	3.9E-04	2.0E-01	5E-04	2E-03	7E-07	6E-06			
		Cadmium	1.7E+00	1.00	5.8E-07	2.3E-06	5.0E-04	1E-03	5E-03	4E-09	3E-08			
		Chromium	1.5E+01	1.00	5.2E-06	2.1E-05	5.0E-03	1E-03	4E-03	4E-08	3E-07	5E-01	2E-08	1E-07
		Cobalt	3.4E+00	1.00	1.2E-06	4.7E-06	3.0E-03	4E-04	2E-03	8E-09	7E-08			
		Iron	8.4E+03	1.00	2.9E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	8.5E+02	1.00	3.0E-04	1.2E-03	2.4E-02	1E-02	5E-02	2E-06	2E-05			
		Mercury	1.9E-01	1.00	6.5E-08	2.6E-07	2.0E-03	3E-05	1E-04	5E-10	4E-09			
		Thallium	1.1E-01	1.00	3.8E-08	1.5E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	1.4E+01	1.00	4.8E-06	1.9E-05	1.0E-02	5E-04	2E-03	3E-08	3E-07			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	1.00	2.0E-12	8.1E-12	2.0E-08	1E-04	4E-04	1E-14	1E-13	1E+05	2E-09	2E-08
		Aluminum	8.2E+03	1.00	2.9E-03	1.1E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	2.0E-01	1.00	7.0E-08	2.8E-07	4.0E-04	2E-04	7E-04	5E-10	4E-09			
		Arsenic	3.7E+00	0.60	7.8E-07	3.1E-06	3.0E-04	3E-03	1E-02	6E-09	4E-08	2E+00	8E-09	7E-08
		Barium	2.0E+02	1.00	6.8E-05	2.7E-04	2.0E-01	3E-04	1E-03	5E-07	4E-06			
		Cadmium	1.1E+00	1.00	3.9E-07	1.5E-06	5.0E-04	8E-04	3E-03	3E-09	2E-08			
		Chromium	1.2E+01	1.00	4.3E-06	1.7E-05	5.0E-03	9E-04	3E-03	3E-08	2E-07	5E-01	2E-08	1E-07
		Cobalt	3.8E+00	1.00	1.3E-06	5.3E-06	3.0E-03	4E-04	2E-03	1E-08	8E-08			
		Iron	9.9E+03	1.00	3.5E-03	1.4E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	4.8E+02	1.00	1.7E-04	6.7E-04	2.4E-02	7E-03	3E-02	1E-06	1E-05			
		Mercury	1.1E-01	1.00	3.9E-08	1.5E-07	2.0E-03	2E-05	8E-05	3E-10	2E-09			
		Thallium	1.1E-01	1.00	3.9E-08	1.5E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	1.3E+01	1.00	4.7E-06	1.9E-05	1.0E-02	5E-04	2E-03	3E-08	3E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	1.00	3.9E-13	1.5E-12	2.0E-08	2E-05	8E-05	3E-15	2E-14	1E+05	4E-10	3E-09
		Aluminum	7.7E+03	1.00	2.7E-03	1.1E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.6E+00	0.60	5.5E-07	2.2E-06	3.0E-04	2E-03	7E-03	4E-09	3E-08	2E+00	6E-09	5E-08
		Barium	1.6E+02	1.00	5.7E-05	2.3E-04	2.0E-01	3E-04	1E-03	4E-07	3E-06			
		Cadmium	3.7E-01	1.00	1.3E-07	5.2E-07	5.0E-04	3E-04	1E-03	9E-10	7E-09			
		Chromium	1.1E+01	1.00	3.8E-06	1.5E-05	5.0E-03	8E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	4.0E+00	1.00	1.4E-06	5.6E-06	3.0E-03	5E-04	2E-03	1E-08	8E-08			
		Iron	1.1E+04	1.00	3.7E-03	1.5E-02	7.0E-01	5E-03	2E-02	3E-05	2E-04			
		Manganese	2.7E+02	1.00	9.6E-05	3.8E-04	2.4E-02	4E-03	2E-02	7E-07	5E-06			
		Mercury	9.6E-02	1.00	3.4E-08	1.3E-07	2.0E-03	2E-05	7E-05	2E-10	2E-09			
		Thallium	1.2E-01	1.00	4.2E-08	1.7E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	1.1E+01	1.00	4.0E-06	1.6E-05	1.0E-02	4E-04	2E-03	3E-08	2E-07			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	5.5E-12	2.2E-11	2.0E-08	3E-04	1E-03	4E-14	3E-13	1E+05	5E-09	4E-08
		Aluminum	7.6E+03	1.00	2.7E-03	1.1E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	1.1E-01	1.00	3.7E-08	1.5E-07	4.0E-04	9E-05	4E-04	3E-10	2E-09			
		Arsenic	3.1E+00	0.60	6.4E-07	2.6E-06	3.0E-04	2E-03	9E-03	5E-09	4E-08	2E+00	7E-09	5E-08
		Barium	2.7E+02	1.00	9.5E-05	3.8E-04	2.0E-01	5E-04	2E-03	7E-07	5E-06			
		Cadmium	7.8E-01	1.00	2.7E-07	1.1E-06	5.0E-04	5E-04	2E-03	2E-09	2E-08			
		Chromium	1.2E+01	1.00	4.2E-06	1.7E-05	5.0E-03	8E-04	3E-03	3E-08	2E-07	5E-01	1E-08	1E-07
		Cobalt	3.4E+00	1.00	1.2E-06	4.8E-06	3.0E-03	4E-04	2E-03	9E-09	7E-08			
		Iron	9.9E+03	1.00	3.5E-03	1.4E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	5.4E+02	1.00	1.9E-04	7.6E-04	2.4E-02	8E-03	3E-02	1E-06	1E-05			
		Mercury	3.4E+00	1.00	1.2E-06	4.8E-06	2.0E-03	6E-04	2E-03	9E-09	7E-08			
		Thallium	9.9E-02	1.00	3.5E-08	1.4E-07	4.0E-05	9E-04	3E-03	2E-10	2E-09			
		Vanadium	1.2E+01	1.00	4.1E-06	1.6E-05	1.0E-02	4E-04	2E-03	3E-08	2E-07			
Upland	65	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	1.00	4.6E-12	1.8E-11	2.0E-08	2E-04	9E-04	3E-14	3E-13	1E+05	4E-09	3E-08
		Aluminum	8.7E+03	1.00	3.1E-03	1.2E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.3E+00	0.60	9.0E-07	3.6E-06	3.0E-04	3E-03	1E-02	6E-09	5E-08	2E+00	1E-08	8E-08
		Barium	4.5E+02	1.00	1.6E-04	6.3E-04	2.0E-01	8E-04	3E-03	1E-06	9E-06			
		Cadmium	2.5E+00	1.00	8.8E-07	3.5E-06	5.0E-04	2E-03	7E-03	6E-09	5E-08			
		Chromium	2.7E+01	1.00	9.4E-06	3.8E-05	5.0E-03	2E-03	8E-03	7E-08	5E-07	5E-01	3E-08	3E-07
		Cobalt	3.1E+00	1.00	1.1E-06	4.3E-06	3.0E-03	4E-04	1E-03	8E-09	6E-08			
		Iron	9.6E+03	1.00	3.4E-03	1.3E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	1.4E+03	1.00	4.7E-04	1.9E-03	2.4E-02	2E-02	8E-02	3E-06	3E-05			
		Mercury	3.0E-01	1.00	1.1E-07	4.2E-07	2.0E-03	5E-05	2E-04	8E-10	6E-09			
		Thallium	1.2E-01	1.00	4.2E-08	1.7E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	1.3E+01	1.00	4.6E-06	1.8E-05	1.0E-02	5E-04	2E-03	3E-08	3E-07			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.9E-06	1.00	6.5E-13	2.6E-12	2.0E-08	3E-05	1E-04	5E-15	4E-14	1E+05	6E-10	5E-09
		Aluminum	4.7E+03	1.00	1.6E-03	6.5E-03	1.0E+00	2E-03	7E-03	1E-05	9E-05			
		Antimony	2.1E-01	1.00	7.5E-08	3.0E-07	4.0E-04	2E-04	7E-04	5E-10	4E-09			
		Arsenic	3.2E+00	0.60	6.7E-07	2.7E-06	3.0E-04	2E-03	9E-03	5E-09	4E-08	2E+00	7E-09	6E-08
		Barium	2.7E+02	1.00	9.3E-05	3.7E-04	2.0E-01	5E-04	2E-03	7E-07	5E-06			
		Cadmium	9.2E-01	1.00	3.2E-07	1.3E-06	5.0E-04	6E-04	3E-03	2E-09	2E-08			
		Chromium	1.2E+01	1.00	4.3E-06	1.7E-05	5.0E-03	9E-04	3E-03	3E-08	2E-07	5E-01	2E-08	1E-07
		Cobalt	2.4E+00	1.00	8.5E-07	3.4E-06	3.0E-03	3E-04	1E-03	6E-09	5E-08			
		Iron	6.3E+03	1.00	2.2E-03	8.8E-03	7.0E-01	3E-03	1E-02	2E-05	1E-04			
		Manganese	5.3E+02	1.00	1.8E-04	7.4E-04	2.4E-02	8E-03	3E-02	1E-06	1E-05			
		Mercury	7.5E-02	1.00	2.6E-08	1.1E-07	2.0E-03	1E-05	5E-05	2E-10	2E-09			
		Thallium	7.0E-02	1.00	2.5E-08	9.9E-08	4.0E-05	6E-04	2E-03	2E-10	1E-09			
		Vanadium	7.6E+00	1.00	2.6E-06	1.1E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	7.9E-05	1.00	2.8E-11	1.1E-10	2.0E-08	1E-03	6E-03	2E-13	2E-12	1E+05	3E-08	2E-07
		Aluminum	6.0E+03	1.00	2.1E-03	8.4E-03	1.0E+00	2E-03	8E-03	1E-05	1E-04			
		Antimony	1.6E+00	1.00	5.6E-07	2.2E-06	4.0E-04	1E-03	6E-03	4E-09	3E-08			
		Arsenic	1.4E+01	0.60	3.0E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-08	2E-07	2E+00	3E-08	3E-07
		Barium	6.0E+02	1.00	2.1E-04	8.4E-04	2.0E-01	1E-03	4E-03	2E-06	1E-05			
		Cadmium	4.6E+00	1.00	1.6E-06	6.5E-06	5.0E-04	3E-03	1E-02	1E-08	9E-08			
		Chromium	1.9E+01	1.00	6.5E-06	2.6E-05	5.0E-03	1E-03	5E-03	5E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	2.4E+00	1.00	8.4E-07	3.3E-06	3.0E-03	3E-04	1E-03	6E-09	5E-08			
		Iron	3.7E+03	1.00	1.3E-03	5.2E-03	7.0E-01	2E-03	7E-03	9E-06	7E-05			
		Manganese	2.0E+03	1.00	6.9E-04	2.8E-03	2.4E-02	3E-02	1E-01	5E-06	4E-05			
		Mercury	3.2E-02	1.00	1.1E-08	4.5E-08	2.0E-03	6E-06	2E-05	8E-11	6E-10			
		Thallium	3.7E-01	1.00	1.3E-07	5.1E-07	4.0E-05	3E-03	1E-02	9E-10	7E-09			
		Vanadium	5.7E+00	1.00	2.0E-06	8.0E-06	1.0E-02	2E-04	8E-04	1E-08	1E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	7.9E-05	1.00	2.8E-11	1.1E-10	2.0E-08	1E-03	6E-03	2E-13	2E-12	1E+05	3E-08	2E-07
		Aluminum	6.0E+03	1.00	2.1E-03	8.4E-03	1.0E+00	2E-03	8E-03	1E-05	1E-04			
		Antimony	1.6E+00	1.00	5.6E-07	2.2E-06	4.0E-04	1E-03	6E-03	4E-09	3E-08			
		Arsenic	1.4E+01	0.60	3.0E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-08	2E-07	2E+00	3E-08	3E-07
		Barium	6.0E+02	1.00	2.1E-04	8.4E-04	2.0E-01	1E-03	4E-03	2E-06	1E-05			
		Cadmium	4.6E+00	1.00	1.6E-06	6.5E-06	5.0E-04	3E-03	1E-02	1E-08	9E-08			
		Chromium	1.9E+01	1.00	6.5E-06	2.6E-05	5.0E-03	1E-03	5E-03	5E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	2.4E+00	1.00	8.4E-07	3.3E-06	3.0E-03	3E-04	1E-03	6E-09	5E-08			
		Iron	3.7E+03	1.00	1.3E-03	5.2E-03	7.0E-01	2E-03	7E-03	9E-06	7E-05			
		Manganese	2.0E+03	1.00	6.9E-04	2.8E-03	2.4E-02	3E-02	1E-01	5E-06	4E-05			
		Mercury	3.2E-02	1.00	1.1E-08	4.5E-08	2.0E-03	6E-06	2E-05	8E-11	6E-10			
		Thallium	3.7E-01	1.00	1.3E-07	5.1E-07	4.0E-05	3E-03	1E-02	9E-10	7E-09			
		Vanadium	5.7E+00	1.00	2.0E-06	8.0E-06	1.0E-02	2E-04	8E-04	1E-08	1E-07			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.5E-06	1.00	1.6E-12	6.3E-12	2.0E-08	8E-05	3E-04	1E-14	9E-14	1E+05	1E-09	1E-08
		Aluminum	3.3E+03	1.00	1.2E-03	4.7E-03	1.0E+00	1E-03	5E-03	8E-06	7E-05			
		Antimony	4.7E-01	1.00	1.6E-07	6.6E-07	4.0E-04	4E-04	2E-03	1E-09	9E-09			
		Arsenic	6.0E+00	0.60	1.3E-06	5.0E-06	3.0E-04	4E-03	2E-02	9E-09	7E-08	2E+00	1E-08	1E-07
		Barium	4.5E+02	1.00	1.6E-04	6.3E-04	2.0E-01	8E-04	3E-03	1E-06	9E-06			
		Cadmium	1.9E+00	1.00	6.7E-07	2.7E-06	5.0E-04	1E-03	5E-03	5E-09	4E-08			
		Chromium	1.5E+01	1.00	5.3E-06	2.1E-05	5.0E-03	1E-03	4E-03	4E-08	3E-07	5E-01	2E-08	2E-07
		Cobalt	1.6E+00	1.00	5.6E-07	2.2E-06	3.0E-03	2E-04	7E-04	4E-09	3E-08			
		Iron	3.5E+03	1.00	1.2E-03	4.9E-03	7.0E-01	2E-03	7E-03	9E-06	7E-05			
		Manganese	1.0E+03	1.00	3.7E-04	1.5E-03	2.4E-02	2E-02	6E-02	3E-06	2E-05			
		Mercury	9.5E-02	1.00	3.3E-08	1.3E-07	2.0E-03	2E-05	7E-05	2E-10	2E-09			
		Thallium	1.2E-01	1.00	4.4E-08	1.7E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	1.2E+01	1.00	4.1E-06	1.6E-05	1.0E-02	4E-04	2E-03	3E-08	2E-07			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-06	1.00	1.9E-12	7.7E-12	2.0E-08	1E-04	4E-04	1E-14	1E-13	1E+05	2E-09	1E-08
		Aluminum	1.6E+03	1.00	5.5E-04	2.2E-03	1.0E+00	6E-04	2E-03	4E-06	3E-05			
		Antimony	1.3E-01	1.00	4.4E-08	1.8E-07	4.0E-04	1E-04	4E-04	3E-10	3E-09			
		Arsenic	5.7E+00	0.60	1.2E-06	4.8E-06	3.0E-04	4E-03	2E-02	9E-09	7E-08	2E+00	1E-08	1E-07
		Barium	5.0E+02	1.00	1.7E-04	7.0E-04	2.0E-01	9E-04	3E-03	1E-06	1E-05			
		Cadmium	1.5E+00	1.00	5.2E-07	2.1E-06	5.0E-04	1E-03	4E-03	4E-09	3E-08			
		Chromium	3.2E+01	1.00	1.1E-05	4.5E-05	5.0E-03	2E-03	9E-03	8E-08	6E-07	5E-01	4E-08	3E-07
		Cobalt	2.3E+00	1.00	8.2E-07	3.3E-06	3.0E-03	3E-04	1E-03	6E-09	5E-08			
		Iron	3.0E+03	1.00	1.0E-03	4.1E-03	7.0E-01	1E-03	6E-03	7E-06	6E-05			
		Manganese	8.0E+02	1.00	2.8E-04	1.1E-03	2.4E-02	1E-02	5E-02	2E-06	2E-05			
		Mercury	4.4E-02	1.00	1.5E-08	6.2E-08	2.0E-03	8E-06	3E-05	1E-10	9E-10			
		Thallium	8.1E-02	1.00	2.9E-08	1.1E-07	4.0E-05	7E-04	3E-03	2E-10	2E-09			
		Vanadium	3.7E+00	1.00	1.3E-06	5.2E-06	1.0E-02	1E-04	5E-04	9E-09	7E-08			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	8.2E-12	3.3E-11	2.0E-08	4E-04	2E-03	6E-14	5E-13	1E+05	8E-09	6E-08
		Aluminum	2.3E+03	1.00	8.0E-04	3.2E-03	1.0E+00	8E-04	3E-03	6E-06	5E-05			
		Antimony	2.4E-01	1.00	8.4E-08	3.4E-07	4.0E-04	2E-04	8E-04	6E-10	5E-09			
		Arsenic	7.0E+00	0.60	1.5E-06	5.9E-06	3.0E-04	5E-03	2E-02	1E-08	8E-08	2E+00	2E-08	1E-07
		Barium	5.4E+02	1.00	1.9E-04	7.5E-04	2.0E-01	9E-04	4E-03	1E-06	1E-05			
		Cadmium	2.2E+00	1.00	7.7E-07	3.1E-06	5.0E-04	2E-03	6E-03	6E-09	4E-08			
		Chromium	1.9E+01	1.00	6.7E-06	2.7E-05	5.0E-03	1E-03	5E-03	5E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	1.3E+00	1.00	4.6E-07	1.8E-06	3.0E-03	2E-04	6E-04	3E-09	3E-08			
		Iron	1.3E+03	1.00	4.4E-04	1.8E-03	7.0E-01	6E-04	3E-03	3E-06	3E-05			
		Manganese	2.3E+03	1.00	7.9E-04	3.2E-03	2.4E-02	3E-02	1E-01	6E-06	5E-05			
		Mercury	4.9E-03	1.00	1.7E-09	6.8E-09	2.0E-03	8E-07	3E-06	1E-11	1E-10			
		Thallium	6.6E-02	1.00	2.3E-08	9.2E-08	4.0E-05	6E-04	2E-03	2E-10	1E-09			
		Vanadium	4.7E+00	1.00	1.6E-06	6.6E-06	1.0E-02	2E-04	7E-04	1E-08	9E-08			
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-04	1.00	1.0E-10	4.2E-10	2.0E-08	5E-03	2E-02	7E-13	6E-12	1E+05	1E-07	8E-07
		Aluminum	1.8E+04	1.00	6.2E-03	2.5E-02	1.0E+00	6E-03	2E-02	4E-05	4E-04			
		Antimony	2.4E+00	1.00	8.3E-07	3.3E-06	4.0E-04	2E-03	8E-03	6E-09	5E-08			
		Arsenic	4.0E+01	0.60	8.4E-06	3.4E-05	3.0E-04	3E-02	1E-01	6E-08	5E-07	2E+00	9E-08	7E-07
		Barium	8.2E+02	1.00	2.9E-04	1.2E-03	2.0E-01	1E-03	6E-03	2E-06	2E-05			
		Cadmium	6.4E+00	1.00	2.2E-06	8.9E-06	5.0E-04	4E-03	2E-02	2E-08	1E-07			
		Chromium	3.0E+01	1.00	1.0E-05	4.2E-05	5.0E-03	2E-03	8E-03	7E-08	6E-07	5E-01	4E-08	3E-07
		Cobalt	7.1E+00	1.00	2.5E-06	9.9E-06	3.0E-03	8E-04	3E-03	2E-08	1E-07			
		Iron	1.3E+04	1.00	4.6E-03	1.8E-02	7.0E-01	7E-03	3E-02	3E-05	3E-04			
		Manganese	2.3E+03	1.00	8.1E-04	3.2E-03	2.4E-02	3E-02	1E-01	6E-06	5E-05			
		Mercury	2.3E-01	1.00	8.0E-08	3.2E-07	2.0E-03	4E-05	2E-04	6E-10	5E-09			
		Thallium	7.6E-01	1.00	2.7E-07	1.1E-06	4.0E-05	7E-03	3E-02	2E-09	2E-08			
		Vanadium	2.2E+01	1.00	7.8E-06	3.1E-05	1.0E-02	8E-04	3E-03	6E-08	4E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	1.2E-13	4.8E-13	2.0E-08	6E-06	2E-05	9E-16	7E-15	1E+05	1E-10	9E-10
		Aluminum	1.2E+04	1.00	4.2E-03	1.7E-02	1.0E+00	4E-03	2E-02	3E-05	2E-04			
		Antimony	9.5E-02	1.00	3.3E-08	1.3E-07	4.0E-04	8E-05	3E-04	2E-10	2E-09			
		Arsenic	4.2E+00	0.60	8.8E-07	3.5E-06	3.0E-04	3E-03	1E-02	6E-09	5E-08	2E+00	9E-09	8E-08
		Barium	2.0E+02	1.00	7.0E-05	2.8E-04	2.0E-01	3E-04	1E-03	5E-07	4E-06			
		Cadmium	1.4E-01	1.00	5.0E-08	2.0E-07	5.0E-04	1E-04	4E-04	4E-10	3E-09			
		Chromium	1.3E+01	1.00	4.6E-06	1.8E-05	5.0E-03	9E-04	4E-03	3E-08	3E-07	5E-01	2E-08	1E-07
		Cobalt	6.2E+00	1.00	2.2E-06	8.7E-06	3.0E-03	7E-04	3E-03	2E-08	1E-07			
		Iron	1.5E+04	1.00	5.4E-03	2.1E-02	7.0E-01	8E-03	3E-02	4E-05	3E-04			
		Manganese	3.6E+02	1.00	1.3E-04	5.1E-04	2.4E-02	5E-03	2E-02	9E-07	7E-06			
		Mercury	1.4E-02	1.00	4.7E-09	1.9E-08	2.0E-03	2E-06	9E-06	3E-11	3E-10			
		Thallium	1.7E-01	1.00	6.1E-08	2.4E-07	4.0E-05	2E-03	6E-03	4E-10	3E-09			
		Vanadium	1.7E+01	1.00	5.9E-06	2.3E-05	1.0E-02	6E-04	2E-03	4E-08	3E-07			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	6.9E-13	2.8E-12	2.0E-08	3E-05	1E-04	5E-15	4E-14	1E+05	6E-10	5E-09
		Aluminum	6.7E+03	1.00	2.3E-03	9.4E-03	1.0E+00	2E-03	9E-03	2E-05	1E-04			
		Antimony	1.3E-01	1.00	4.4E-08	1.8E-07	4.0E-04	1E-04	4E-04	3E-10	3E-09			
		Arsenic	2.8E+00	0.60	5.9E-07	2.4E-06	3.0E-04	2E-03	8E-03	4E-09	3E-08	2E+00	6E-09	5E-08
		Barium	1.4E+02	1.00	5.0E-05	2.0E-04	2.0E-01	3E-04	1E-03	4E-07	3E-06			
		Cadmium	1.2E-01	1.00	4.1E-08	1.6E-07	5.0E-04	8E-05	3E-04	3E-10	2E-09			
		Chromium	9.1E+00	1.00	3.2E-06	1.3E-05	5.0E-03	6E-04	3E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	3.3E+00	1.00	1.1E-06	4.6E-06	3.0E-03	4E-04	2E-03	8E-09	7E-08			
		Iron	8.6E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.7E+02	1.00	6.0E-05	2.4E-04	2.4E-02	2E-03	1E-02	4E-07	3E-06			
		Mercury	2.2E-02	1.00	7.9E-09	3.2E-08	2.0E-03	4E-06	2E-05	6E-11	5E-10			
		Thallium	8.4E-02	1.00	2.9E-08	1.2E-07	4.0E-05	7E-04	3E-03	2E-10	2E-09			
		Vanadium	1.0E+01	1.00	3.6E-06	1.4E-05	1.0E-02	4E-04	1E-03	3E-08	2E-07			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	6.9E-13	2.8E-12	2.0E-08	3E-05	1E-04	5E-15	4E-14	1E+05	6E-10	5E-09
		Aluminum	6.7E+03	1.00	2.3E-03	9.4E-03	1.0E+00	2E-03	9E-03	2E-05	1E-04			
		Antimony	1.3E-01	1.00	4.4E-08	1.8E-07	4.0E-04	1E-04	4E-04	3E-10	3E-09			
		Arsenic	2.8E+00	0.60	5.9E-07	2.4E-06	3.0E-04	2E-03	8E-03	4E-09	3E-08	2E+00	6E-09	5E-08
		Barium	1.4E+02	1.00	5.0E-05	2.0E-04	2.0E-01	3E-04	1E-03	4E-07	3E-06			
		Cadmium	1.2E-01	1.00	4.1E-08	1.6E-07	5.0E-04	8E-05	3E-04	3E-10	2E-09			
		Chromium	9.1E+00	1.00	3.2E-06	1.3E-05	5.0E-03	6E-04	3E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	3.3E+00	1.00	1.1E-06	4.6E-06	3.0E-03	4E-04	2E-03	8E-09	7E-08			
		Iron	8.6E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.7E+02	1.00	6.0E-05	2.4E-04	2.4E-02	2E-03	1E-02	4E-07	3E-06			
		Mercury	2.2E-02	1.00	7.9E-09	3.2E-08	2.0E-03	4E-06	2E-05	6E-11	5E-10			
		Thallium	8.4E-02	1.00	2.9E-08	1.2E-07	4.0E-05	7E-04	3E-03	2E-10	2E-09			
		Vanadium	1.0E+01	1.00	3.6E-06	1.4E-05	1.0E-02	4E-04	1E-03	3E-08	2E-07			
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	1.2E-13	4.8E-13	2.0E-08	6E-06	2E-05	9E-16	7E-15	1E+05	1E-10	9E-10
		Aluminum	1.2E+04	1.00	4.2E-03	1.7E-02	1.0E+00	4E-03	2E-02	3E-05	2E-04			
		Antimony	9.5E-02	1.00	3.3E-08	1.3E-07	4.0E-04	8E-05	3E-04	2E-10	2E-09			
		Arsenic	4.2E+00	0.60	8.8E-07	3.5E-06	3.0E-04	3E-03	1E-02	6E-09	5E-08	2E+00	9E-09	8E-08
		Barium	2.0E+02	1.00	7.0E-05	2.8E-04	2.0E-01	3E-04	1E-03	5E-07	4E-06			
		Cadmium	1.4E-01	1.00	5.0E-08	2.0E-07	5.0E-04	1E-04	4E-04	4E-10	3E-09			
		Chromium	1.3E+01	1.00	4.6E-06	1.8E-05	5.0E-03	9E-04	4E-03	3E-08	3E-07	5E-01	2E-08	1E-07
		Cobalt	6.2E+00	1.00	2.2E-06	8.7E-06	3.0E-03	7E-04	3E-03	2E-08	1E-07			
		Iron	1.5E+04	1.00	5.4E-03	2.1E-02	7.0E-01	8E-03	3E-02	4E-05	3E-04			
		Manganese	3.6E+02	1.00	1.3E-04	5.1E-04	2.4E-02	5E-03	2E-02	9E-07	7E-06			
		Mercury	1.4E-02	1.00	4.7E-09	1.9E-08	2.0E-03	2E-06	9E-06	3E-11	3E-10			
		Thallium	1.7E-01	1.00	6.1E-08	2.4E-07	4.0E-05	2E-03	6E-03	4E-10	3E-09			
		Vanadium	1.7E+01	1.00	5.9E-06	2.3E-05	1.0E-02	6E-04	2E-03	4E-08	3E-07			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	6.9E-13	2.8E-12	2.0E-08	3E-05	1E-04	5E-15	4E-14	1E+05	6E-10	5E-09
		Aluminum	6.7E+03	1.00	2.3E-03	9.4E-03	1.0E+00	2E-03	9E-03	2E-05	1E-04			
		Antimony	1.3E-01	1.00	4.4E-08	1.8E-07	4.0E-04	1E-04	4E-04	3E-10	3E-09			
		Arsenic	2.8E+00	0.60	5.9E-07	2.4E-06	3.0E-04	2E-03	8E-03	4E-09	3E-08	2E+00	6E-09	5E-08
		Barium	1.4E+02	1.00	5.0E-05	2.0E-04	2.0E-01	3E-04	1E-03	4E-07	3E-06			
		Cadmium	1.2E-01	1.00	4.1E-08	1.6E-07	5.0E-04	8E-05	3E-04	3E-10	2E-09			
		Chromium	9.1E+00	1.00	3.2E-06	1.3E-05	5.0E-03	6E-04	3E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	3.3E+00	1.00	1.1E-06	4.6E-06	3.0E-03	4E-04	2E-03	8E-09	7E-08			
		Iron	8.6E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.7E+02	1.00	6.0E-05	2.4E-04	2.4E-02	2E-03	1E-02	4E-07	3E-06			
		Mercury	2.2E-02	1.00	7.9E-09	3.2E-08	2.0E-03	4E-06	2E-05	6E-11	5E-10			
		Thallium	8.4E-02	1.00	2.9E-08	1.2E-07	4.0E-05	7E-04	3E-03	2E-10	2E-09			
		Vanadium	1.0E+01	1.00	3.6E-06	1.4E-05	1.0E-02	4E-04	1E-03	3E-08	2E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	6.9E-13	2.8E-12	2.0E-08	3E-05	1E-04	5E-15	4E-14	1E+05	6E-10	5E-09
		Aluminum	6.7E+03	1.00	2.3E-03	9.4E-03	1.0E+00	2E-03	9E-03	2E-05	1E-04			
		Antimony	1.3E-01	1.00	4.4E-08	1.8E-07	4.0E-04	1E-04	4E-04	3E-10	3E-09			
		Arsenic	2.8E+00	0.60	5.9E-07	2.4E-06	3.0E-04	2E-03	8E-03	4E-09	3E-08	2E+00	6E-09	5E-08
		Barium	1.4E+02	1.00	5.0E-05	2.0E-04	2.0E-01	3E-04	1E-03	4E-07	3E-06			
		Cadmium	1.2E-01	1.00	4.1E-08	1.6E-07	5.0E-04	8E-05	3E-04	3E-10	2E-09			
		Chromium	9.1E+00	1.00	3.2E-06	1.3E-05	5.0E-03	6E-04	3E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	3.3E+00	1.00	1.1E-06	4.6E-06	3.0E-03	4E-04	2E-03	8E-09	7E-08			
		Iron	8.6E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	1.7E+02	1.00	6.0E-05	2.4E-04	2.4E-02	2E-03	1E-02	4E-07	3E-06			
		Mercury	2.2E-02	1.00	7.9E-09	3.2E-08	2.0E-03	4E-06	2E-05	6E-11	5E-10			
		Thallium	8.4E-02	1.00	2.9E-08	1.2E-07	4.0E-05	7E-04	3E-03	2E-10	2E-09			
		Vanadium	1.0E+01	1.00	3.6E-06	1.4E-05	1.0E-02	4E-04	1E-03	3E-08	2E-07			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	1.00	2.1E-13	8.4E-13	2.0E-08	1E-05	4E-05	1E-15	1E-14	1E+05	2E-10	2E-09
		Aluminum	6.8E+03	1.00	2.4E-03	9.5E-03	1.0E+00	2E-03	1E-02	2E-05	1E-04			
		Antimony	1.0E-01	1.00	3.5E-08	1.4E-07	4.0E-04	9E-05	4E-04	3E-10	2E-09			
		Arsenic	4.4E+00	0.60	9.3E-07	3.7E-06	3.0E-04	3E-03	1E-02	7E-09	5E-08	2E+00	1E-08	8E-08
		Barium	1.8E+02	1.00	6.3E-05	2.5E-04	2.0E-01	3E-04	1E-03	5E-07	4E-06			
		Cadmium	3.1E-01	1.00	1.1E-07	4.3E-07	5.0E-04	2E-04	9E-04	8E-10	6E-09			
		Chromium	8.2E+00	1.00	2.9E-06	1.1E-05	5.0E-03	6E-04	2E-03	2E-08	2E-07	5E-01	1E-08	8E-08
		Cobalt	3.8E+00	1.00	1.3E-06	5.3E-06	3.0E-03	4E-04	2E-03	9E-09	8E-08			
		Iron	9.4E+03	1.00	3.3E-03	1.3E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	2.8E+02	1.00	9.7E-05	3.9E-04	2.4E-02	4E-03	2E-02	7E-07	6E-06			
		Mercury	3.2E-02	1.00	1.1E-08	4.4E-08	2.0E-03	6E-06	2E-05	8E-11	6E-10			
		Thallium	1.1E-01	1.00	3.8E-08	1.5E-07	4.0E-05	9E-04	4E-03	3E-10	2E-09			
		Vanadium	1.2E+01	1.00	4.2E-06	1.7E-05	1.0E-02	4E-04	2E-03	3E-08	2E-07			
Floodplain	85	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	1.00	1.4E-13	5.6E-13	2.0E-08	7E-06	3E-05	1E-15	8E-15	1E+05	1E-10	1E-09
		Aluminum	2.9E+03	1.00	1.0E-03	4.1E-03	1.0E+00	1E-03	4E-03	7E-06	6E-05			
		Antimony	8.5E-02	1.00	3.0E-08	1.2E-07	4.0E-04	7E-05	3E-04	2E-10	2E-09			
		Arsenic	1.9E+00	0.60	4.0E-07	1.6E-06	3.0E-04	1E-03	5E-03	3E-09	2E-08	2E+00	4E-09	3E-08
		Barium	2.9E+01	1.00	1.0E-05	4.1E-05	2.0E-01	5E-05	2E-04	7E-08	6E-07			
		Cadmium	1.6E-02	1.00	5.6E-09	2.2E-08	5.0E-04	1E-05	4E-05	4E-11	3E-10			
		Chromium	3.9E+00	1.00	1.4E-06	5.5E-06	5.0E-03	3E-04	1E-03	1E-08	8E-08	5E-01	5E-09	4E-08
		Cobalt	1.8E+00	1.00	6.3E-07	2.5E-06	3.0E-03	2E-04	8E-04	5E-09	4E-08			
		Iron	5.2E+03	1.00	1.8E-03	7.2E-03	7.0E-01	3E-03	1E-02	1E-05	1E-04			
		Manganese	6.4E+01	1.00	2.2E-05	9.0E-05	2.4E-02	9E-04	4E-03	2E-07	1E-06			
		Mercury	4.4E-03	1.00	1.5E-09	6.1E-09	2.0E-03	8E-07	3E-06	1E-11	9E-11			
		Thallium	4.4E-02	1.00	1.5E-08	6.2E-08	4.0E-05	4E-04	2E-03	1E-10	9E-10			
		Vanadium	5.1E+00	1.00	1.8E-06	7.1E-06	1.0E-02	2E-04	7E-04	1E-08	1E-07			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	5.6E-12	2.3E-11	2.0E-08	3E-04	1E-03	4E-14	3E-13	1E+05	5E-09	4E-08
		Aluminum	1.7E+04	1.00	6.0E-03	2.4E-02	1.0E+00	6E-03	2E-02	4E-05	3E-04			
		Antimony	3.8E-01	1.00	1.3E-07	5.3E-07	4.0E-04	3E-04	1E-03	1E-09	8E-09			
		Arsenic	4.0E+00	0.60	8.4E-07	3.4E-06	3.0E-04	3E-03	1E-02	6E-09	5E-08	2E+00	9E-09	7E-08
		Barium	4.0E+02	1.00	1.4E-04	5.6E-04	2.0E-01	7E-04	3E-03	1E-06	8E-06			
		Cadmium	4.7E-01	1.00	1.6E-07	6.6E-07	5.0E-04	3E-04	1E-03	1E-09	9E-09			
		Chromium	1.7E+01	1.00	6.1E-06	2.4E-05	5.0E-03	1E-03	5E-03	4E-08	3E-07	5E-01	2E-08	2E-07
		Cobalt	5.0E+00	1.00	1.7E-06	7.0E-06	3.0E-03	6E-04	2E-03	1E-08	1E-07			
		Iron	2.0E+04	1.00	7.0E-03	2.8E-02	7.0E-01	1E-02	4E-02	5E-05	4E-04			
		Manganese	4.8E+02	1.00	1.7E-04	6.7E-04	2.4E-02	7E-03	3E-02	1E-06	1E-05			
		Mercury	4.6E-01	1.00	1.6E-07	6.5E-07	2.0E-03	8E-05	3E-04	1E-09	9E-09			
		Thallium	1.7E-01	1.00	5.9E-08	2.3E-07	4.0E-05	1E-03	6E-03	4E-10	3E-09			
		Vanadium	1.9E+01	1.00	6.6E-06	2.6E-05	1.0E-02	7E-04	3E-03	5E-08	4E-07			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	1.00	2.0E-12	8.1E-12	2.0E-08	1E-04	4E-04	1E-14	1E-13	1E+05	2E-09	1E-08
		Aluminum	9.5E+03	1.00	3.3E-03	1.3E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	1.1E-01	1.00	3.7E-08	1.5E-07	4.0E-04	9E-05	4E-04	3E-10	2E-09			
		Arsenic	4.0E+00	0.60	8.4E-07	3.4E-06	3.0E-04	3E-03	1E-02	6E-09	5E-08	2E+00	9E-09	7E-08
		Barium	6.5E+02	1.00	2.3E-04	9.1E-04	2.0E-01	1E-03	5E-03	2E-06	1E-05			
		Cadmium	6.7E-01	1.00	2.3E-07	9.4E-07	5.0E-04	5E-04	2E-03	2E-09	1E-08			
		Chromium	1.3E+01	1.00	4.7E-06	1.9E-05	5.0E-03	9E-04	4E-03	3E-08	3E-07	5E-01	2E-08	1E-07
		Cobalt	3.6E+00	1.00	1.3E-06	5.0E-06	3.0E-03	4E-04	2E-03	9E-09	7E-08			
		Iron	1.1E+04	1.00	3.8E-03	1.5E-02	7.0E-01	5E-03	2E-02	3E-05	2E-04			
		Manganese	2.4E+02	1.00	8.4E-05	3.4E-04	2.4E-02	3E-03	1E-02	6E-07	5E-06			
		Mercury	8.8E-02	1.00	3.1E-08	1.2E-07	2.0E-03	2E-05	6E-05	2E-10	2E-09			
		Thallium	1.8E-01	1.00	6.3E-08	2.5E-07	4.0E-05	2E-03	6E-03	5E-10	4E-09			
		Vanadium	1.8E+01	1.00	6.3E-06	2.5E-05	1.0E-02	6E-04	3E-03	4E-08	4E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	1.00	2.0E-11	7.8E-11	2.0E-08	1E-03	4E-03	1E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	1.2E+04	1.00	4.1E-03	1.7E-02	1.0E+00	4E-03	2E-02	3E-05	2E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.5E+00	0.60	1.2E-06	4.6E-06	3.0E-04	4E-03	2E-02	8E-09	7E-08	2E+00	1E-08	1E-07
		Barium	1.5E+03	1.00	5.1E-04	2.0E-03	2.0E-01	3E-03	1E-02	4E-06	3E-05			
		Cadmium	1.8E+00	1.00	6.3E-07	2.5E-06	5.0E-04	1E-03	5E-03	5E-09	4E-08			
		Chromium	2.6E+01	1.00	9.2E-06	3.7E-05	5.0E-03	2E-03	7E-03	7E-08	5E-07	5E-01	3E-08	3E-07
		Cobalt	2.6E+00	1.00	9.1E-07	3.6E-06	3.0E-03	3E-04	1E-03	7E-09	5E-08			
		Iron	8.7E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	5.3E+02	1.00	1.8E-04	7.4E-04	2.4E-02	8E-03	3E-02	1E-06	1E-05			
		Mercury	6.9E-01	1.00	2.4E-07	9.7E-07	2.0E-03	1E-04	5E-04	2E-09	1E-08			
		Thallium	1.5E-01	1.00	5.3E-08	2.1E-07	4.0E-05	1E-03	5E-03	4E-10	3E-09			
		Vanadium	1.4E+01	1.00	4.8E-06	1.9E-05	1.0E-02	5E-04	2E-03	3E-08	3E-07			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.3E-06	1.00	3.3E-12	1.3E-11	2.0E-08	2E-04	7E-04	2E-14	2E-13	1E+05	3E-09	2E-08
		Aluminum	1.1E+04	1.00	3.9E-03	1.5E-02	1.0E+00	4E-03	2E-02	3E-05	2E-04			
		Antimony	3.6E-01	1.00	1.2E-07	5.0E-07	4.0E-04	3E-04	1E-03	9E-10	7E-09			
		Arsenic	4.7E+00	0.60	9.8E-07	3.9E-06	3.0E-04	3E-03	1E-02	7E-09	6E-08	2E+00	1E-08	8E-08
		Barium	4.9E+02	1.00	1.7E-04	6.8E-04	2.0E-01	9E-04	3E-03	1E-06	1E-05			
		Cadmium	5.3E-01	1.00	1.9E-07	7.4E-07	5.0E-04	4E-04	1E-03	1E-09	1E-08			
		Chromium	1.7E+01	1.00	5.9E-06	2.4E-05	5.0E-03	1E-03	5E-03	4E-08	3E-07	5E-01	2E-08	2E-07
		Cobalt	4.4E+00	1.00	1.5E-06	6.2E-06	3.0E-03	5E-04	2E-03	1E-08	9E-08			
		Iron	1.2E+04	1.00	4.4E-03	1.7E-02	7.0E-01	6E-03	2E-02	3E-05	2E-04			
		Manganese	3.6E+02	1.00	1.2E-04	5.0E-04	2.4E-02	5E-03	2E-02	9E-07	7E-06			
		Mercury	1.7E-01	1.00	6.0E-08	2.4E-07	2.0E-03	3E-05	1E-04	4E-10	3E-09			
		Thallium	1.5E-01	1.00	5.4E-08	2.2E-07	4.0E-05	1E-03	5E-03	4E-10	3E-09			
		Vanadium	1.9E+01	1.00	6.5E-06	2.6E-05	1.0E-02	6E-04	3E-03	5E-08	4E-07			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	1.9E-11	7.8E-11	2.0E-08	1E-03	4E-03	1E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	1.1E+04	1.00	3.9E-03	1.6E-02	1.0E+00	4E-03	2E-02	3E-05	2E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.0E+01	0.60	2.1E-06	8.4E-06	3.0E-04	7E-03	3E-02	2E-08	1E-07	2E+00	2E-08	2E-07
		Barium	7.6E+02	1.00	2.7E-04	1.1E-03	2.0E-01	1E-03	5E-03	2E-06	2E-05			
		Cadmium	2.8E+00	1.00	9.8E-07	3.9E-06	5.0E-04	2E-03	8E-03	7E-09	6E-08			
		Chromium	2.8E+01	1.00	9.7E-06	3.9E-05	5.0E-03	2E-03	8E-03	7E-08	6E-07	5E-01	3E-08	3E-07
		Cobalt	3.1E+00	1.00	1.1E-06	4.3E-06	3.0E-03	4E-04	1E-03	8E-09	6E-08			
		Iron	9.3E+03	1.00	3.2E-03	1.3E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	1.1E+03	1.00	3.9E-04	1.6E-03	2.4E-02	2E-02	7E-02	3E-06	2E-05			
		Mercury	1.5E+00	1.00	5.2E-07	2.1E-06	2.0E-03	3E-04	1E-03	4E-09	3E-08			
		Thallium	1.6E-01	1.00	5.4E-08	2.2E-07	4.0E-05	1E-03	5E-03	4E-10	3E-09			
		Vanadium	3.1E+01	1.00	1.1E-05	4.4E-05	1.0E-02	1E-03	4E-03	8E-08	6E-07			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	7.9E-12	3.2E-11	2.0E-08	4E-04	2E-03	6E-14	5E-13	1E+05	7E-09	6E-08
		Aluminum	1.5E+04	1.00	5.2E-03	2.1E-02	1.0E+00	5E-03	2E-02	4E-05	3E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	6.3E+00	0.60	1.3E-06	5.3E-06	3.0E-04	4E-03	2E-02	9E-09	8E-08	2E+00	1E-08	1E-07
		Barium	9.2E+02	1.00	3.2E-04	1.3E-03	2.0E-01	2E-03	6E-03	2E-06	2E-05			
		Cadmium	1.7E+00	1.00	5.9E-07	2.4E-06	5.0E-04	1E-03	5E-03	4E-09	3E-08			
		Chromium	2.6E+01	1.00	9.2E-06	3.7E-05	5.0E-03	2E-03	7E-03	7E-08	5E-07	5E-01	3E-08	3E-07
		Cobalt	5.3E+00	1.00	1.9E-06	7.4E-06	3.0E-03	6E-04	2E-03	1E-08	1E-07			
		Iron	1.4E+04	1.00	5.0E-03	2.0E-02	7.0E-01	7E-03	3E-02	4E-05	3E-04			
		Manganese	4.0E+02	1.00	1.4E-04	5.6E-04	2.4E-02	6E-03	2E-02	1E-06	8E-06			
		Mercury	8.3E-01	1.00	2.9E-07	1.2E-06	2.0E-03	1E-04	6E-04	2E-09	2E-08			
		Thallium	1.9E-01	1.00	6.7E-08	2.7E-07	4.0E-05	2E-03	7E-03	5E-10	4E-09			
		Vanadium	2.6E+01	1.00	9.2E-06	3.7E-05	1.0E-02	9E-04	4E-03	7E-08	5E-07			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	1.00	1.6E-11	6.5E-11	2.0E-08	8E-04	3E-03	1E-13	9E-13	1E+05	1E-08	1E-07
		Aluminum	1.5E+04	1.00	5.3E-03	2.1E-02	1.0E+00	5E-03	2E-02	4E-05	3E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	7.8E+00	0.60	1.6E-06	6.6E-06	3.0E-04	5E-03	2E-02	1E-08	9E-08	2E+00	2E-08	1E-07
		Barium	4.3E+02	1.00	1.5E-04	6.0E-04	2.0E-01	8E-04	3E-03	1E-06	9E-06			
		Cadmium	2.1E+00	1.00	7.4E-07	3.0E-06	5.0E-04	1E-03	6E-03	5E-09	4E-08			
		Chromium	2.5E+01	1.00	8.8E-06	3.5E-05	5.0E-03	2E-03	7E-03	6E-08	5E-07	5E-01	3E-08	3E-07
		Cobalt	3.2E+00	1.00	1.1E-06	4.5E-06	3.0E-03	4E-04	1E-03	8E-09	6E-08			
		Iron	7.9E+03	1.00	2.8E-03	1.1E-02	7.0E-01	4E-03	2E-02	2E-05	2E-04			
		Manganese	8.8E+02	1.00	3.1E-04	1.2E-03	2.4E-02	1E-02	5E-02	2E-06	2E-05			
		Mercury	3.2E+00	1.00	1.1E-06	4.4E-06	2.0E-03	6E-04	2E-03	8E-09	6E-08			
		Thallium	1.2E-01	1.00	4.3E-08	1.7E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	2.9E+01	1.00	1.0E-05	4.0E-05	1.0E-02	1E-03	4E-03	7E-08	6E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	1.00	7.6E-12	3.0E-11	2.0E-08	4E-04	2E-03	5E-14	4E-13	1E+05	7E-09	6E-08
		Aluminum	1.0E+04	1.00	3.5E-03	1.4E-02	1.0E+00	4E-03	1E-02	3E-05	2E-04			
		Antimony	4.5E-01	1.00	1.6E-07	6.3E-07	4.0E-04	4E-04	2E-03	1E-09	9E-09			
		Arsenic	3.9E+00	0.60	8.2E-07	3.3E-06	3.0E-04	3E-03	1E-02	6E-09	5E-08	2E+00	9E-09	7E-08
		Barium	4.0E+02	1.00	1.4E-04	5.6E-04	2.0E-01	7E-04	3E-03	1E-06	8E-06			
		Cadmium	1.1E+00	1.00	3.9E-07	1.6E-06	5.0E-04	8E-04	3E-03	3E-09	2E-08			
		Chromium	1.9E+01	1.00	6.8E-06	2.7E-05	5.0E-03	1E-03	5E-03	5E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	3.1E+00	1.00	1.1E-06	4.4E-06	3.0E-03	4E-04	1E-03	8E-09	6E-08			
		Iron	9.3E+03	1.00	3.3E-03	1.3E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	3.9E+02	1.00	1.4E-04	5.5E-04	2.4E-02	6E-03	2E-02	1E-06	8E-06			
		Mercury	9.0E-01	1.00	3.2E-07	1.3E-06	2.0E-03	2E-04	6E-04	2E-09	2E-08			
		Thallium	1.5E-01	1.00	5.2E-08	2.1E-07	4.0E-05	1E-03	5E-03	4E-10	3E-09			
		Vanadium	1.7E+01	1.00	6.1E-06	2.4E-05	1.0E-02	6E-04	2E-03	4E-08	3E-07			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	1.00	7.4E-12	3.0E-11	2.0E-08	4E-04	1E-03	5E-14	4E-13	1E+05	7E-09	5E-08
		Aluminum	9.8E+03	1.00	3.4E-03	1.4E-02	1.0E+00	3E-03	1E-02	2E-05	2E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.6E+00	0.60	1.2E-06	4.7E-06	3.0E-04	4E-03	2E-02	8E-09	7E-08	2E+00	1E-08	1E-07
		Barium	3.9E+02	1.00	1.4E-04	5.5E-04	2.0E-01	7E-04	3E-03	1E-06	8E-06			
		Cadmium	1.2E+00	1.00	4.3E-07	1.7E-06	5.0E-04	9E-04	3E-03	3E-09	2E-08			
		Chromium	1.8E+01	1.00	6.2E-06	2.5E-05	5.0E-03	1E-03	5E-03	4E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	3.5E+00	1.00	1.2E-06	4.9E-06	3.0E-03	4E-04	2E-03	9E-09	7E-08			
		Iron	9.7E+03	1.00	3.4E-03	1.4E-02	7.0E-01	5E-03	2E-02	2E-05	2E-04			
		Manganese	7.4E+02	1.00	2.6E-04	1.0E-03	2.4E-02	1E-02	4E-02	2E-06	1E-05			
		Mercury	1.0E+00	1.00	3.7E-07	1.5E-06	2.0E-03	2E-04	7E-04	3E-09	2E-08			
		Thallium	1.2E-01	1.00	4.3E-08	1.7E-07	4.0E-05	1E-03	4E-03	3E-10	2E-09			
		Vanadium	2.3E+01	1.00	8.2E-06	3.3E-05	1.0E-02	8E-04	3E-03	6E-08	5E-07			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	1.00	8.4E-13	3.3E-12	2.0E-08	4E-05	2E-04	6E-15	5E-14	1E+05	8E-10	6E-09
		Aluminum	6.7E+03	1.00	2.4E-03	9.4E-03	1.0E+00	2E-03	9E-03	2E-05	1E-04			
		Antimony	4.7E-02	1.00	1.7E-08	6.6E-08	4.0E-04	4E-05	2E-04	1E-10	9E-10			
		Arsenic	2.0E+00	0.60	4.2E-07	1.7E-06	3.0E-04	1E-03	6E-03	3E-09	2E-08	2E+00	5E-09	4E-08
		Barium	2.1E+02	1.00	7.3E-05	2.9E-04	2.0E-01	4E-04	1E-03	5E-07	4E-06			
		Cadmium	2.2E-01	1.00	7.7E-08	3.1E-07	5.0E-04	2E-04	6E-04	6E-10	4E-09			
		Chromium	8.7E+00	1.00	3.1E-06	1.2E-05	5.0E-03	6E-04	2E-03	2E-08	2E-07	5E-01	1E-08	9E-08
		Cobalt	1.9E+00	1.00	6.5E-07	2.6E-06	3.0E-03	2E-04	9E-04	5E-09	4E-08			
		Iron	5.9E+03	1.00	2.1E-03	8.2E-03	7.0E-01	3E-03	1E-02	1E-05	1E-04			
		Manganese	8.5E+01	1.00	3.0E-05	1.2E-04	2.4E-02	1E-03	5E-03	2E-07	2E-06			
		Mercury	4.3E-02	1.00	1.5E-08	6.0E-08	2.0E-03	8E-06	3E-05	1E-10	9E-10			
		Thallium	7.4E-03	1.00	2.6E-09	1.0E-08	4.0E-05	6E-05	3E-04	2E-11	1E-10			
		Vanadium	8.8E+00	1.00	3.1E-06	1.2E-05	1.0E-02	3E-04	1E-03	2E-08	2E-07			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.2E-05	1.00	4.3E-12	1.7E-11	2.0E-08	2E-04	9E-04	3E-14	2E-13	1E+05	4E-09	3E-08
		Aluminum	1.5E+04	1.00	5.2E-03	2.1E-02	1.0E+00	5E-03	2E-02	4E-05	3E-04			
		Antimony	9.0E-02	1.00	3.2E-08	1.3E-07	4.0E-04	8E-05	3E-04	2E-10	2E-09			
		Arsenic	4.2E+00	0.60	8.9E-07	3.6E-06	3.0E-04	3E-03	1E-02	6E-09	5E-08	2E+00	1E-08	8E-08
		Barium	1.9E+03	1.00	6.5E-04	2.6E-03	2.0E-01	3E-03	1E-02	5E-06	4E-05			
		Cadmium	1.0E+00	1.00	3.6E-07	1.4E-06	5.0E-04	7E-04	3E-03	3E-09	2E-08			
		Chromium	1.9E+01	1.00	6.5E-06	2.6E-05	5.0E-03	1E-03	5E-03	5E-08	4E-07	5E-01	2E-08	2E-07
		Cobalt	3.3E+00	1.00	1.2E-06	4.7E-06	3.0E-03	4E-04	2E-03	8E-09	7E-08			
		Iron	1.1E+04	1.00	3.9E-03	1.6E-02	7.0E-01	6E-03	2E-02	3E-05	2E-04			
		Manganese	2.6E+02	1.00	9.3E-05	3.7E-04	2.4E-02	4E-03	2E-02	7E-07	5E-06			
		Mercury	2.6E-01	1.00	9.0E-08	3.6E-07	2.0E-03	5E-05	2E-04	6E-10	5E-09			
		Thallium	1.3E-01	1.00	4.6E-08	1.8E-07	4.0E-05	1E-03	5E-03	3E-10	3E-09			
		Vanadium	2.0E+01	1.00	7.2E-06	2.9E-05	1.0E-02	7E-04	3E-03	5E-08	4E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	7.49E-07	4.49E-06
Cancer	5.35E-09	6.42E-08

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	0.03	7.1E-14	4.2E-13	2.0E-08	4E-06	2E-05	5E-16	6E-15	1E+05	7E-11	8E-10
		Arsenic	7.9E+00	0.03	1.8E-07	1.1E-06	3.0E-04	6E-04	4E-03	1E-09	2E-08	2E+00	2E-09	2E-08
		Cadmium	5.9E-01	0.001	4.4E-10	2.6E-09	1.3E-05	4E-05	2E-04	3E-12	4E-11			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	0.03	5.7E-14	3.4E-13	2.0E-08	3E-06	2E-05	4E-16	5E-15	1E+05	5E-11	6E-10
		Arsenic	1.0E+00	0.03	2.2E-08	1.3E-07	3.0E-04	7E-05	4E-04	2E-10	2E-09	2E+00	2E-10	3E-09
		Cadmium	6.4E-02	0.001	4.8E-11	2.9E-10	1.3E-05	4E-06	2E-05	3E-13	4E-12			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	0.03	1.5E-14	8.8E-14	2.0E-08	7E-07	4E-06	1E-16	1E-15	1E+05	1E-11	2E-10
		Arsenic	9.5E-01	0.03	2.1E-08	1.3E-07	3.0E-04	7E-05	4E-04	2E-10	2E-09	2E+00	2E-10	3E-09
		Cadmium	7.3E-02	0.001	5.5E-11	3.3E-10	1.3E-05	4E-06	3E-05	4E-13	5E-12			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	0.03	6.4E-14	3.8E-13	2.0E-08	3E-06	2E-05	5E-16	5E-15	1E+05	6E-11	7E-10
		Arsenic	1.7E+00	0.03	3.9E-08	2.3E-07	3.0E-04	1E-04	8E-04	3E-10	3E-09	2E+00	4E-10	5E-09
		Cadmium	1.4E-01	0.001	1.0E-10	6.2E-10	1.3E-05	8E-06	5E-05	7E-13	9E-12			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	0.03	3.8E-14	2.3E-13	2.0E-08	2E-06	1E-05	3E-16	3E-15	1E+05	4E-11	4E-10
		Arsenic	1.2E+00	0.03	2.7E-08	1.6E-07	3.0E-04	9E-05	5E-04	2E-10	2E-09	2E+00	3E-10	3E-09
		Cadmium	1.3E-01	0.001	9.7E-11	5.8E-10	1.3E-05	8E-06	5E-05	7E-13	8E-12			
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	6.9E-07	0.03	1.5E-14	9.3E-14	2.0E-08	8E-07	5E-06	1E-16	1E-15	1E+05	1E-11	2E-10
		Arsenic	1.7E+00	0.03	3.9E-08	2.3E-07	3.0E-04	1E-04	8E-04	3E-10	3E-09	2E+00	4E-10	5E-09
		Cadmium	4.1E-02	0.001	3.1E-11	1.8E-10	1.3E-05	2E-06	1E-05	2E-13	3E-12			
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	0.03	1.2E-14	7.1E-14	2.0E-08	6E-07	4E-06	9E-17	1E-15	1E+05	1E-11	1E-10
		Arsenic	1.1E+00	0.03	2.5E-08	1.5E-07	3.0E-04	8E-05	5E-04	2E-10	2E-09	2E+00	3E-10	3E-09
		Cadmium	4.6E-02	0.001	3.4E-11	2.1E-10	1.3E-05	3E-06	2E-05	2E-13	3E-12			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	9.9E-07	0.03	2.2E-14	1.3E-13	2.0E-08	1E-06	7E-06	2E-16	2E-15	1E+05	2E-11	2E-10
		Arsenic	4.0E+00	0.03	9.0E-08	5.4E-07	3.0E-04	3E-04	2E-03	6E-10	8E-09	2E+00	1E-09	1E-08
		Cadmium	1.3E-01	0.001	9.5E-11	5.7E-10	1.3E-05	8E-06	5E-05	7E-13	8E-12			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	0.03	1.9E-14	1.1E-13	2.0E-08	9E-07	6E-06	1E-16	2E-15	1E+05	2E-11	2E-10
		Arsenic	1.6E+00	0.03	3.6E-08	2.2E-07	3.0E-04	1E-04	7E-04	3E-10	3E-09	2E+00	4E-10	5E-09
		Cadmium	9.3E-02	0.001	7.0E-11	4.2E-10	1.3E-05	6E-06	3E-05	5E-13	6E-12			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	0.03	1.6E-14	9.8E-14	2.0E-08	8E-07	5E-06	1E-16	1E-15	1E+05	2E-11	2E-10
		Arsenic	2.1E+00	0.03	4.7E-08	2.8E-07	3.0E-04	2E-04	9E-04	3E-10	4E-09	2E+00	5E-10	6E-09
		Cadmium	1.9E-01	0.001	1.4E-10	8.5E-10	1.3E-05	1E-05	7E-05	1E-12	1E-11			
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	0.03	2.1E-13	1.2E-12	2.0E-08	1E-05	6E-05	1E-15	2E-14	1E+05	2E-10	2E-09
		Arsenic	5.1E+00	0.03	1.1E-07	6.9E-07	3.0E-04	4E-04	2E-03	8E-10	1E-08	2E+00	1E-09	1E-08
		Cadmium	8.5E-01	0.001	6.4E-10	3.8E-09	1.3E-05	5E-05	3E-04	5E-12	5E-11			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	3.4E-14	2.1E-13	2.0E-08	2E-06	1E-05	2E-16	3E-15	1E+05	3E-11	4E-10
		Arsenic	2.5E+00	0.03	5.7E-08	3.4E-07	3.0E-04	2E-04	1E-03	4E-10	5E-09	2E+00	6E-10	7E-09
		Cadmium	2.6E-01	0.001	1.9E-10	1.2E-09	1.3E-05	2E-05	9E-05	1E-12	2E-11			
Upland	38	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	0.03	4.7E-14	2.8E-13	2.0E-08	2E-06	1E-05	3E-16	4E-15	1E+05	4E-11	5E-10
		Arsenic	1.0E+00	0.03	2.2E-08	1.3E-07	3.0E-04	7E-05	4E-04	2E-10	2E-09	2E+00	2E-10	3E-09
		Cadmium	1.6E-02	0.001	1.2E-11	7.2E-11	1.3E-05	1E-06	6E-06	9E-14	1E-12			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.7E-06	0.03	6.0E-14	3.6E-13	2.0E-08	3E-06	2E-05	4E-16	5E-15	1E+05	6E-11	7E-10
		Arsenic	2.1E+00	0.03	4.8E-08	2.9E-07	3.0E-04	2E-04	1E-03	3E-10	4E-09	2E+00	5E-10	6E-09
		Cadmium	3.2E-01	0.001	2.4E-10	1.4E-09	1.3E-05	2E-05	1E-04	2E-12	2E-11			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	0.03	8.0E-14	4.8E-13	2.0E-08	4E-06	2E-05	6E-16	7E-15	1E+05	7E-11	9E-10
		Arsenic	1.4E+00	0.03	3.1E-08	1.9E-07	3.0E-04	1E-04	6E-04	2E-10	3E-09	2E+00	3E-10	4E-09
		Cadmium	2.8E-01	0.001	2.1E-10	1.3E-09	1.3E-05	2E-05	1E-04	1E-12	2E-11			
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-06	0.03	7.7E-14	4.6E-13	2.0E-08	4E-06	2E-05	6E-16	7E-15	1E+05	7E-11	9E-10
		Arsenic	1.3E+00	0.03	2.9E-08	1.7E-07	3.0E-04	1E-04	6E-04	2E-10	2E-09	2E+00	3E-10	4E-09
		Cadmium	2.4E-01	0.001	1.8E-10	1.1E-09	1.3E-05	1E-05	9E-05	1E-12	2E-11			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	0.03	1.7E-13	1.0E-12	2.0E-08	8E-06	5E-05	1E-15	1E-14	1E+05	2E-10	2E-09
		Arsenic	3.1E+00	0.03	7.0E-08	4.2E-07	3.0E-04	2E-04	1E-03	5E-10	6E-09	2E+00	7E-10	9E-09
		Cadmium	3.2E-01	0.001	2.4E-10	1.4E-09	1.3E-05	2E-05	1E-04	2E-12	2E-11			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	8.8E-14	5.3E-13	2.0E-08	4E-06	3E-05	6E-16	8E-15	1E+05	8E-11	1E-09
		Arsenic	2.8E+00	0.03	6.3E-08	3.8E-07	3.0E-04	2E-04	1E-03	4E-10	5E-09	2E+00	7E-10	8E-09
		Cadmium	4.7E-01	0.001	3.5E-10	2.1E-09	1.3E-05	3E-05	2E-04	3E-12	3E-11			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	4.8E-14	2.9E-13	2.0E-08	2E-06	1E-05	3E-16	4E-15	1E+05	4E-11	5E-10
		Arsenic	4.4E+00	0.03	9.9E-08	5.9E-07	3.0E-04	3E-04	2E-03	7E-10	8E-09	2E+00	1E-09	1E-08
		Cadmium	8.0E-01	0.001	6.0E-10	3.6E-09	1.3E-05	5E-05	3E-04	4E-12	5E-11			
Upland	45	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	0.03	8.3E-15	5.0E-14	2.0E-08	4E-07	2E-06	6E-17	7E-16	1E+05	8E-12	9E-11
		Arsenic	3.1E+00	0.03	7.0E-08	4.2E-07	3.0E-04	2E-04	1E-03	5E-10	6E-09	2E+00	7E-10	9E-09
		Cadmium	8.0E-02	0.001	6.0E-11	3.6E-10	1.3E-05	5E-06	3E-05	4E-13	5E-12			
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	6.3E-14	3.8E-13	2.0E-08	3E-06	2E-05	4E-16	5E-15	1E+05	6E-11	7E-10
		Arsenic	2.3E+00	0.03	5.1E-08	3.1E-07	3.0E-04	2E-04	1E-03	4E-10	4E-09	2E+00	5E-10	7E-09
		Cadmium	2.3E-01	0.001	1.7E-10	1.0E-09	1.3E-05	1E-05	8E-05	1E-12	1E-11			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	3.5E-13	2.1E-12	2.0E-08	2E-05	1E-04	2E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	1.2E+01	0.03	2.8E-07	1.7E-06	3.0E-04	9E-04	6E-03	2E-09	2E-08	2E+00	3E-09	4E-08
		Cadmium	5.0E+00	0.001	3.7E-09	2.2E-08	1.3E-05	3E-04	2E-03	3E-11	3E-10			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	7.49E-07	4.49E-06
Cancer	5.35E-09	6.42E-08

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	0.03	1.1E-12	6.6E-12	2.0E-08	6E-05	3E-04	8E-15	9E-14	1E+05	1E-09	1E-08
		Arsenic	1.4E+01	0.03	3.2E-07	1.9E-06	3.0E-04	1E-03	6E-03	2E-09	3E-08	2E+00	3E-09	4E-08
		Cadmium	8.3E+00	0.001	6.2E-09	3.7E-08	1.3E-05	5E-04	3E-03	4E-11	5E-10			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	0.03	8.9E-13	5.4E-12	2.0E-08	4E-05	3E-04	6E-15	8E-14	1E+05	8E-10	1E-08
		Arsenic	3.6E+00	0.03	8.1E-08	4.9E-07	3.0E-04	3E-04	2E-03	6E-10	7E-09	2E+00	9E-10	1E-08
		Cadmium	2.0E+00	0.001	1.5E-09	9.0E-09	1.3E-05	1E-04	7E-04	1E-11	1E-10			
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	0.03	5.3E-13	3.2E-12	2.0E-08	3E-05	2E-04	4E-15	5E-14	1E+05	5E-10	6E-09
		Arsenic	7.7E+00	0.03	1.7E-07	1.0E-06	3.0E-04	6E-04	3E-03	1E-09	1E-08	2E+00	2E-09	2E-08
		Cadmium	3.8E+00	0.001	2.8E-09	1.7E-08	1.3E-05	2E-04	1E-03	2E-11	2E-10			
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	0.03	7.0E-14	4.2E-13	2.0E-08	3E-06	2E-05	5E-16	6E-15	1E+05	6E-11	8E-10
		Arsenic	2.2E+00	0.03	4.9E-08	3.0E-07	3.0E-04	2E-04	1E-03	4E-10	4E-09	2E+00	5E-10	6E-09
		Cadmium	5.2E-01	0.001	3.9E-10	2.3E-09	1.3E-05	3E-05	2E-04	3E-12	3E-11			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	4.8E-14	2.9E-13	2.0E-08	2E-06	1E-05	3E-16	4E-15	1E+05	5E-11	5E-10
		Arsenic	1.8E+00	0.03	4.0E-08	2.4E-07	3.0E-04	1E-04	8E-04	3E-10	3E-09	2E+00	4E-10	5E-09
		Cadmium	1.6E-01	0.001	1.2E-10	7.1E-10	1.3E-05	1E-05	6E-05	8E-13	1E-11			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	0.03	4.9E-13	2.9E-12	2.0E-08	2E-05	1E-04	3E-15	4E-14	1E+05	5E-10	5E-09
		Arsenic	2.6E+00	0.03	5.7E-08	3.4E-07	3.0E-04	2E-04	1E-03	4E-10	5E-09	2E+00	6E-10	7E-09
		Cadmium	1.2E+00	0.001	8.6E-10	5.2E-09	1.3E-05	7E-05	4E-04	6E-12	7E-11			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.2E-05	0.03	2.7E-13	1.6E-12	2.0E-08	1E-05	8E-05	2E-15	2E-14	1E+05	3E-10	3E-09
		Arsenic	9.5E+00	0.03	2.1E-07	1.3E-06	3.0E-04	7E-04	4E-03	2E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	4.0E+00	0.001	3.0E-09	1.8E-08	1.3E-05	2E-04	1E-03	2E-11	3E-10			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	4.7E-05	0.03	1.1E-12	6.3E-12	2.0E-08	5E-05	3E-04	8E-15	9E-14	1E+05	1E-09	1E-08
		Arsenic	1.2E+01	0.03	2.6E-07	1.6E-06	3.0E-04	9E-04	5E-03	2E-09	2E-08	2E+00	3E-09	3E-08
		Cadmium	4.7E+00	0.001	3.5E-09	2.1E-08	1.3E-05	3E-04	2E-03	3E-11	3E-10			
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.7E-05	0.03	1.3E-12	7.7E-12	2.0E-08	6E-05	4E-04	9E-15	1E-13	1E+05	1E-09	1E-08
		Arsenic	1.2E+01	0.03	2.7E-07	1.6E-06	3.0E-04	9E-04	5E-03	2E-09	2E-08	2E+00	3E-09	3E-08
		Cadmium	6.5E+00	0.001	4.9E-09	2.9E-08	1.3E-05	4E-04	2E-03	3E-11	4E-10			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	7.0E-05	0.03	1.6E-12	9.4E-12	2.0E-08	8E-05	5E-04	1E-14	1E-13	1E+05	1E-09	2E-08
		Arsenic	1.0E+01	0.03	2.3E-07	1.4E-06	3.0E-04	8E-04	5E-03	2E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	4.0E+00	0.001	3.0E-09	1.8E-08	1.3E-05	2E-04	1E-03	2E-11	3E-10			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-05	0.03	3.5E-13	2.1E-12	2.0E-08	2E-05	1E-04	2E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	6.1E+00	0.03	1.4E-07	8.3E-07	3.0E-04	5E-04	3E-03	1E-09	1E-08	2E+00	1E-09	2E-08
		Cadmium	3.2E+00	0.001	2.4E-09	1.5E-08	1.3E-05	2E-04	1E-03	2E-11	2E-10			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.6E-06	0.03	1.9E-13	1.2E-12	2.0E-08	1E-05	6E-05	1E-15	2E-14	1E+05	2E-10	2E-09
		Arsenic	4.6E+00	0.03	1.0E-07	6.1E-07	3.0E-04	3E-04	2E-03	7E-10	9E-09	2E+00	1E-09	1E-08
		Cadmium	1.7E+00	0.001	1.2E-09	7.5E-09	1.3E-05	1E-04	6E-04	9E-12	1E-10			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	0.03	1.3E-13	7.8E-13	2.0E-08	7E-06	4E-05	9E-16	1E-14	1E+05	1E-10	1E-09
		Arsenic	3.7E+00	0.03	8.3E-08	5.0E-07	3.0E-04	3E-04	2E-03	6E-10	7E-09	2E+00	9E-10	1E-08
		Cadmium	1.1E+00	0.001	8.2E-10	4.9E-09	1.3E-05	7E-05	4E-04	6E-12	7E-11			
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	0.03	2.5E-14	1.5E-13	2.0E-08	1E-06	7E-06	2E-16	2E-15	1E+05	2E-11	3E-10
		Arsenic	2.6E+00	0.03	5.8E-08	3.5E-07	3.0E-04	2E-04	1E-03	4E-10	5E-09	2E+00	6E-10	8E-09
		Cadmium	3.7E-01	0.001	2.8E-10	1.7E-09	1.3E-05	2E-05	1E-04	2E-12	2E-11			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	3.6E-13	2.1E-12	2.0E-08	2E-05	1E-04	3E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	3.1E+00	0.03	6.9E-08	4.1E-07	3.0E-04	2E-04	1E-03	5E-10	6E-09	2E+00	7E-10	9E-09
		Cadmium	7.8E-01	0.001	5.9E-10	3.5E-09	1.3E-05	5E-05	3E-04	4E-12	5E-11			
Upland	65	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	0.03	2.9E-13	1.8E-12	2.0E-08	1E-05	9E-05	2E-15	3E-14	1E+05	3E-10	3E-09
		Arsenic	4.3E+00	0.03	9.7E-08	5.8E-07	3.0E-04	3E-04	2E-03	7E-10	8E-09	2E+00	1E-09	1E-08
		Cadmium	2.5E+00	0.001	1.9E-09	1.1E-08	1.3E-05	1E-04	9E-04	1E-11	2E-10			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.9E-06	0.03	4.2E-14	2.5E-13	2.0E-08	2E-06	1E-05	3E-16	4E-15	1E+05	4E-11	5E-10
		Arsenic	3.2E+00	0.03	7.2E-08	4.3E-07	3.0E-04	2E-04	1E-03	5E-10	6E-09	2E+00	8E-10	9E-09
		Cadmium	9.2E-01	0.001	6.9E-10	4.1E-09	1.3E-05	6E-05	3E-04	5E-12	6E-11			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	7.9E-05	0.03	1.8E-12	1.1E-11	2.0E-08	9E-05	5E-04	1E-14	2E-13	1E+05	2E-09	2E-08
		Arsenic	1.4E+01	0.03	3.3E-07	2.0E-06	3.0E-04	1E-03	7E-03	2E-09	3E-08	2E+00	3E-09	4E-08
		Cadmium	4.6E+00	0.001	3.5E-09	2.1E-08	1.3E-05	3E-04	2E-03	2E-11	3E-10			
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	7.9E-05	0.03	1.8E-12	1.1E-11	2.0E-08	9E-05	5E-04	1E-14	2E-13	1E+05	2E-09	2E-08
		Arsenic	1.4E+01	0.03	3.3E-07	2.0E-06	3.0E-04	1E-03	7E-03	2E-09	3E-08	2E+00	3E-09	4E-08
		Cadmium	4.6E+00	0.001	3.5E-09	2.1E-08	1.3E-05	3E-04	2E-03	2E-11	3E-10			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.5E-06	0.03	1.0E-13	6.1E-13	2.0E-08	5E-06	3E-05	7E-16	9E-15	1E+05	9E-11	1E-09
		Arsenic	6.0E+00	0.03	1.3E-07	8.0E-07	3.0E-04	4E-04	3E-03	1E-09	1E-08	2E+00	1E-09	2E-08
		Cadmium	1.9E+00	0.001	1.4E-09	8.5E-09	1.3E-05	1E-04	7E-04	1E-11	1E-10			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-06	0.03	1.2E-13	7.4E-13	2.0E-08	6E-06	4E-05	9E-16	1E-14	1E+05	1E-10	1E-09
		Arsenic	5.7E+00	0.03	1.3E-07	7.6E-07	3.0E-04	4E-04	3E-03	9E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	1.5E+00	0.001	1.1E-09	6.6E-09	1.3E-05	9E-05	5E-04	8E-12	9E-11			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	5.3E-13	3.2E-12	2.0E-08	3E-05	2E-04	4E-15	5E-14	1E+05	5E-10	6E-09
		Arsenic	7.0E+00	0.03	1.6E-07	9.4E-07	3.0E-04	5E-04	3E-03	1E-09	1E-08	2E+00	2E-09	2E-08
		Cadmium	2.2E+00	0.001	1.6E-09	9.9E-09	1.3E-05	1E-04	8E-04	1E-11	1E-10			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	7.49E-07	4.49E-06
Cancer	5.35E-09	6.42E-08

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-04	0.03	6.7E-12	4.0E-11	2.0E-08	3E-04	2E-03	5E-14	6E-13	1E+05	6E-09	7E-08
		Arsenic	4.0E+01	0.03	9.0E-07	5.4E-06	3.0E-04	3E-03	2E-02	6E-09	8E-08	2E+00	1E-08	1E-07
		Cadmium	6.4E+00	0.001	4.8E-09	2.9E-08	1.3E-05	4E-04	2E-03	3E-11	4E-10			
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	7.7E-15	4.6E-14	2.0E-08	4E-07	2E-06	6E-17	7E-16	1E+05	7E-12	9E-11
		Arsenic	4.2E+00	0.03	9.4E-08	5.7E-07	3.0E-04	3E-04	2E-03	7E-10	8E-09	2E+00	1E-09	1E-08
		Cadmium	1.4E-01	0.001	1.1E-10	6.5E-10	1.3E-05	9E-06	5E-05	8E-13	9E-12			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	4.4E-14	2.7E-13	2.0E-08	2E-06	1E-05	3E-16	4E-15	1E+05	4E-11	5E-10
		Arsenic	2.8E+00	0.03	6.3E-08	3.8E-07	3.0E-04	2E-04	1E-03	5E-10	5E-09	2E+00	7E-10	8E-09
		Cadmium	1.2E-01	0.001	8.8E-11	5.3E-10	1.3E-05	7E-06	4E-05	6E-13	8E-12			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	4.4E-14	2.7E-13	2.0E-08	2E-06	1E-05	3E-16	4E-15	1E+05	4E-11	5E-10
		Arsenic	2.8E+00	0.03	6.3E-08	3.8E-07	3.0E-04	2E-04	1E-03	5E-10	5E-09	2E+00	7E-10	8E-09
		Cadmium	1.2E-01	0.001	8.8E-11	5.3E-10	1.3E-05	7E-06	4E-05	6E-13	8E-12			
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	7.7E-15	4.6E-14	2.0E-08	4E-07	2E-06	6E-17	7E-16	1E+05	7E-12	9E-11
		Arsenic	4.2E+00	0.03	9.4E-08	5.7E-07	3.0E-04	3E-04	2E-03	7E-10	8E-09	2E+00	1E-09	1E-08
		Cadmium	1.4E-01	0.001	1.1E-10	6.5E-10	1.3E-05	9E-06	5E-05	8E-13	9E-12			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	4.4E-14	2.7E-13	2.0E-08	2E-06	1E-05	3E-16	4E-15	1E+05	4E-11	5E-10
		Arsenic	2.8E+00	0.03	6.3E-08	3.8E-07	3.0E-04	2E-04	1E-03	5E-10	5E-09	2E+00	7E-10	8E-09
		Cadmium	1.2E-01	0.001	8.8E-11	5.3E-10	1.3E-05	7E-06	4E-05	6E-13	8E-12			
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	4.4E-14	2.7E-13	2.0E-08	2E-06	1E-05	3E-16	4E-15	1E+05	4E-11	5E-10
		Arsenic	2.8E+00	0.03	6.3E-08	3.8E-07	3.0E-04	2E-04	1E-03	5E-10	5E-09	2E+00	7E-10	8E-09
		Cadmium	1.2E-01	0.001	8.8E-11	5.3E-10	1.3E-05	7E-06	4E-05	6E-13	8E-12			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	0.03	1.3E-14	8.0E-14	2.0E-08	7E-07	4E-06	1E-16	1E-15	1E+05	1E-11	1E-10
		Arsenic	4.4E+00	0.03	9.9E-08	6.0E-07	3.0E-04	3E-04	2E-03	7E-10	9E-09	2E+00	1E-09	1E-08
		Cadmium	3.1E-01	0.001	2.3E-10	1.4E-09	1.3E-05	2E-05	1E-04	2E-12	2E-11			
Floodplain	85	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	0.03	9.0E-15	5.4E-14	2.0E-08	5E-07	3E-06	6E-17	8E-16	1E+05	8E-12	1E-10
		Arsenic	1.9E+00	0.03	4.3E-08	2.6E-07	3.0E-04	1E-04	9E-04	3E-10	4E-09	2E+00	5E-10	5E-09
		Cadmium	1.6E-02	0.001	1.2E-11	7.2E-11	1.3E-05	1E-06	6E-06	9E-14	1E-12			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	3.6E-13	2.2E-12	2.0E-08	2E-05	1E-04	3E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	4.0E+00	0.03	9.0E-08	5.4E-07	3.0E-04	3E-04	2E-03	6E-10	8E-09	2E+00	1E-09	1E-08
		Cadmium	4.7E-01	0.001	3.5E-10	2.1E-09	1.3E-05	3E-05	2E-04	3E-12	3E-11			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	0.03	1.3E-13	7.8E-13	2.0E-08	6E-06	4E-05	9E-16	1E-14	1E+05	1E-10	1E-09
		Arsenic	4.0E+00	0.03	9.0E-08	5.4E-07	3.0E-04	3E-04	2E-03	6E-10	8E-09	2E+00	1E-09	1E-08
		Cadmium	6.7E-01	0.001	5.0E-10	3.0E-09	1.3E-05	4E-05	2E-04	4E-12	4E-11			
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	0.03	1.3E-12	7.5E-12	2.0E-08	6E-05	4E-04	9E-15	1E-13	1E+05	1E-09	1E-08
		Arsenic	5.5E+00	0.03	1.2E-07	7.4E-07	3.0E-04	4E-04	2E-03	9E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	1.8E+00	0.001	1.3E-09	8.1E-09	1.3E-05	1E-04	6E-04	1E-11	1E-10			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.3E-06	0.03	2.1E-13	1.3E-12	2.0E-08	1E-05	6E-05	1E-15	2E-14	1E+05	2E-10	2E-09
		Arsenic	4.7E+00	0.03	1.0E-07	6.3E-07	3.0E-04	3E-04	2E-03	7E-10	9E-09	2E+00	1E-09	1E-08
		Cadmium	5.3E-01	0.001	4.0E-10	2.4E-09	1.3E-05	3E-05	2E-04	3E-12	3E-11			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	1.2E-12	7.5E-12	2.0E-08	6E-05	4E-04	9E-15	1E-13	1E+05	1E-09	1E-08
		Arsenic	1.0E+01	0.03	2.2E-07	1.3E-06	3.0E-04	7E-04	4E-03	2E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	2.8E+00	0.001	2.1E-09	1.3E-08	1.3E-05	2E-04	1E-03	1E-11	2E-10			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	5.1E-13	3.0E-12	2.0E-08	3E-05	2E-04	4E-15	4E-14	1E+05	5E-10	6E-09
		Arsenic	6.3E+00	0.03	1.4E-07	8.5E-07	3.0E-04	5E-04	3E-03	1E-09	1E-08	2E+00	2E-09	2E-08
		Cadmium	1.7E+00	0.001	1.3E-09	7.6E-09	1.3E-05	1E-04	6E-04	9E-12	1E-10			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	0.03	1.0E-12	6.2E-12	2.0E-08	5E-05	3E-04	7E-15	9E-14	1E+05	1E-09	1E-08
		Arsenic	7.8E+00	0.03	1.8E-07	1.1E-06	3.0E-04	6E-04	4E-03	1E-09	2E-08	2E+00	2E-09	2E-08
		Cadmium	2.1E+00	0.001	1.6E-09	9.5E-09	1.3E-05	1E-04	8E-04	1E-11	1E-10			
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	0.03	4.9E-13	2.9E-12	2.0E-08	2E-05	1E-04	3E-15	4E-14	1E+05	5E-10	5E-09
		Arsenic	3.9E+00	0.03	8.7E-08	5.2E-07	3.0E-04	3E-04	2E-03	6E-10	7E-09	2E+00	9E-10	1E-08
		Cadmium	1.1E+00	0.001	8.3E-10	5.0E-09	1.3E-05	7E-05	4E-04	6E-12	7E-11			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	0.03	4.7E-13	2.8E-12	2.0E-08	2E-05	1E-04	3E-15	4E-14	1E+05	4E-10	5E-09
		Arsenic	5.6E+00	0.03	1.3E-07	7.5E-07	3.0E-04	4E-04	3E-03	9E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	1.2E+00	0.001	9.3E-10	5.6E-09	1.3E-05	7E-05	4E-04	7E-12	8E-11			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	0.03	5.4E-14	3.2E-13	2.0E-08	3E-06	2E-05	4E-16	5E-15	1E+05	5E-11	6E-10
		Arsenic	2.0E+00	0.03	4.5E-08	2.7E-07	3.0E-04	2E-04	9E-04	3E-10	4E-09	2E+00	5E-10	6E-09
		Cadmium	2.2E-01	0.001	1.7E-10	9.9E-10	1.3E-05	1E-05	8E-05	1E-12	1E-11			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.2E-05	0.03	2.8E-13	1.7E-12	2.0E-08	1E-05	8E-05	2E-15	2E-14	1E+05	3E-10	3E-09
		Arsenic	4.2E+00	0.03	9.5E-08	5.7E-07	3.0E-04	3E-04	2E-03	7E-10	8E-09	2E+00	1E-09	1E-08
		Cadmium	1.0E+00	0.001	7.7E-10	4.6E-09	1.3E-05	6E-05	4E-04	5E-12	7E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC	Air EPC	Non-Cancer					Cancer				
					EC (mg/m^3)		RfC	HQ		EC ($\mu g/m^3$)		UR	Risk	
			mg/kg	mg/m^3	CTE	RME	mg/m^3	CTE	RME	CTE	RME	$(\mu g/m^3)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	7.1E-15	4.0E-16	8.1E-16	4.0E-08	1E-08	2E-08	3E-15	1E-17	4E+01	1E-13	4E-16
		Aluminum	1.6E+04	3.7E-05	2.1E-06	4.2E-06	5.0E-03	4E-04	8E-04	1E-05	6E-08			
		Antimony	1.3E+00	2.9E-09	1.6E-10	3.3E-10	1.0E-03	2E-07	3E-07	1E-09	5E-12			
		Arsenic	7.9E+00	1.8E-08	1.0E-09	2.0E-09	1.5E-05	7E-05	1E-04	7E-09	3E-11	4E-03	3E-11	1E-13
		Barium	8.7E+02	2.0E-06	1.1E-07	2.3E-07	5.0E-03	2E-05	5E-05	8E-07	3E-09			
		Cadmium	5.9E-01	1.3E-09	7.5E-11	1.5E-10	1.0E-05	8E-06	2E-05	5E-10	2E-12	2E-03	1E-12	4E-15
		Chromium	1.8E+01	4.0E-08	2.3E-09	4.5E-09	3.0E-04	8E-06	2E-05	2E-08	6E-11	8E-02	1E-09	5E-12
		Cobalt	4.9E+00	1.1E-08	6.2E-10	1.2E-09	2.0E-05	3E-05	6E-05	4E-09	2E-11	9E-03	4E-11	2E-13
		Manganese	4.2E+02	9.5E-07	5.4E-08	1.1E-07	5.0E-05	1E-03	2E-03	4E-07	2E-09			
		Mercury	1.2E-01	2.7E-10	1.5E-11	3.0E-11	3.0E-04	5E-08	1E-07	1E-10	4E-13			
		Vanadium	3.5E+01	8.0E-08	4.6E-09	9.1E-09	1.0E-04	5E-05	9E-05	3E-08	1E-10			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	5.7E-15	3.2E-16	6.5E-16	4.0E-08	8E-09	2E-08	2E-15	9E-18	4E+01	9E-14	4E-16
		Aluminum	6.7E+03	1.5E-05	8.7E-07	1.7E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	9.0E-02	2.0E-10	1.2E-11	2.3E-11	1.0E-03	1E-08	2E-08	8E-11	3E-13			
		Arsenic	1.0E+00	2.3E-09	1.3E-10	2.6E-10	1.5E-05	9E-06	2E-05	9E-10	4E-12	4E-03	4E-12	2E-14
		Barium	2.0E+02	4.5E-07	2.6E-08	5.1E-08	5.0E-03	5E-06	1E-05	2E-07	7E-10			
		Cadmium	6.4E-02	1.5E-10	8.2E-12	1.6E-11	1.0E-05	8E-07	2E-06	6E-11	2E-13	2E-03	1E-13	4E-16
		Chromium	8.7E+00	2.0E-08	1.1E-09	2.2E-09	3.0E-04	4E-06	7E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	2.6E+00	5.9E-09	3.3E-10	6.7E-10	2.0E-05	2E-05	3E-05	2E-09	1E-11	9E-03	2E-11	9E-14
		Manganese	1.1E+02	2.5E-07	1.4E-08	2.8E-08	5.0E-05	3E-04	6E-04	1E-07	4E-10			
		Mercury	1.2E-02	2.7E-11	1.5E-12	3.1E-12	3.0E-04	5E-09	1E-08	1E-11	4E-14			
		Vanadium	9.4E+00	2.1E-08	1.2E-09	2.4E-09	1.0E-04	1E-05	2E-05	9E-09	3E-11			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	1.5E-15	8.4E-17	1.7E-16	4.0E-08	2E-09	4E-09	6E-16	2E-18	4E+01	2E-14	9E-17
		Aluminum	6.4E+03	1.4E-05	8.2E-07	1.6E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	9.0E-02	2.0E-10	1.2E-11	2.3E-11	1.0E-03	1E-08	2E-08	8E-11	3E-13			
		Arsenic	9.5E-01	2.2E-09	1.2E-10	2.4E-10	1.5E-05	8E-06	2E-05	9E-10	3E-12	4E-03	4E-12	2E-14
		Barium	2.0E+02	4.5E-07	2.6E-08	5.1E-08	5.0E-03	5E-06	1E-05	2E-07	7E-10			
		Cadmium	7.3E-02	1.7E-10	9.4E-12	1.9E-11	1.0E-05	9E-07	2E-06	7E-11	3E-13	2E-03	1E-13	5E-16
		Chromium	7.2E+00	1.6E-08	9.3E-10	1.9E-09	3.0E-04	3E-06	6E-06	7E-09	3E-11	8E-02	6E-10	2E-12
		Cobalt	2.4E+00	5.5E-09	3.1E-10	6.2E-10	2.0E-05	2E-05	3E-05	2E-09	9E-12	9E-03	2E-11	8E-14
		Manganese	8.4E+01	1.9E-07	1.1E-08	2.2E-08	5.0E-05	2E-04	4E-04	8E-08	3E-10			
		Mercury	1.6E-02	3.6E-11	2.1E-12	4.1E-12	3.0E-04	7E-09	1E-08	1E-11	6E-14			
		Vanadium	8.7E+00	2.0E-08	1.1E-09	2.2E-09	1.0E-04	1E-05	2E-05	8E-09	3E-11			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	6.5E-15	3.7E-16	7.3E-16	4.0E-08	9E-09	2E-08	3E-15	1E-17	4E+01	1E-13	4E-16
		Aluminum	7.8E+03	1.8E-05	1.0E-06	2.0E-06	5.0E-03	2E-04	4E-04	7E-06	3E-08			
		Antimony	1.9E-01	4.2E-10	2.4E-11	4.8E-11	1.0E-03	2E-08	5E-08	2E-10	7E-13			
		Arsenic	1.7E+00	3.9E-09	2.2E-10	4.5E-10	1.5E-05	1E-05	3E-05	2E-09	6E-12	4E-03	7E-12	3E-14
		Barium	1.9E+02	4.4E-07	2.5E-08	5.0E-08	5.0E-03	5E-06	1E-05	2E-07	7E-10			
		Cadmium	1.4E-01	3.1E-10	1.8E-11	3.5E-11	1.0E-05	2E-06	4E-06	1E-10	5E-13	2E-03	2E-13	9E-16
		Chromium	1.1E+01	2.5E-08	1.4E-09	2.8E-09	3.0E-04	5E-06	9E-06	1E-08	4E-11	8E-02	8E-10	3E-12
		Cobalt	3.2E+00	7.3E-09	4.1E-10	8.3E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.6E+02	3.6E-07	2.0E-08	4.0E-08	5.0E-05	4E-04	8E-04	1E-07	6E-10			
		Mercury	3.2E-02	7.4E-11	4.2E-12	8.3E-12	3.0E-04	1E-08	3E-08	3E-11	1E-13			
		Vanadium	1.9E+01	4.3E-08	2.4E-09	4.8E-09	1.0E-04	2E-05	5E-05	2E-08	7E-11			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	3.9E-15	2.2E-16	4.4E-16	4.0E-08	5E-09	1E-08	2E-15	6E-18	4E+01	6E-14	2E-16
		Aluminum	8.2E+03	1.9E-05	1.1E-06	2.1E-06	5.0E-03	2E-04	4E-04	8E-06	3E-08			
		Antimony	2.0E-01	4.5E-10	2.6E-11	5.1E-11	1.0E-03	3E-08	5E-08	2E-10	7E-13			
		Arsenic	1.2E+00	2.7E-09	1.5E-10	3.1E-10	1.5E-05	1E-05	2E-05	1E-09	4E-12	4E-03	5E-12	2E-14
		Barium	3.6E+02	8.1E-07	4.6E-08	9.2E-08	5.0E-03	9E-06	2E-05	3E-07	1E-09			
		Cadmium	1.3E-01	3.0E-10	1.7E-11	3.3E-11	1.0E-05	2E-06	3E-06	1E-10	5E-13	2E-03	2E-13	9E-16
		Chromium	1.0E+01	2.3E-08	1.3E-09	2.6E-09	3.0E-04	4E-06	9E-06	9E-09	4E-11	8E-02	8E-10	3E-12
		Cobalt	2.6E+00	5.9E-09	3.3E-10	6.7E-10	2.0E-05	2E-05	3E-05	2E-09	1E-11	9E-03	2E-11	9E-14
		Manganese	1.1E+02	2.5E-07	1.4E-08	2.8E-08	5.0E-05	3E-04	6E-04	1E-07	4E-10			
		Mercury	2.4E-02	5.5E-11	3.1E-12	6.2E-12	3.0E-04	1E-08	2E-08	2E-11	9E-14			
		Vanadium	1.2E+01	2.7E-08	1.5E-09	3.0E-09	1.0E-04	2E-05	3E-05	1E-08	4E-11			
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	6.9E-07	1.6E-15	8.8E-17	1.8E-16	4.0E-08	2E-09	4E-09	6E-16	3E-18	4E+01	2E-14	1E-16
		Aluminum	6.0E+03	1.4E-05	7.7E-07	1.5E-06	5.0E-03	2E-04	3E-04	5E-06	2E-08			
		Antimony	4.2E-02	9.5E-11	5.4E-12	1.1E-11	1.0E-03	5E-09	1E-08	4E-11	2E-13			
		Arsenic	1.7E+00	4.0E-09	2.2E-10	4.5E-10	1.5E-05	1E-05	3E-05	2E-09	6E-12	4E-03	7E-12	3E-14
		Barium	7.5E+01	1.7E-07	9.6E-09	1.9E-08	5.0E-03	2E-06	4E-06	7E-08	3E-10			
		Cadmium	4.1E-02	9.3E-11	5.2E-12	1.0E-11	1.0E-05	5E-07	1E-06	4E-11	1E-13	2E-03	7E-14	3E-16
		Chromium	9.2E+00	2.1E-08	1.2E-09	2.4E-09	3.0E-04	4E-06	8E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	2.6E+00	6.0E-09	3.4E-10	6.8E-10	2.0E-05	2E-05	3E-05	2E-09	1E-11	9E-03	2E-11	9E-14
		Manganese	1.1E+02	2.5E-07	1.4E-08	2.9E-08	5.0E-05	3E-04	6E-04	1E-07	4E-10			
		Mercury	3.4E-03	7.8E-12	4.4E-13	8.8E-13	3.0E-04	1E-09	3E-09	3E-12	1E-14			
		Vanadium	8.5E+00	1.9E-08	1.1E-09	2.2E-09	1.0E-04	1E-05	2E-05	8E-09	3E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC mg/kg	Air EPC mg/m^3	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	HQ CTE	HQ RME	Cancer EC ($\mu g/m^3$) CTE	Cancer EC ($\mu g/m^3$) RME	UR $(\mu g/m^3)^{-1}$	Risk CTE	Risk RME
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	1.2E-15	6.8E-17	1.4E-16	4.0E-08	2E-09	3E-09	5E-16	2E-18	4E+01	2E-14	7E-17
		Aluminum	4.8E+03	1.1E-05	6.2E-07	1.2E-06	5.0E-03	1E-04	2E-04	4E-06	2E-08			
		Antimony	1.5E-01	3.4E-10	1.9E-11	3.9E-11	1.0E-03	2E-08	4E-08	1E-10	6E-13			
		Arsenic	1.1E+00	2.5E-09	1.4E-10	2.8E-10	1.5E-05	9E-06	2E-05	1E-09	4E-12	4E-03	4E-12	2E-14
		Barium	1.2E+02	2.8E-07	1.6E-08	3.1E-08	5.0E-03	3E-06	6E-06	1E-07	4E-10			
		Cadmium	4.6E-02	1.0E-10	5.9E-12	1.2E-11	1.0E-05	6E-07	1E-06	4E-11	2E-13	2E-03	8E-14	3E-16
		Chromium	6.3E+00	1.4E-08	8.1E-10	1.6E-09	3.0E-04	3E-06	5E-06	6E-09	2E-11	8E-02	5E-10	2E-12
		Cobalt	2.2E+00	5.0E-09	2.8E-10	5.7E-10	2.0E-05	1E-05	3E-05	2E-09	8E-12	9E-03	2E-11	7E-14
		Manganese	9.1E+01	2.1E-07	1.2E-08	2.3E-08	5.0E-05	2E-04	5E-04	8E-08	3E-10			
		Mercury	3.1E-03	7.0E-12	4.0E-13	8.0E-13	3.0E-04	1E-09	3E-09	3E-12	1E-14			
		Vanadium	8.3E+00	1.9E-08	1.1E-09	2.1E-09	1.0E-04	1E-05	2E-05	8E-09	3E-11			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	9.9E-07	2.3E-15	1.3E-16	2.6E-16	4.0E-08	3E-09	6E-09	9E-16	4E-18	4E+01	3E-14	1E-16
		Aluminum	8.7E+03	2.0E-05	1.1E-06	2.2E-06	5.0E-03	2E-04	4E-04	8E-06	3E-08			
		Antimony	9.1E-02	2.1E-10	1.2E-11	2.3E-11	1.0E-03	1E-08	2E-08	8E-11	3E-13			
		Arsenic	4.0E+00	9.1E-09	5.1E-10	1.0E-09	1.5E-05	3E-05	7E-05	4E-09	1E-11	4E-03	2E-11	6E-14
		Barium	2.2E+02	5.0E-07	2.9E-08	5.7E-08	5.0E-03	6E-06	1E-05	2E-07	8E-10			
		Cadmium	1.3E-01	2.9E-10	1.6E-11	3.3E-11	1.0E-05	2E-06	3E-06	1E-10	5E-13	2E-03	2E-13	8E-16
		Chromium	1.1E+01	2.4E-08	1.4E-09	2.7E-09	3.0E-04	5E-06	9E-06	1E-08	4E-11	8E-02	8E-10	3E-12
		Cobalt	4.2E+00	9.5E-09	5.4E-10	1.1E-09	2.0E-05	3E-05	5E-05	4E-09	2E-11	9E-03	3E-11	1E-13
		Manganese	3.8E+02	8.7E-07	4.9E-08	9.8E-08	5.0E-05	1E-03	2E-03	4E-07	1E-09			
		Mercury	1.7E-02	3.8E-11	2.2E-12	4.3E-12	3.0E-04	7E-09	1E-08	2E-11	6E-14			
		Vanadium	1.6E+01	3.7E-08	2.1E-09	4.2E-09	1.0E-04	2E-05	4E-05	2E-08	6E-11			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	1.9E-15	1.1E-16	2.1E-16	4.0E-08	3E-09	5E-09	8E-16	3E-18	4E+01	3E-14	1E-16
		Aluminum	7.2E+03	1.6E-05	9.2E-07	1.8E-06	5.0E-03	2E-04	4E-04	7E-06	3E-08			
		Antimony	8.5E-02	1.9E-10	1.1E-11	2.2E-11	1.0E-03	1E-08	2E-08	8E-11	3E-13			
		Arsenic	1.6E+00	3.6E-09	2.1E-10	4.1E-10	1.5E-05	1E-05	3E-05	1E-09	6E-12	4E-03	6E-12	3E-14
		Barium	2.0E+02	4.5E-07	2.6E-08	5.1E-08	5.0E-03	5E-06	1E-05	2E-07	7E-10			
		Cadmium	9.3E-02	2.1E-10	1.2E-11	2.4E-11	1.0E-05	1E-06	2E-06	9E-11	3E-13	2E-03	2E-13	6E-16
		Chromium	8.2E+00	1.9E-08	1.1E-09	2.1E-09	3.0E-04	4E-06	7E-06	8E-09	3E-11	8E-02	6E-10	3E-12
		Cobalt	3.2E+00	7.3E-09	4.1E-10	8.2E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.6E+02	3.6E-07	2.0E-08	4.0E-08	5.0E-05	4E-04	8E-04	1E-07	6E-10			
		Mercury	1.3E-02	3.0E-11	1.7E-12	3.3E-12	3.0E-04	6E-09	1E-08	1E-11	5E-14			
		Vanadium	1.1E+01	2.4E-08	1.4E-09	2.8E-09	1.0E-04	1E-05	3E-05	1E-08	4E-11			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	1.7E-15	9.3E-17	1.9E-16	4.0E-08	2E-09	5E-09	7E-16	3E-18	4E+01	3E-14	1E-16
		Aluminum	9.5E+03	2.2E-05	1.2E-06	2.5E-06	5.0E-03	2E-04	5E-04	9E-06	4E-08			
		Antimony	2.3E-01	5.2E-10	3.0E-11	5.9E-11	1.0E-03	3E-08	6E-08	2E-10	8E-13			
		Arsenic	2.1E+00	4.8E-09	2.7E-10	5.4E-10	1.5E-05	2E-05	4E-05	2E-09	8E-12	4E-03	8E-12	3E-14
		Barium	2.3E+02	5.2E-07	2.9E-08	5.8E-08	5.0E-03	6E-06	1E-05	2E-07	8E-10			
		Cadmium	1.9E-01	4.3E-10	2.4E-11	4.9E-11	1.0E-05	2E-06	5E-06	2E-10	7E-13	2E-03	3E-13	1E-15
		Chromium	8.9E+00	2.0E-08	1.1E-09	2.3E-09	3.0E-04	4E-06	8E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	4.5E+00	1.0E-08	5.8E-10	1.2E-09	2.0E-05	3E-05	6E-05	4E-09	2E-11	9E-03	4E-11	1E-13
		Manganese	4.9E+02	1.1E-06	6.3E-08	1.3E-07	5.0E-05	1E-03	3E-03	4E-07	2E-09			
		Mercury	1.8E-02	4.1E-11	2.3E-12	4.6E-12	3.0E-04	8E-09	2E-08	2E-11	7E-14			
		Vanadium	1.2E+01	2.6E-08	1.5E-09	3.0E-09	1.0E-04	1E-05	3E-05	1E-08	4E-11			
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	2.1E-14	1.2E-15	2.4E-15	4.0E-08	3E-08	6E-08	8E-15	3E-17	4E+01	3E-13	1E-15
		Aluminum	1.3E+04	2.8E-05	1.6E-06	3.2E-06	5.0E-03	3E-04	6E-04	1E-05	5E-08			
		Antimony	8.0E-01	1.8E-09	1.0E-10	2.1E-10	1.0E-03	1E-07	2E-07	7E-10	3E-12			
		Arsenic	5.1E+00	1.2E-08	6.6E-10	1.3E-09	1.5E-05	4E-05	9E-05	5E-09	2E-11	4E-03	2E-11	8E-14
		Barium	4.9E+02	1.1E-06	6.3E-08	1.3E-07	5.0E-03	1E-05	3E-05	5E-07	2E-09			
		Cadmium	8.5E-01	1.9E-09	1.1E-10	2.2E-10	1.0E-05	1E-05	2E-05	8E-10	3E-12	2E-03	1E-12	6E-15
		Chromium	1.8E+01	4.0E-08	2.3E-09	4.5E-09	3.0E-04	8E-06	2E-05	2E-08	6E-11	8E-02	1E-09	5E-12
		Cobalt	4.9E+00	1.1E-08	6.3E-10	1.3E-09	2.0E-05	3E-05	6E-05	5E-09	2E-11	9E-03	4E-11	2E-13
		Manganese	4.1E+02	9.3E-07	5.2E-08	1.0E-07	5.0E-05	1E-03	2E-03	4E-07	1E-09			
		Mercury	2.7E-01	6.1E-10	3.5E-11	6.9E-11	3.0E-04	1E-07	2E-07	2E-10	1E-12			
		Vanadium	3.1E+01	7.0E-08	4.0E-09	8.0E-09	1.0E-04	4E-05	8E-05	3E-08	1E-10			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	3.5E-15	2.0E-16	3.9E-16	4.0E-08	5E-09	1E-08	1E-15	6E-18	4E+01	5E-14	2E-16
		Aluminum	7.9E+03	1.8E-05	1.0E-06	2.0E-06	5.0E-03	2E-04	4E-04	7E-06	3E-08			
		Antimony	3.3E-01	7.5E-10	4.2E-11	8.5E-11	1.0E-03	4E-08	8E-08	3E-10	1E-12			
		Arsenic	2.5E+00	5.7E-09	3.2E-10	6.5E-10	1.5E-05	2E-05	4E-05	2E-09	9E-12	4E-03	1E-11	4E-14
		Barium	2.0E+02	4.6E-07	2.6E-08	5.2E-08	5.0E-03	5E-06	1E-05	2E-07	7E-10			
		Cadmium	2.6E-01	5.8E-10	3.3E-11	6.6E-11	1.0E-05	3E-06	7E-06	2E-10	9E-13	2E-03	4E-13	2E-15
		Chromium	1.0E+01	2.3E-08	1.3E-09	2.6E-09	3.0E-04	4E-06	9E-06	9E-09	4E-11	8E-02	8E-10	3E-12
		Cobalt	3.5E+00	8.0E-09	4.5E-10	9.0E-10	2.0E-05	2E-05	5E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	2.6E+02	6.0E-07	3.4E-08	6.8E-08	5.0E-05	7E-04	1E-03	2E-07	1E-09			
		Mercury	4.0E-02	9.1E-11	5.1E-12	1.0E-11	3.0E-04	2E-08	3E-08	4E-11	1E-13			
		Vanadium	1.1E+01	2.6E-08	1.5E-09	3.0E-09	1.0E-04	1E-05	3E-05	1E-08	4E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC mg/kg	Air EPC mg/m^3	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	HQ CTE	HQ RME	Cancer EC ($\mu g/m^3$) CTE	Cancer EC ($\mu g/m^3$) RME	UR $(\mu g/m^3)^{-1}$	Risk CTE	Risk RME
Upland	38	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	4.8E-15	2.7E-16	5.4E-16	4.0E-08	7E-09	1E-08	2E-15	8E-18	4E+01	7E-14	3E-16
		Aluminum	2.7E+03	6.1E-06	3.5E-07	6.9E-07	5.0E-03	7E-05	1E-04	2E-06	1E-08			
		Antimony	8.5E-02	1.9E-10	1.1E-11	2.2E-11	1.0E-03	1E-08	2E-08	8E-11	3E-13			
		Arsenic	1.0E+00	2.3E-09	1.3E-10	2.6E-10	1.5E-05	9E-06	2E-05	9E-10	4E-12	4E-03	4E-12	2E-14
		Barium	4.4E+01	1.0E-07	5.7E-09	1.1E-08	5.0E-03	1E-06	2E-06	4E-08	2E-10			
		Cadmium	1.6E-02	3.6E-11	2.1E-12	4.1E-12	1.0E-05	2E-07	4E-07	1E-11	6E-14	2E-03	3E-14	1E-16
		Chromium	3.8E+00	8.6E-09	4.9E-10	9.8E-10	3.0E-04	2E-06	3E-06	3E-09	1E-11	8E-02	3E-10	1E-12
		Cobalt	1.5E+00	3.4E-09	1.9E-10	3.9E-10	2.0E-05	1E-05	2E-05	1E-09	6E-12	9E-03	1E-11	5E-14
		Manganese	3.9E+01	8.8E-08	5.0E-09	9.9E-09	5.0E-05	1E-04	2E-04	4E-08	1E-10			
		Mercury	4.6E-03	1.0E-11	5.9E-13	1.2E-12	3.0E-04	2E-09	4E-09	4E-12	2E-14			
		Vanadium	5.3E+00	1.2E-08	6.8E-10	1.4E-09	1.0E-04	7E-06	1E-05	5E-09	2E-11			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.7E-06	6.1E-15	3.5E-16	6.9E-16	4.0E-08	9E-09	2E-08	2E-15	1E-17	4E+01	9E-14	4E-16
		Aluminum	9.5E+03	2.2E-05	1.2E-06	2.4E-06	5.0E-03	2E-04	5E-04	9E-06	3E-08			
		Antimony	4.1E-01	9.3E-10	5.3E-11	1.1E-10	1.0E-03	5E-08	1E-07	4E-10	2E-12			
		Arsenic	2.1E+00	4.9E-09	2.7E-10	5.5E-10	1.5E-05	2E-05	4E-05	2E-09	8E-12	4E-03	8E-12	3E-14
		Barium	4.1E+02	9.3E-07	5.3E-08	1.1E-07	5.0E-03	1E-05	2E-05	4E-07	2E-09			
		Cadmium	3.2E-01	7.3E-10	4.1E-11	8.2E-11	1.0E-05	4E-06	8E-06	3E-10	1E-12	2E-03	5E-13	2E-15
		Chromium	1.2E+01	2.7E-08	1.5E-09	3.0E-09	3.0E-04	5E-06	1E-05	1E-08	4E-11	8E-02	9E-10	4E-12
		Cobalt	3.2E+00	7.3E-09	4.1E-10	8.2E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.3E+02	3.0E-07	1.7E-08	3.3E-08	5.0E-05	3E-04	7E-04	1E-07	5E-10			
		Mercury	7.1E-02	1.6E-10	9.2E-12	1.8E-11	3.0E-04	3E-08	6E-08	7E-11	3E-13			
		Vanadium	1.8E+01	4.0E-08	2.3E-09	4.5E-09	1.0E-04	2E-05	5E-05	2E-08	6E-11			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	8.1E-15	4.6E-16	9.1E-16	4.0E-08	1E-08	2E-08	3E-15	1E-17	4E+01	1E-13	5E-16
		Aluminum	6.0E+03	1.4E-05	7.7E-07	1.5E-06	5.0E-03	2E-04	3E-04	5E-06	2E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	1.4E+00	3.2E-09	1.8E-10	3.6E-10	1.5E-05	1E-05	2E-05	1E-09	5E-12	4E-03	6E-12	2E-14
		Barium	2.1E+02	4.7E-07	2.6E-08	5.3E-08	5.0E-03	5E-06	1E-05	2E-07	8E-10			
		Cadmium	2.8E-01	6.4E-10	3.6E-11	7.2E-11	1.0E-05	4E-06	7E-06	3E-10	1E-12	2E-03	5E-13	2E-15
		Chromium	1.1E+01	2.5E-08	1.4E-09	2.9E-09	3.0E-04	5E-06	1E-05	1E-08	4E-11	8E-02	9E-10	3E-12
		Cobalt	2.2E+00	5.0E-09	2.8E-10	5.7E-10	2.0E-05	1E-05	3E-05	2E-09	8E-12	9E-03	2E-11	7E-14
		Manganese	9.2E+01	2.1E-07	1.2E-08	2.4E-08	5.0E-05	2E-04	5E-04	8E-08	3E-10			
		Mercury	4.0E-02	9.1E-11	5.1E-12	1.0E-11	3.0E-04	2E-08	3E-08	4E-11	1E-13			
		Vanadium	7.6E+00	1.7E-08	9.8E-10	2.0E-09	1.0E-04	1E-05	2E-05	7E-09	3E-11			
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-06	7.8E-15	4.4E-16	8.8E-16	4.0E-08	1E-08	2E-08	3E-15	1E-17	4E+01	1E-13	5E-16
		Aluminum	5.2E+03	1.2E-05	6.7E-07	1.3E-06	5.0E-03	1E-04	3E-04	5E-06	2E-08			
		Antimony	4.2E-02	9.5E-11	5.4E-12	1.1E-11	1.0E-03	5E-09	1E-08	4E-11	2E-13			
		Arsenic	1.3E+00	2.9E-09	1.6E-10	3.3E-10	1.5E-05	1E-05	2E-05	1E-09	5E-12	4E-03	5E-12	2E-14
		Barium	2.7E+02	6.1E-07	3.4E-08	6.9E-08	5.0E-03	7E-06	1E-05	2E-07	1E-09			
		Cadmium	2.4E-01	5.4E-10	3.0E-11	6.1E-11	1.0E-05	3E-06	6E-06	2E-10	9E-13	2E-03	4E-13	2E-15
		Chromium	7.5E+00	1.7E-08	9.6E-10	1.9E-09	3.0E-04	3E-06	6E-06	7E-09	3E-11	8E-02	6E-10	2E-12
		Cobalt	1.5E+00	3.5E-09	2.0E-10	4.0E-10	2.0E-05	1E-05	2E-05	1E-09	6E-12	9E-03	1E-11	5E-14
		Manganese	1.1E+02	2.5E-07	1.4E-08	2.9E-08	5.0E-05	3E-04	6E-04	1E-07	4E-10			
		Mercury	4.8E-02	1.1E-10	6.2E-12	1.2E-11	3.0E-04	2E-08	4E-08	4E-11	2E-13			
		Vanadium	4.9E+00	1.1E-08	6.3E-10	1.3E-09	1.0E-04	6E-06	1E-05	5E-09	2E-11			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	1.7E-14	9.6E-16	1.9E-15	4.0E-08	2E-08	5E-08	7E-15	3E-17	4E+01	3E-13	1E-15
		Aluminum	1.3E+04	2.9E-05	1.7E-06	3.3E-06	5.0E-03	3E-04	7E-04	1E-05	5E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	3.1E+00	7.0E-09	4.0E-10	8.0E-10	1.5E-05	3E-05	5E-05	3E-09	1E-11	4E-03	1E-11	5E-14
		Barium	3.0E+02	6.8E-07	3.8E-08	7.7E-08	5.0E-03	8E-06	2E-05	3E-07	1E-09			
		Cadmium	3.2E-01	7.3E-10	4.1E-11	8.2E-11	1.0E-05	4E-06	8E-06	3E-10	1E-12	2E-03	5E-13	2E-15
		Chromium	2.1E+01	4.7E-08	2.7E-09	5.3E-09	3.0E-04	9E-06	2E-05	2E-08	8E-11	8E-02	2E-09	6E-12
		Cobalt	4.9E+00	1.1E-08	6.3E-10	1.3E-09	2.0E-05	3E-05	6E-05	5E-09	2E-11	9E-03	4E-11	2E-13
		Manganese	3.0E+02	6.7E-07	3.8E-08	7.6E-08	5.0E-05	8E-04	2E-03	3E-07	1E-09			
		Mercury	1.6E-01	3.6E-10	2.1E-11	4.1E-11	3.0E-04	7E-08	1E-07	1E-10	6E-13			
		Vanadium	1.8E+01	4.1E-08	2.3E-09	4.7E-09	1.0E-04	2E-05	5E-05	2E-08	7E-11			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	8.9E-15	5.0E-16	1.0E-15	4.0E-08	1E-08	3E-08	4E-15	1E-17	4E+01	1E-13	5E-16
		Aluminum	9.1E+03	2.1E-05	1.2E-06	2.3E-06	5.0E-03	2E-04	5E-04	8E-06	3E-08			
		Antimony	7.6E-01	1.7E-09	9.8E-11	2.0E-10	1.0E-03	1E-07	2E-07	7E-10	3E-12			
		Arsenic	2.8E+00	6.4E-09	3.6E-10	7.2E-10	1.5E-05	2E-05	5E-05	3E-09	1E-11	4E-03	1E-11	4E-14
		Barium	5.8E+02	1.3E-06	7.4E-08	1.5E-07	5.0E-03	1E-05	3E-05	5E-07	2E-09			
		Cadmium	4.7E-01	1.1E-09	6.0E-11	1.2E-10	1.0E-05	6E-06	1E-05	4E-10	2E-12	2E-03	8E-13	3E-15
		Chromium	1.3E+01	3.0E-08	1.7E-09	3.4E-09	3.0E-04	6E-06	1E-05	1E-08	5E-11	8E-02	1E-09	4E-12
		Cobalt	2.8E+00	6.4E-09	3.6E-10	7.2E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	2E-11	9E-14
		Manganese	1.5E+02	3.4E-07	1.9E-08	3.8E-08	5.0E-05	4E-04	8E-04	1E-07	5E-10			
		Mercury	1.2E-01	2.7E-10	1.5E-11	3.1E-11	3.0E-04	5E-08	1E-07	1E-10	4E-13			
		Vanadium	2.7E+01	6.1E-08	3.4E-09	6.9E-09	1.0E-04	3E-05	7E-05	2E-08	1E-10			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC	Air EPC	Non-Cancer					Cancer				
					EC (mg/m^3)		RfC	HQ		EC ($\mu g/m^3$)		UR	Risk	
			mg/kg	mg/m^3	CTE	RME	mg/m^3	CTE	RME	CTE	RME	$(\mu g/m^3)^{-1}$	CTE	RME
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	4.9E-15	2.8E-16	5.5E-16	4.0E-08	7E-09	1E-08	2E-15	8E-18	4E+01	8E-14	3E-16
		Aluminum	9.9E+03	2.3E-05	1.3E-06	2.5E-06	5.0E-03	3E-04	5E-04	9E-06	4E-08			
		Antimony	1.2E+00	2.6E-09	1.5E-10	3.0E-10	1.0E-03	1E-07	3E-07	1E-09	4E-12			
		Arsenic	4.4E+00	1.0E-08	5.7E-10	1.1E-09	1.5E-05	4E-05	8E-05	4E-09	2E-11	4E-03	2E-11	7E-14
		Barium	2.9E+02	6.6E-07	3.8E-08	7.5E-08	5.0E-03	8E-06	2E-05	3E-07	1E-09			
		Cadmium	8.0E-01	1.8E-09	1.0E-10	2.0E-10	1.0E-05	1E-05	2E-05	7E-10	3E-12	2E-03	1E-12	5E-15
		Chromium	1.2E+01	2.7E-08	1.5E-09	3.1E-09	3.0E-04	5E-06	1E-05	1E-08	4E-11	8E-02	9E-10	4E-12
		Cobalt	3.0E+00	6.9E-09	3.9E-10	7.8E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	2E-11	1E-13
		Manganese	3.3E+02	7.6E-07	4.3E-08	8.6E-08	5.0E-05	9E-04	2E-03	3E-07	1E-09			
		Mercury	1.6E-01	3.5E-10	2.0E-11	4.0E-11	3.0E-04	7E-08	1E-07	1E-10	6E-13			
		Vanadium	3.4E+01	7.7E-08	4.4E-09	8.8E-09	1.0E-04	4E-05	9E-05	3E-08	1E-10			
Upland	45	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	8.4E-16	4.7E-17	9.5E-17	4.0E-08	1E-09	2E-09	3E-16	1E-18	4E+01	1E-14	5E-17
		Aluminum	2.1E+04	4.8E-05	2.7E-06	5.4E-06	5.0E-03	5E-04	1E-03	2E-05	8E-08			
		Antimony	2.3E-01	5.2E-10	3.0E-11	5.9E-11	1.0E-03	3E-08	6E-08	2E-10	8E-13			
		Arsenic	3.1E+00	7.0E-09	4.0E-10	8.0E-10	1.5E-05	3E-05	5E-05	3E-09	1E-11	4E-03	1E-11	5E-14
		Barium	3.1E+02	7.1E-07	4.0E-08	8.0E-08	5.0E-03	8E-06	2E-05	3E-07	1E-09			
		Cadmium	8.0E-02	1.8E-10	1.0E-11	2.1E-11	1.0E-05	1E-06	2E-06	7E-11	3E-13	2E-03	1E-13	5E-16
		Chromium	1.8E+01	4.2E-08	2.4E-09	4.7E-09	3.0E-04	8E-06	2E-05	2E-08	7E-11	8E-02	1E-09	6E-12
		Cobalt	6.9E+00	1.6E-08	8.9E-10	1.8E-09	2.0E-05	4E-05	9E-05	6E-09	3E-11	9E-03	6E-11	2E-13
		Manganese	1.8E+02	4.0E-07	2.3E-08	4.5E-08	5.0E-05	5E-04	9E-04	2E-07	6E-10			
		Mercury	1.9E-02	4.3E-11	2.4E-12	4.9E-12	3.0E-04	8E-09	2E-08	2E-11	7E-14			
		Vanadium	1.9E+01	4.3E-08	2.4E-09	4.8E-09	1.0E-04	2E-05	5E-05	2E-08	7E-11			
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	6.4E-15	3.6E-16	7.2E-16	4.0E-08	9E-09	2E-08	3E-15	1E-17	4E+01	1E-13	4E-16
		Aluminum	1.0E+04	2.3E-05	1.3E-06	2.7E-06	5.0E-03	3E-04	5E-04	9E-06	4E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	2.3E+00	5.2E-09	2.9E-10	5.8E-10	1.5E-05	2E-05	4E-05	2E-09	8E-12	4E-03	9E-12	4E-14
		Barium	3.6E+02	8.1E-07	4.6E-08	9.2E-08	5.0E-03	9E-06	2E-05	3E-07	1E-09			
		Cadmium	2.3E-01	5.1E-10	2.9E-11	5.8E-11	1.0E-05	3E-06	6E-06	2E-10	8E-13	2E-03	4E-13	1E-15
		Chromium	1.5E+01	3.5E-08	2.0E-09	4.0E-09	3.0E-04	7E-06	1E-05	1E-08	6E-11	8E-02	1E-09	5E-12
		Cobalt	4.5E+00	1.0E-08	5.8E-10	1.2E-09	2.0E-05	3E-05	6E-05	4E-09	2E-11	9E-03	4E-11	1E-13
		Manganese	2.2E+02	4.9E-07	2.8E-08	5.5E-08	5.0E-05	6E-04	1E-03	2E-07	8E-10			
		Mercury	4.6E-02	1.0E-10	5.9E-12	1.2E-11	3.0E-04	2E-08	4E-08	4E-11	2E-13			
		Vanadium	1.6E+01	3.6E-08	2.1E-09	4.1E-09	1.0E-04	2E-05	4E-05	1E-08	6E-11			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	3.5E-14	2.0E-15	4.0E-15	4.0E-08	5E-08	1E-07	1E-14	6E-17	4E+01	5E-13	2E-15
		Aluminum	1.7E+04	3.9E-05	2.2E-06	4.4E-06	5.0E-03	4E-04	9E-04	2E-05	6E-08			
		Antimony	1.6E+00	3.6E-09	2.1E-10	4.1E-10	1.0E-03	2E-07	4E-07	1E-09	6E-12			
		Arsenic	1.2E+01	2.8E-08	1.6E-09	3.2E-09	1.5E-05	1E-04	2E-04	1E-08	5E-11	4E-03	5E-11	2E-13
		Barium	5.4E+02	1.2E-06	6.9E-08	1.4E-07	5.0E-03	1E-05	3E-05	5E-07	2E-09			
		Cadmium	5.0E+00	1.1E-08	6.4E-10	1.3E-09	1.0E-05	6E-05	1E-04	5E-09	2E-11	2E-03	8E-12	3E-14
		Chromium	2.1E+01	4.9E-08	2.8E-09	5.5E-09	3.0E-04	9E-06	2E-05	2E-08	8E-11	8E-02	2E-09	7E-12
		Cobalt	2.0E+00	4.6E-09	2.6E-10	5.2E-10	2.0E-05	1E-05	3E-05	2E-09	7E-12	9E-03	2E-11	7E-14
		Manganese	1.1E+03	2.5E-06	1.4E-07	2.8E-07	5.0E-05	3E-03	6E-03	1E-06	4E-09			
		Mercury	7.7E-01	1.8E-09	1.0E-10	2.0E-10	3.0E-04	3E-07	7E-07	7E-10	3E-12			
		Vanadium	4.9E+01	1.1E-07	6.3E-09	1.3E-08	1.0E-04	6E-05	1E-04	4E-08	2E-10			
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	1.1E-13	6.3E-15	1.3E-14	4.0E-08	2E-07	3E-07	5E-14	2E-16	4E+01	2E-12	7E-15
		Aluminum	1.9E+04	4.3E-05	2.4E-06	4.8E-06	5.0E-03	5E-04	1E-03	2E-05	7E-08			
		Antimony	2.4E+00	5.5E-09	3.1E-10	6.2E-10	1.0E-03	3E-07	6E-07	2E-09	9E-12			
		Arsenic	1.4E+01	3.2E-08	1.8E-09	3.7E-09	1.5E-05	1E-04	2E-04	1E-08	5E-11	4E-03	6E-11	2E-13
		Barium	8.0E+02	1.8E-06	1.0E-07	2.1E-07	5.0E-03	2E-05	4E-05	7E-07	3E-09			
		Cadmium	8.3E+00	1.9E-08	1.1E-09	2.1E-09	1.0E-05	1E-04	2E-04	8E-09	3E-11	2E-03	1E-11	5E-14
		Chromium	5.8E+01	1.3E-07	7.5E-09	1.5E-08	3.0E-04	2E-05	5E-05	5E-08	2E-10	8E-02	4E-09	2E-11
		Cobalt	2.0E+00	4.5E-09	2.6E-10	5.1E-10	2.0E-05	1E-05	3E-05	2E-09	7E-12	9E-03	2E-11	7E-14
		Manganese	1.7E+03	3.8E-06	2.1E-07	4.2E-07	5.0E-05	4E-03	8E-03	2E-06	6E-09			
		Mercury	2.5E+00	5.7E-09	3.2E-10	6.4E-10	3.0E-04	1E-06	2E-06	2E-09	9E-12			
		Vanadium	7.1E+01	1.6E-07	9.1E-09	1.8E-08	1.0E-04	9E-05	2E-04	6E-08	3E-10			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	9.0E-14	5.1E-15	1.0E-14	4.0E-08	1E-07	3E-07	4E-14	1E-16	4E+01	1E-12	6E-15
		Aluminum	1.4E+04	3.3E-05	1.9E-06	3.7E-06	5.0E-03	4E-04	7E-04	1E-05	5E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	3.6E+00	8.2E-09	4.6E-10	9.3E-10	1.5E-05	3E-05	6E-05	3E-09	1E-11	4E-03	1E-11	6E-14
		Barium	1.0E+03	2.3E-06	1.3E-07	2.6E-07	5.0E-03	3E-05	5E-05	9E-07	4E-09			
		Cadmium	2.0E+00	4.5E-09	2.6E-10	5.1E-10	1.0E-05	3E-05	5E-05	2E-09	7E-12	2E-03	3E-12	1E-14
		Chromium	2.9E+01	6.5E-08	3.7E-09	7.4E-09	3.0E-04	1E-05	2E-05	3E-08	1E-10	8E-02	2E-09	9E-12
		Cobalt	4.5E+00	1.0E-08	5.8E-10	1.2E-09	2.0E-05	3E-05	6E-05	4E-09	2E-11	9E-03	4E-11	1E-13
		Manganese	5.8E+02	1.3E-06	7.4E-08	1.5E-07	5.0E-05	1E-03	3E-03	5E-07	2E-09			
		Mercury	8.0E+00	1.8E-08	1.0E-09	2.1E-09	3.0E-04	3E-06	7E-06	7E-09	3E-11			
		Vanadium	2.2E+01	5.0E-08	2.8E-09	5.6E-09	1.0E-04	3E-05	6E-05	2E-08	8E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC	Air EPC	Non-Cancer					Cancer				
					EC (mg/m^3)		RfC	HQ		EC ($\mu g/m^3$)		UR	Risk	
			mg/kg	mg/m^3	CTE	RME	mg/m^3	CTE	RME	CTE	RME	$(\mu g/m^3)^{-1}$	CTE	RME
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	5.4E-14	3.0E-15	6.1E-15	4.0E-08	8E-08	2E-07	2E-14	9E-17	4E+01	8E-13	3E-15
		Aluminum	1.2E+04	2.6E-05	1.5E-06	3.0E-06	5.0E-03	3E-04	6E-04	1E-05	4E-08			
		Antimony	1.2E+00	2.6E-09	1.5E-10	3.0E-10	1.0E-03	1E-07	3E-07	1E-09	4E-12			
		Arsenic	7.7E+00	1.7E-08	9.9E-10	2.0E-09	1.5E-05	7E-05	1E-04	7E-09	3E-11	4E-03	3E-11	1E-13
		Barium	5.1E+02	1.2E-06	6.6E-08	1.3E-07	5.0E-03	1E-05	3E-05	5E-07	2E-09			
		Cadmium	3.8E+00	8.6E-09	4.9E-10	9.7E-10	1.0E-05	5E-05	1E-04	3E-09	1E-11	2E-03	6E-12	3E-14
		Chromium	2.4E+01	5.4E-08	3.1E-09	6.1E-09	3.0E-04	1E-05	2E-05	2E-08	9E-11	8E-02	2E-09	7E-12
		Cobalt	2.3E+00	5.2E-09	3.0E-10	5.9E-10	2.0E-05	1E-05	3E-05	2E-09	8E-12	9E-03	2E-11	8E-14
		Manganese	1.2E+03	2.8E-06	1.6E-07	3.1E-07	5.0E-05	3E-03	6E-03	1E-06	4E-09			
		Mercury	7.5E-01	1.7E-09	9.6E-11	1.9E-10	3.0E-04	3E-07	6E-07	7E-10	3E-12			
		Vanadium	2.8E+01	6.4E-08	3.6E-09	7.2E-09	1.0E-04	4E-05	7E-05	3E-08	1E-10			
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	7.1E-15	4.0E-16	8.0E-16	4.0E-08	1E-08	2E-08	3E-15	1E-17	4E+01	1E-13	4E-16
		Aluminum	3.2E+03	7.3E-06	4.1E-07	8.3E-07	5.0E-03	8E-05	2E-04	3E-06	1E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	2.2E+00	5.0E-09	2.8E-10	5.7E-10	1.5E-05	2E-05	4E-05	2E-09	8E-12	4E-03	9E-12	3E-14
		Barium	1.1E+02	2.5E-07	1.4E-08	2.8E-08	5.0E-03	3E-06	6E-06	1E-07	4E-10			
		Cadmium	5.2E-01	1.2E-09	6.7E-11	1.3E-10	1.0E-05	7E-06	1E-05	5E-10	2E-12	2E-03	9E-13	3E-15
		Chromium	9.0E+00	2.0E-08	1.2E-09	2.3E-09	3.0E-04	4E-06	8E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	2.0E+00	4.5E-09	2.6E-10	5.1E-10	2.0E-05	1E-05	3E-05	2E-09	7E-12	9E-03	2E-11	7E-14
		Manganese	2.2E+02	5.0E-07	2.8E-08	5.7E-08	5.0E-05	6E-04	1E-03	2E-07	8E-10			
		Mercury	1.6E-01	3.6E-10	2.1E-11	4.1E-11	3.0E-04	7E-08	1E-07	1E-10	6E-13			
		Vanadium	9.2E+00	2.1E-08	1.2E-09	2.4E-09	1.0E-04	1E-05	2E-05	8E-09	3E-11			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	4.9E-15	2.8E-16	5.6E-16	4.0E-08	7E-09	1E-08	2E-15	8E-18	4E+01	8E-14	3E-16
		Aluminum	4.9E+03	1.1E-05	6.3E-07	1.3E-06	5.0E-03	1E-04	3E-04	5E-06	2E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	1.8E+00	4.0E-09	2.3E-10	4.5E-10	1.5E-05	2E-05	3E-05	2E-09	6E-12	4E-03	7E-12	3E-14
		Barium	9.6E+01	2.2E-07	1.2E-08	2.5E-08	5.0E-03	2E-06	5E-06	9E-08	4E-10			
		Cadmium	1.6E-01	3.6E-10	2.0E-11	4.1E-11	1.0E-05	2E-06	4E-06	1E-10	6E-13	2E-03	3E-13	1E-15
		Chromium	6.8E+00	1.6E-08	8.8E-10	1.8E-09	3.0E-04	3E-06	6E-06	6E-09	3E-11	8E-02	5E-10	2E-12
		Cobalt	2.7E+00	6.1E-09	3.4E-10	6.9E-10	2.0E-05	2E-05	3E-05	2E-09	1E-11	9E-03	2E-11	9E-14
		Manganese	1.3E+02	3.0E-07	1.7E-08	3.4E-08	5.0E-05	3E-04	7E-04	1E-07	5E-10			
		Mercury	5.5E-02	1.3E-10	7.1E-12	1.4E-11	3.0E-04	2E-08	5E-08	5E-11	2E-13			
		Vanadium	7.7E+00	1.8E-08	1.0E-09	2.0E-09	1.0E-04	1E-05	2E-05	7E-09	3E-11			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	4.9E-14	2.8E-15	5.6E-15	4.0E-08	7E-08	1E-07	2E-14	8E-17	4E+01	8E-13	3E-15
		Aluminum	1.2E+04	2.8E-05	1.6E-06	3.1E-06	5.0E-03	3E-04	6E-04	1E-05	4E-08			
		Antimony	4.4E-01	1.0E-09	5.7E-11	1.1E-10	1.0E-03	6E-08	1E-07	4E-10	2E-12			
		Arsenic	2.6E+00	5.8E-09	3.3E-10	6.6E-10	1.5E-05	2E-05	4E-05	2E-09	9E-12	4E-03	1E-11	4E-14
		Barium	5.5E+02	1.3E-06	7.1E-08	1.4E-07	5.0E-03	1E-05	3E-05	5E-07	2E-09			
		Cadmium	1.2E+00	2.6E-09	1.5E-10	3.0E-10	1.0E-05	1E-05	3E-05	1E-09	4E-12	2E-03	2E-12	8E-15
		Chromium	2.1E+01	4.8E-08	2.7E-09	5.5E-09	3.0E-04	9E-06	2E-05	2E-08	8E-11	8E-02	2E-09	7E-12
		Cobalt	4.0E+00	9.0E-09	5.1E-10	1.0E-09	2.0E-05	3E-05	5E-05	4E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	4.2E+02	9.6E-07	5.5E-08	1.1E-07	5.0E-05	1E-03	2E-03	4E-07	2E-09			
		Mercury	4.1E+00	9.3E-09	5.3E-10	1.1E-09	3.0E-04	2E-06	4E-06	4E-09	2E-11			
		Vanadium	1.3E+01	3.0E-08	1.7E-09	3.4E-09	1.0E-04	2E-05	3E-05	1E-08	5E-11			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.2E-05	2.8E-14	1.6E-15	3.1E-15	4.0E-08	4E-08	8E-08	1E-14	4E-17	4E+01	4E-13	2E-15
		Aluminum	1.0E+04	2.3E-05	1.3E-06	2.6E-06	5.0E-03	3E-04	5E-04	9E-06	4E-08			
		Antimony	1.6E+00	3.6E-09	2.0E-10	4.1E-10	1.0E-03	2E-07	4E-07	1E-09	6E-12			
		Arsenic	9.5E+00	2.1E-08	1.2E-09	2.4E-09	1.5E-05	8E-05	2E-04	9E-09	3E-11	4E-03	4E-11	1E-13
		Barium	6.2E+02	1.4E-06	7.9E-08	1.6E-07	5.0E-03	2E-05	3E-05	6E-07	2E-09			
		Cadmium	4.0E+00	9.0E-09	5.1E-10	1.0E-09	1.0E-05	5E-05	1E-04	4E-09	1E-11	2E-03	7E-12	3E-14
		Chromium	2.1E+01	4.8E-08	2.7E-09	5.4E-09	3.0E-04	9E-06	2E-05	2E-08	8E-11	8E-02	2E-09	7E-12
		Cobalt	2.6E+00	6.0E-09	3.4E-10	6.8E-10	2.0E-05	2E-05	3E-05	2E-09	1E-11	9E-03	2E-11	9E-14
		Manganese	1.7E+03	3.8E-06	2.2E-07	4.4E-07	5.0E-05	4E-03	9E-03	2E-06	6E-09			
		Mercury	6.6E-01	1.5E-09	8.5E-11	1.7E-10	3.0E-04	3E-07	6E-07	6E-10	2E-12			
		Vanadium	1.3E+01	3.0E-08	1.7E-09	3.4E-09	1.0E-04	2E-05	3E-05	1E-08	5E-11			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	4.7E-05	1.1E-13	6.0E-15	1.2E-14	4.0E-08	2E-07	3E-07	4E-14	2E-16	4E+01	2E-12	7E-15
		Aluminum	1.4E+04	3.1E-05	1.8E-06	3.5E-06	5.0E-03	4E-04	7E-04	1E-05	5E-08			
		Antimony	1.0E+00	2.3E-09	1.3E-10	2.6E-10	1.0E-03	1E-07	3E-07	9E-10	4E-12			
		Arsenic	1.2E+01	2.7E-08	1.5E-09	3.0E-09	1.5E-05	1E-04	2E-04	1E-08	4E-11	4E-03	5E-11	2E-13
		Barium	9.5E+02	2.2E-06	1.2E-07	2.4E-07	5.0E-03	2E-05	5E-05	9E-07	3E-09			
		Cadmium	4.7E+00	1.1E-08	6.1E-10	1.2E-09	1.0E-05	6E-05	1E-04	4E-09	2E-11	2E-03	8E-12	3E-14
		Chromium	3.6E+01	8.1E-08	4.6E-09	9.2E-09	3.0E-04	2E-05	3E-05	3E-08	1E-10	8E-02	3E-09	1E-11
		Cobalt	1.8E+00	4.0E-09	2.3E-10	4.5E-10	2.0E-05	1E-05	2E-05	2E-09	6E-12	9E-03	1E-11	6E-14
		Manganese	2.3E+03	5.2E-06	2.9E-07	5.9E-07	5.0E-05	6E-03	1E-02	2E-06	8E-09			
		Mercury	9.2E-01	2.1E-09	1.2E-10	2.4E-10	3.0E-04	4E-07	8E-07	8E-10	3E-12			
		Vanadium	4.2E+01	9.6E-08	5.4E-09	1.1E-08	1.0E-04	5E-05	1E-04	4E-08	2E-10			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC mg/kg	Air EPC mg/m^3	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	HQ CTE	HQ RME	Cancer EC ($\mu g/m^3$) CTE	Cancer EC ($\mu g/m^3$) RME	UR $(\mu g/m^3)^{-1}$	Risk CTE	Risk RME
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.7E-05	1.3E-13	7.3E-15	1.5E-14	4.0E-08	2E-07	4E-07	5E-14	2E-16	4E+01	2E-12	8E-15
		Aluminum	1.6E+04	3.6E-05	2.0E-06	4.1E-06	5.0E-03	4E-04	8E-04	1E-05	6E-08			
		Antimony	1.7E+00	3.8E-09	2.1E-10	4.3E-10	1.0E-03	2E-07	4E-07	2E-09	6E-12			
		Arsenic	1.2E+01	2.7E-08	1.5E-09	3.1E-09	1.5E-05	1E-04	2E-04	1E-08	4E-11	4E-03	5E-11	2E-13
		Barium	7.6E+02	1.7E-06	9.8E-08	2.0E-07	5.0E-03	2E-05	4E-05	7E-07	3E-09			
		Cadmium	6.5E+00	1.5E-08	8.3E-10	1.7E-09	1.0E-05	8E-05	2E-04	6E-09	2E-11	2E-03	1E-11	4E-14
		Chromium	4.8E+01	1.1E-07	6.1E-09	1.2E-08	3.0E-04	2E-05	4E-05	4E-08	2E-10	8E-02	4E-09	1E-11
		Cobalt	2.5E+00	5.6E-09	3.2E-10	6.3E-10	2.0E-05	2E-05	3E-05	2E-09	9E-12	9E-03	2E-11	8E-14
		Manganese	1.8E+03	4.1E-06	2.3E-07	4.6E-07	5.0E-05	5E-03	9E-03	2E-06	7E-09			
		Mercury	1.3E+00	2.8E-09	1.6E-10	3.2E-10	3.0E-04	5E-07	1E-06	1E-09	5E-12			
		Vanadium	5.6E+01	1.3E-07	7.3E-09	1.5E-08	1.0E-04	7E-05	1E-04	5E-08	2E-10			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	7.0E-05	1.6E-13	9.0E-15	1.8E-14	4.0E-08	2E-07	4E-07	6E-14	3E-16	4E+01	2E-12	1E-14
		Aluminum	1.5E+04	3.3E-05	1.9E-06	3.8E-06	5.0E-03	4E-04	8E-04	1E-05	5E-08			
		Antimony	1.9E+00	4.4E-09	2.5E-10	4.9E-10	1.0E-03	2E-07	5E-07	2E-09	7E-12			
		Arsenic	1.0E+01	2.3E-08	1.3E-09	2.6E-09	1.5E-05	9E-05	2E-04	9E-09	4E-11	4E-03	4E-11	2E-13
		Barium	6.9E+02	1.6E-06	8.8E-08	1.8E-07	5.0E-03	2E-05	4E-05	6E-07	3E-09			
		Cadmium	4.0E+00	9.1E-09	5.2E-10	1.0E-09	1.0E-05	5E-05	1E-04	4E-09	1E-11	2E-03	7E-12	3E-14
		Chromium	3.5E+01	7.9E-08	4.5E-09	8.9E-09	3.0E-04	1E-05	3E-05	3E-08	1E-10	8E-02	3E-09	1E-11
		Cobalt	2.6E+00	5.9E-09	3.3E-10	6.7E-10	2.0E-05	2E-05	3E-05	2E-09	1E-11	9E-03	2E-11	9E-14
		Manganese	1.3E+03	2.9E-06	1.7E-07	3.3E-07	5.0E-05	3E-03	7E-03	1E-06	5E-09			
		Mercury	1.0E+00	2.3E-09	1.3E-10	2.6E-10	3.0E-04	4E-07	9E-07	9E-10	4E-12			
		Vanadium	4.1E+01	9.4E-08	5.3E-09	1.1E-08	1.0E-04	5E-05	1E-04	4E-08	2E-10			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-05	3.5E-14	2.0E-15	4.0E-15	4.0E-08	5E-08	1E-07	1E-14	6E-17	4E+01	5E-13	2E-15
		Aluminum	8.7E+03	2.0E-05	1.1E-06	2.2E-06	5.0E-03	2E-04	4E-04	8E-06	3E-08			
		Antimony	8.2E-01	1.9E-09	1.1E-10	2.1E-10	1.0E-03	1E-07	2E-07	8E-10	3E-12			
		Arsenic	6.1E+00	1.4E-08	7.9E-10	1.6E-09	1.5E-05	5E-05	1E-04	6E-09	2E-11	4E-03	2E-11	1E-13
		Barium	7.3E+02	1.7E-06	9.4E-08	1.9E-07	5.0E-03	2E-05	4E-05	7E-07	3E-09			
		Cadmium	3.2E+00	7.4E-09	4.2E-10	8.4E-10	1.0E-05	4E-05	8E-05	3E-09	1E-11	2E-03	5E-12	2E-14
		Chromium	2.1E+01	4.7E-08	2.7E-09	5.4E-09	3.0E-04	9E-06	2E-05	2E-08	8E-11	8E-02	2E-09	6E-12
		Cobalt	2.2E+00	5.1E-09	2.9E-10	5.7E-10	2.0E-05	1E-05	3E-05	2E-09	8E-12	9E-03	2E-11	7E-14
		Manganese	1.6E+03	3.6E-06	2.0E-07	4.1E-07	5.0E-05	4E-03	8E-03	1E-06	6E-09			
		Mercury	9.8E-01	2.2E-09	1.3E-10	2.5E-10	3.0E-04	4E-07	8E-07	9E-10	4E-12			
		Vanadium	1.5E+01	3.3E-08	1.9E-09	3.8E-09	1.0E-04	2E-05	4E-05	1E-08	5E-11			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.6E-06	2.0E-14	1.1E-15	2.2E-15	4.0E-08	3E-08	6E-08	8E-15	3E-17	4E+01	3E-13	1E-15
		Aluminum	8.0E+03	1.8E-05	1.0E-06	2.1E-06	5.0E-03	2E-04	4E-04	7E-06	3E-08			
		Antimony	3.1E-01	7.0E-10	4.0E-11	8.0E-11	1.0E-03	4E-08	8E-08	3E-10	1E-12			
		Arsenic	4.6E+00	1.0E-08	5.9E-10	1.2E-09	1.5E-05	4E-05	8E-05	4E-09	2E-11	4E-03	2E-11	7E-14
		Barium	2.8E+02	6.4E-07	3.6E-08	7.3E-08	5.0E-03	7E-06	1E-05	3E-07	1E-09			
		Cadmium	1.7E+00	3.8E-09	2.1E-10	4.3E-10	1.0E-05	2E-05	4E-05	2E-09	6E-12	2E-03	3E-12	1E-14
		Chromium	1.5E+01	3.4E-08	1.9E-09	3.8E-09	3.0E-04	6E-06	1E-05	1E-08	5E-11	8E-02	1E-09	5E-12
		Cobalt	3.4E+00	7.7E-09	4.3E-10	8.7E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	8.5E+02	1.9E-06	1.1E-07	2.2E-07	5.0E-05	2E-03	4E-03	8E-07	3E-09			
		Mercury	1.9E-01	4.2E-10	2.4E-11	4.8E-11	3.0E-04	8E-08	2E-07	2E-10	7E-13			
		Vanadium	1.4E+01	3.1E-08	1.8E-09	3.5E-09	1.0E-04	2E-05	4E-05	1E-08	5E-11			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	1.3E-14	7.5E-16	1.5E-15	4.0E-08	2E-08	4E-08	5E-15	2E-17	4E+01	2E-13	8E-16
		Aluminum	8.2E+03	1.9E-05	1.1E-06	2.1E-06	5.0E-03	2E-04	4E-04	8E-06	3E-08			
		Antimony	2.0E-01	4.5E-10	2.6E-11	5.1E-11	1.0E-03	3E-08	5E-08	2E-10	7E-13			
		Arsenic	3.7E+00	8.4E-09	4.8E-10	9.5E-10	1.5E-05	3E-05	6E-05	3E-09	1E-11	4E-03	1E-11	6E-14
		Barium	2.0E+02	4.4E-07	2.5E-08	5.0E-08	5.0E-03	5E-06	1E-05	2E-07	7E-10			
		Cadmium	1.1E+00	2.5E-09	1.4E-10	2.8E-10	1.0E-05	1E-05	3E-05	1E-09	4E-12	2E-03	2E-12	7E-15
		Chromium	1.2E+01	2.8E-08	1.6E-09	3.2E-09	3.0E-04	5E-06	1E-05	1E-08	5E-11	8E-02	1E-09	4E-12
		Cobalt	3.8E+00	8.6E-09	4.9E-10	9.8E-10	2.0E-05	2E-05	5E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	4.8E+02	1.1E-06	6.1E-08	1.2E-07	5.0E-05	1E-03	2E-03	4E-07	2E-09			
		Mercury	1.1E-01	2.5E-10	1.4E-11	2.8E-11	3.0E-04	5E-08	9E-08	1E-10	4E-13			
		Vanadium	1.3E+01	3.0E-08	1.7E-09	3.4E-09	1.0E-04	2E-05	3E-05	1E-08	5E-11			
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	2.5E-15	1.4E-16	2.8E-16	4.0E-08	4E-09	7E-09	1E-15	4E-18	4E+01	4E-14	2E-16
		Aluminum	7.7E+03	1.8E-05	9.9E-07	2.0E-06	5.0E-03	2E-04	4E-04	7E-06	3E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	2.6E+00	5.9E-09	3.3E-10	6.7E-10	1.5E-05	2E-05	4E-05	2E-09	1E-11	4E-03	1E-11	4E-14
		Barium	1.6E+02	3.7E-07	2.1E-08	4.2E-08	5.0E-03	4E-06	8E-06	1E-07	6E-10			
		Cadmium	3.7E-01	8.4E-10	4.8E-11	9.5E-11	1.0E-05	5E-06	1E-05	3E-10	1E-12	2E-03	6E-13	2E-15
		Chromium	1.1E+01	2.5E-08	1.4E-09	2.8E-09	3.0E-04	5E-06	9E-06	1E-08	4E-11	8E-02	8E-10	3E-12
		Cobalt	4.0E+00	9.1E-09	5.1E-10	1.0E-09	2.0E-05	3E-05	5E-05	4E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	2.7E+02	6.2E-07	3.5E-08	7.1E-08	5.0E-05	7E-04	1E-03	3E-07	1E-09			
		Mercury	9.6E-02	2.2E-10	1.2E-11	2.5E-11	3.0E-04	4E-08	8E-08	9E-11	4E-13			
		Vanadium	1.1E+01	2.6E-08	1.5E-09	2.9E-09	1.0E-04	1E-05	3E-05	1E-08	4E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC mg/kg	Air EPC mg/m^3	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	HQ CTE	HQ RME	Cancer EC ($\mu g/m^3$) CTE	Cancer EC ($\mu g/m^3$) RME	UR $(\mu g/m^3)^{-1}$	Risk CTE	Risk RME
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	3.6E-14	2.0E-15	4.1E-15	4.0E-08	5E-08	1E-07	1E-14	6E-17	4E+01	6E-13	2E-15
		Aluminum	7.6E+03	1.7E-05	9.8E-07	2.0E-06	5.0E-03	2E-04	4E-04	7E-06	3E-08			
		Antimony	1.1E-01	2.4E-10	1.4E-11	2.7E-11	1.0E-03	1E-08	3E-08	1E-10	4E-13			
		Arsenic	3.1E+00	6.9E-09	3.9E-10	7.9E-10	1.5E-05	3E-05	5E-05	3E-09	1E-11	4E-03	1E-11	5E-14
		Barium	2.7E+02	6.1E-07	3.5E-08	7.0E-08	5.0E-03	7E-06	1E-05	2E-07	1E-09			
		Cadmium	7.8E-01	1.8E-09	1.0E-10	2.0E-10	1.0E-05	1E-05	2E-05	7E-10	3E-12	2E-03	1E-12	5E-15
		Chromium	1.2E+01	2.7E-08	1.5E-09	3.0E-09	3.0E-04	5E-06	1E-05	1E-08	4E-11	8E-02	9E-10	4E-12
		Cobalt	3.4E+00	7.8E-09	4.4E-10	8.8E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	5.4E+02	1.2E-06	7.0E-08	1.4E-07	5.0E-05	1E-03	3E-03	5E-07	2E-09			
		Mercury	3.4E+00	7.8E-09	4.4E-10	8.9E-10	3.0E-04	1E-06	3E-06	3E-09	1E-11			
		Vanadium	1.2E+01	2.7E-08	1.5E-09	3.0E-09	1.0E-04	2E-05	3E-05	1E-08	4E-11			
Upland	65	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	3.0E-14	1.7E-15	3.3E-15	4.0E-08	4E-08	8E-08	1E-14	5E-17	4E+01	5E-13	2E-15
		Aluminum	8.7E+03	2.0E-05	1.1E-06	2.2E-06	5.0E-03	2E-04	4E-04	8E-06	3E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	4.3E+00	9.8E-09	5.5E-10	1.1E-09	1.5E-05	4E-05	7E-05	4E-09	2E-11	4E-03	2E-11	7E-14
		Barium	4.5E+02	1.0E-06	5.8E-08	1.2E-07	5.0E-03	1E-05	2E-05	4E-07	2E-09			
		Cadmium	2.5E+00	5.7E-09	3.2E-10	6.4E-10	1.0E-05	3E-05	6E-05	2E-09	9E-12	2E-03	4E-12	2E-14
		Chromium	2.7E+01	6.1E-08	3.5E-09	6.9E-09	3.0E-04	1E-05	2E-05	2E-08	1E-10	8E-02	2E-09	8E-12
		Cobalt	3.1E+00	7.0E-09	4.0E-10	8.0E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.4E+03	3.1E-06	1.7E-07	3.5E-07	5.0E-05	3E-03	7E-03	1E-06	5E-09			
		Mercury	3.0E-01	6.8E-10	3.9E-11	7.7E-11	3.0E-04	1E-07	3E-07	3E-10	1E-12			
		Vanadium	1.3E+01	3.0E-08	1.7E-09	3.4E-09	1.0E-04	2E-05	3E-05	1E-08	5E-11			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.9E-06	4.2E-15	2.4E-16	4.8E-16	4.0E-08	6E-09	1E-08	2E-15	7E-18	4E+01	7E-14	3E-16
		Aluminum	4.7E+03	1.1E-05	6.0E-07	1.2E-06	5.0E-03	1E-04	2E-04	4E-06	2E-08			
		Antimony	2.1E-01	4.9E-10	2.8E-11	5.5E-11	1.0E-03	3E-08	6E-08	2E-10	8E-13			
		Arsenic	3.2E+00	7.3E-09	4.1E-10	8.2E-10	1.5E-05	3E-05	5E-05	3E-09	1E-11	4E-03	1E-11	5E-14
		Barium	2.7E+02	6.0E-07	3.4E-08	6.8E-08	5.0E-03	7E-06	1E-05	2E-07	1E-09			
		Cadmium	9.2E-01	2.1E-09	1.2E-10	2.4E-10	1.0E-05	1E-05	2E-05	8E-10	3E-12	2E-03	2E-12	6E-15
		Chromium	1.2E+01	2.8E-08	1.6E-09	3.1E-09	3.0E-04	5E-06	1E-05	1E-08	4E-11	8E-02	9E-10	4E-12
		Cobalt	2.4E+00	5.5E-09	3.1E-10	6.2E-10	2.0E-05	2E-05	3E-05	2E-09	9E-12	9E-03	2E-11	8E-14
		Manganese	5.3E+02	1.2E-06	6.8E-08	1.4E-07	5.0E-05	1E-03	3E-03	5E-07	2E-09			
		Mercury	7.5E-02	1.7E-10	9.7E-12	1.9E-11	3.0E-04	3E-08	6E-08	7E-11	3E-13			
		Vanadium	7.6E+00	1.7E-08	9.7E-10	1.9E-09	1.0E-04	1E-05	2E-05	7E-09	3E-11			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	7.9E-05	1.8E-13	1.0E-14	2.0E-14	4.0E-08	3E-07	5E-07	7E-14	3E-16	4E+01	3E-12	1E-14
		Aluminum	6.0E+03	1.4E-05	7.7E-07	1.5E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	1.6E+00	3.6E-09	2.1E-10	4.1E-10	1.0E-03	2E-07	4E-07	1E-09	6E-12			
		Arsenic	1.4E+01	3.3E-08	1.9E-09	3.7E-09	1.5E-05	1E-04	2E-04	1E-08	5E-11	4E-03	6E-11	2E-13
		Barium	6.0E+02	1.4E-06	7.7E-08	1.5E-07	5.0E-03	2E-05	3E-05	6E-07	2E-09			
		Cadmium	4.6E+00	1.0E-08	5.9E-10	1.2E-09	1.0E-05	6E-05	1E-04	4E-09	2E-11	2E-03	8E-12	3E-14
		Chromium	1.9E+01	4.2E-08	2.4E-09	4.8E-09	3.0E-04	8E-06	2E-05	2E-08	7E-11	8E-02	1E-09	6E-12
		Cobalt	2.4E+00	5.4E-09	3.1E-10	6.2E-10	2.0E-05	2E-05	3E-05	2E-09	9E-12	9E-03	2E-11	8E-14
		Manganese	2.0E+03	4.5E-06	2.5E-07	5.1E-07	5.0E-05	5E-03	1E-02	2E-06	7E-09			
		Mercury	3.2E-02	7.4E-11	4.2E-12	8.4E-12	3.0E-04	1E-08	3E-08	3E-11	1E-13			
		Vanadium	5.7E+00	1.3E-08	7.4E-10	1.5E-09	1.0E-04	7E-06	1E-05	5E-09	2E-11			
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	7.9E-05	1.8E-13	1.0E-14	2.0E-14	4.0E-08	3E-07	5E-07	7E-14	3E-16	4E+01	3E-12	1E-14
		Aluminum	6.0E+03	1.4E-05	7.7E-07	1.5E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	1.6E+00	3.6E-09	2.1E-10	4.1E-10	1.0E-03	2E-07	4E-07	1E-09	6E-12			
		Arsenic	1.4E+01	3.3E-08	1.9E-09	3.7E-09	1.5E-05	1E-04	2E-04	1E-08	5E-11	4E-03	6E-11	2E-13
		Barium	6.0E+02	1.4E-06	7.7E-08	1.5E-07	5.0E-03	2E-05	3E-05	6E-07	2E-09			
		Cadmium	4.6E+00	1.0E-08	5.9E-10	1.2E-09	1.0E-05	6E-05	1E-04	4E-09	2E-11	2E-03	8E-12	3E-14
		Chromium	1.9E+01	4.2E-08	2.4E-09	4.8E-09	3.0E-04	8E-06	2E-05	2E-08	7E-11	8E-02	1E-09	6E-12
		Cobalt	2.4E+00	5.4E-09	3.1E-10	6.2E-10	2.0E-05	2E-05	3E-05	2E-09	9E-12	9E-03	2E-11	8E-14
		Manganese	2.0E+03	4.5E-06	2.5E-07	5.1E-07	5.0E-05	5E-03	1E-02	2E-06	7E-09			
		Mercury	3.2E-02	7.4E-11	4.2E-12	8.4E-12	3.0E-04	1E-08	3E-08	3E-11	1E-13			
		Vanadium	5.7E+00	1.3E-08	7.4E-10	1.5E-09	1.0E-04	7E-06	1E-05	5E-09	2E-11			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.5E-06	1.0E-14	5.8E-16	1.2E-15	4.0E-08	1E-08	3E-08	4E-15	2E-17	4E+01	2E-13	6E-16
		Aluminum	3.3E+03	7.6E-06	4.3E-07	8.6E-07	5.0E-03	9E-05	2E-04	3E-06	1E-08			
		Antimony	4.7E-01	1.1E-09	6.0E-11	1.2E-10	1.0E-03	6E-08	1E-07	4E-10	2E-12			
		Arsenic	6.0E+00	1.4E-08	7.7E-10	1.5E-09	1.5E-05	5E-05	1E-04	5E-09	2E-11	4E-03	2E-11	9E-14
		Barium	4.5E+02	1.0E-06	5.8E-08	1.2E-07	5.0E-03	1E-05	2E-05	4E-07	2E-09			
		Cadmium	1.9E+00	4.3E-09	2.4E-10	4.9E-10	1.0E-05	2E-05	5E-05	2E-09	7E-12	2E-03	3E-12	1E-14
		Chromium	1.5E+01	3.5E-08	2.0E-09	3.9E-09	3.0E-04	7E-06	1E-05	1E-08	6E-11	8E-02	1E-09	5E-12
		Cobalt	1.6E+00	3.6E-09	2.1E-10	4.1E-10	2.0E-05	1E-05	2E-05	1E-09	6E-12	9E-03	1E-11	5E-14
		Manganese	1.0E+03	2.4E-06	1.3E-07	2.7E-07	5.0E-05	3E-03	5E-03	1E-06	4E-09			
		Mercury	9.5E-02	2.2E-10	1.2E-11	2.4E-11	3.0E-04	4E-08	8E-08	9E-11	3E-13			
		Vanadium	1.2E+01	2.7E-08	1.5E-09	3.0E-09	1.0E-04	2E-05	3E-05	1E-08	4E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC	Air EPC	Non-Cancer					Cancer				
					EC (mg/m^3)		RfC	HQ		EC ($\mu g/m^3$)		UR	Risk	
			mg/kg	mg/m^3	CTE	RME	mg/m^3	CTE	RME	CTE	RME	$(\mu g/m^3)^{-1}$	CTE	RME
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-06	1.2E-14	7.0E-16	1.4E-15	4.0E-08	2E-08	4E-08	5E-15	2E-17	4E+01	2E-13	8E-16
		Aluminum	1.6E+03	3.6E-06	2.0E-07	4.0E-07	5.0E-03	4E-05	8E-05	1E-06	6E-09			
		Antimony	1.3E-01	2.9E-10	1.6E-11	3.2E-11	1.0E-03	2E-08	3E-08	1E-10	5E-13			
		Arsenic	5.7E+00	1.3E-08	7.3E-10	1.5E-09	1.5E-05	5E-05	1E-04	5E-09	2E-11	4E-03	2E-11	9E-14
		Barium	5.0E+02	1.1E-06	6.4E-08	1.3E-07	5.0E-03	1E-05	3E-05	5E-07	2E-09			
		Cadmium	1.5E+00	3.4E-09	1.9E-10	3.8E-10	1.0E-05	2E-05	4E-05	1E-09	5E-12	2E-03	2E-12	1E-14
		Chromium	3.2E+01	7.2E-08	4.1E-09	8.2E-09	3.0E-04	1E-05	3E-05	3E-08	1E-10	8E-02	2E-09	1E-11
		Cobalt	2.3E+00	5.3E-09	3.0E-10	6.0E-10	2.0E-05	2E-05	3E-05	2E-09	9E-12	9E-03	2E-11	8E-14
		Manganese	8.0E+02	1.8E-06	1.0E-07	2.1E-07	5.0E-05	2E-03	4E-03	7E-07	3E-09			
		Mercury	4.4E-02	1.0E-10	5.7E-12	1.1E-11	3.0E-04	2E-08	4E-08	4E-11	2E-13			
		Vanadium	3.7E+00	8.4E-09	4.8E-10	9.5E-10	1.0E-04	5E-06	1E-05	3E-09	1E-11			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	5.3E-14	3.0E-15	6.0E-15	4.0E-08	8E-08	2E-07	2E-14	9E-17	4E+01	8E-13	3E-15
		Aluminum	2.3E+03	5.2E-06	2.9E-07	5.8E-07	5.0E-03	6E-05	1E-04	2E-06	8E-09			
		Antimony	2.4E-01	5.5E-10	3.1E-11	6.2E-11	1.0E-03	3E-08	6E-08	2E-10	9E-13			
		Arsenic	7.0E+00	1.6E-08	9.0E-10	1.8E-09	1.5E-05	6E-05	1E-04	6E-09	3E-11	4E-03	3E-11	1E-13
		Barium	5.4E+02	1.2E-06	6.9E-08	1.4E-07	5.0E-03	1E-05	3E-05	5E-07	2E-09			
		Cadmium	2.2E+00	5.0E-09	2.8E-10	5.7E-10	1.0E-05	3E-05	6E-05	2E-09	8E-12	2E-03	4E-12	1E-14
		Chromium	1.9E+01	4.3E-08	2.5E-09	4.9E-09	3.0E-04	8E-06	2E-05	2E-08	7E-11	8E-02	1E-09	6E-12
		Cobalt	1.3E+00	3.0E-09	1.7E-10	3.3E-10	2.0E-05	8E-06	2E-05	1E-09	5E-12	9E-03	1E-11	4E-14
		Manganese	2.3E+03	5.1E-06	2.9E-07	5.8E-07	5.0E-05	6E-03	1E-02	2E-06	8E-09			
		Mercury	4.9E-03	1.1E-11	6.2E-13	1.2E-12	3.0E-04	2E-09	4E-09	4E-12	2E-14			
		Vanadium	4.7E+00	1.1E-08	6.0E-10	1.2E-09	1.0E-04	6E-06	1E-05	4E-09	2E-11			
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-04	6.7E-13	3.8E-14	7.6E-14	4.0E-08	1E-06	2E-06	3E-13	1E-15	4E+01	1E-11	4E-14
		Aluminum	1.8E+04	4.0E-05	2.3E-06	4.6E-06	5.0E-03	5E-04	9E-04	2E-05	7E-08			
		Antimony	2.4E+00	5.4E-09	3.1E-10	6.1E-10	1.0E-03	3E-07	6E-07	2E-09	9E-12			
		Arsenic	4.0E+01	9.1E-08	5.1E-09	1.0E-08	1.5E-05	3E-04	7E-04	4E-08	1E-10	4E-03	2E-10	6E-13
		Barium	8.2E+02	1.9E-06	1.1E-07	2.1E-07	5.0E-03	2E-05	4E-05	8E-07	3E-09			
		Cadmium	6.4E+00	1.4E-08	8.2E-10	1.6E-09	1.0E-05	8E-05	2E-04	6E-09	2E-11	2E-03	1E-11	4E-14
		Chromium	3.0E+01	6.8E-08	3.8E-09	7.7E-09	3.0E-04	1E-05	3E-05	3E-08	1E-10	8E-02	2E-09	9E-12
		Cobalt	7.1E+00	1.6E-08	9.1E-10	1.8E-09	2.0E-05	5E-05	9E-05	7E-09	3E-11	9E-03	6E-11	2E-13
		Manganese	2.3E+03	5.3E-06	3.0E-07	6.0E-07	5.0E-05	6E-03	1E-02	2E-06	9E-09			
		Mercury	2.3E-01	5.2E-10	2.9E-11	5.9E-11	3.0E-04	1E-07	2E-07	2E-10	8E-13			
		Vanadium	2.2E+01	5.1E-08	2.9E-09	5.7E-09	1.0E-04	3E-05	6E-05	2E-08	8E-11			
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	7.8E-16	4.4E-17	8.8E-17	4.0E-08	1E-09	2E-09	3E-16	1E-18	4E+01	1E-14	5E-17
		Aluminum	1.2E+04	2.7E-05	1.5E-06	3.1E-06	5.0E-03	3E-04	6E-04	1E-05	4E-08			
		Antimony	9.5E-02	2.1E-10	1.2E-11	2.4E-11	1.0E-03	1E-08	2E-08	9E-11	3E-13			
		Arsenic	4.2E+00	9.5E-09	5.4E-10	1.1E-09	1.5E-05	4E-05	7E-05	4E-09	2E-11	4E-03	2E-11	7E-14
		Barium	2.0E+02	4.5E-07	2.6E-08	5.1E-08	5.0E-03	5E-06	1E-05	2E-07	7E-10			
		Cadmium	1.4E-01	3.3E-10	1.8E-11	3.7E-11	1.0E-05	2E-06	4E-06	1E-10	5E-13	2E-03	2E-13	1E-15
		Chromium	1.3E+01	3.0E-08	1.7E-09	3.4E-09	3.0E-04	6E-06	1E-05	1E-08	5E-11	8E-02	1E-09	4E-12
		Cobalt	6.2E+00	1.4E-08	8.0E-10	1.6E-09	2.0E-05	4E-05	8E-05	6E-09	2E-11	9E-03	5E-11	2E-13
		Manganese	3.6E+02	8.2E-07	4.7E-08	9.3E-08	5.0E-05	9E-04	2E-03	3E-07	1E-09			
		Mercury	1.4E-02	3.1E-11	1.7E-12	3.5E-12	3.0E-04	6E-09	1E-08	1E-11	5E-14			
		Vanadium	1.7E+01	3.8E-08	2.2E-09	4.3E-09	1.0E-04	2E-05	4E-05	2E-08	6E-11			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	4.5E-15	2.5E-16	5.1E-16	4.0E-08	6E-09	1E-08	2E-15	7E-18	4E+01	7E-14	3E-16
		Aluminum	6.7E+03	1.5E-05	8.6E-07	1.7E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	1.3E-01	2.9E-10	1.6E-11	3.3E-11	1.0E-03	2E-08	3E-08	1E-10	5E-13			
		Arsenic	2.8E+00	6.4E-09	3.6E-10	7.2E-10	1.5E-05	2E-05	5E-05	3E-09	1E-11	4E-03	1E-11	4E-14
		Barium	1.4E+02	3.3E-07	1.8E-08	3.7E-08	5.0E-03	4E-06	7E-06	1E-07	5E-10			
		Cadmium	1.2E-01	2.7E-10	1.5E-11	3.0E-11	1.0E-05	2E-06	3E-06	1E-10	4E-13	2E-03	2E-13	8E-16
		Chromium	9.1E+00	2.1E-08	1.2E-09	2.4E-09	3.0E-04	4E-06	8E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	3.3E+00	7.4E-09	4.2E-10	8.4E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.7E+02	3.9E-07	2.2E-08	4.4E-08	5.0E-05	4E-04	9E-04	2E-07	6E-10			
		Mercury	2.2E-02	5.1E-11	2.9E-12	5.8E-12	3.0E-04	1E-08	2E-08	2E-11	8E-14			
		Vanadium	1.0E+01	2.3E-08	1.3E-09	2.6E-09	1.0E-04	1E-05	3E-05	9E-09	4E-11			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	4.5E-15	2.5E-16	5.1E-16	4.0E-08	6E-09	1E-08	2E-15	7E-18	4E+01	7E-14	3E-16
		Aluminum	6.7E+03	1.5E-05	8.6E-07	1.7E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	1.3E-01	2.9E-10	1.6E-11	3.3E-11	1.0E-03	2E-08	3E-08	1E-10	5E-13			
		Arsenic	2.8E+00	6.4E-09	3.6E-10	7.2E-10	1.5E-05	2E-05	5E-05	3E-09	1E-11	4E-03	1E-11	4E-14
		Barium	1.4E+02	3.3E-07	1.8E-08	3.7E-08	5.0E-03	4E-06	7E-06	1E-07	5E-10			
		Cadmium	1.2E-01	2.7E-10	1.5E-11	3.0E-11	1.0E-05	2E-06	3E-06	1E-10	4E-13	2E-03	2E-13	8E-16
		Chromium	9.1E+00	2.1E-08	1.2E-09	2.4E-09	3.0E-04	4E-06	8E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	3.3E+00	7.4E-09	4.2E-10	8.4E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.7E+02	3.9E-07	2.2E-08	4.4E-08	5.0E-05	4E-04	9E-04	2E-07	6E-10			
		Mercury	2.2E-02	5.1E-11	2.9E-12	5.8E-12	3.0E-04	1E-08	2E-08	2E-11	8E-14			
		Vanadium	1.0E+01	2.3E-08	1.3E-09	2.6E-09	1.0E-04	1E-05	3E-05	9E-09	4E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC	Air EPC	Non-Cancer					Cancer				
					EC (mg/m^3)		RfC	HQ		EC ($\mu g/m^3$)		UR	Risk	
			mg/kg	mg/m^3	CTE	RME	mg/m^3	CTE	RME	CTE	RME	$(\mu g/m^3)^{-1}$	CTE	RME
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	7.8E-16	4.4E-17	8.8E-17	4.0E-08	1E-09	2E-09	3E-16	1E-18	4E+01	1E-14	5E-17
		Aluminum	1.2E+04	2.7E-05	1.5E-06	3.1E-06	5.0E-03	3E-04	6E-04	1E-05	4E-08			
		Antimony	9.5E-02	2.1E-10	1.2E-11	2.4E-11	1.0E-03	1E-08	2E-08	9E-11	3E-13			
		Arsenic	4.2E+00	9.5E-09	5.4E-10	1.1E-09	1.5E-05	4E-05	7E-05	4E-09	2E-11	4E-03	2E-11	7E-14
		Barium	2.0E+02	4.5E-07	2.6E-08	5.1E-08	5.0E-03	5E-06	1E-05	2E-07	7E-10			
		Cadmium	1.4E-01	3.3E-10	1.8E-11	3.7E-11	1.0E-05	2E-06	4E-06	1E-10	5E-13	2E-03	2E-13	1E-15
		Chromium	1.3E+01	3.0E-08	1.7E-09	3.4E-09	3.0E-04	6E-06	1E-05	1E-08	5E-11	8E-02	1E-09	4E-12
		Cobalt	6.2E+00	1.4E-08	8.0E-10	1.6E-09	2.0E-05	4E-05	8E-05	6E-09	2E-11	9E-03	5E-11	2E-13
		Manganese	3.6E+02	8.2E-07	4.7E-08	9.3E-08	5.0E-05	9E-04	2E-03	3E-07	1E-09			
		Mercury	1.4E-02	3.1E-11	1.7E-12	3.5E-12	3.0E-04	6E-09	1E-08	1E-11	5E-14			
		Vanadium	1.7E+01	3.8E-08	2.2E-09	4.3E-09	1.0E-04	2E-05	4E-05	2E-08	6E-11			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	4.5E-15	2.5E-16	5.1E-16	4.0E-08	6E-09	1E-08	2E-15	7E-18	4E+01	7E-14	3E-16
		Aluminum	6.7E+03	1.5E-05	8.6E-07	1.7E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	1.3E-01	2.9E-10	1.6E-11	3.3E-11	1.0E-03	2E-08	3E-08	1E-10	5E-13			
		Arsenic	2.8E+00	6.4E-09	3.6E-10	7.2E-10	1.5E-05	2E-05	5E-05	3E-09	1E-11	4E-03	1E-11	4E-14
		Barium	1.4E+02	3.3E-07	1.8E-08	3.7E-08	5.0E-03	4E-06	7E-06	1E-07	5E-10			
		Cadmium	1.2E-01	2.7E-10	1.5E-11	3.0E-11	1.0E-05	2E-06	3E-06	1E-10	4E-13	2E-03	2E-13	8E-16
		Chromium	9.1E+00	2.1E-08	1.2E-09	2.4E-09	3.0E-04	4E-06	8E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	3.3E+00	7.4E-09	4.2E-10	8.4E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.7E+02	3.9E-07	2.2E-08	4.4E-08	5.0E-05	4E-04	9E-04	2E-07	6E-10			
		Mercury	2.2E-02	5.1E-11	2.9E-12	5.8E-12	3.0E-04	1E-08	2E-08	2E-11	8E-14			
		Vanadium	1.0E+01	2.3E-08	1.3E-09	2.6E-09	1.0E-04	1E-05	3E-05	9E-09	4E-11			
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	4.5E-15	2.5E-16	5.1E-16	4.0E-08	6E-09	1E-08	2E-15	7E-18	4E+01	7E-14	3E-16
		Aluminum	6.7E+03	1.5E-05	8.6E-07	1.7E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	1.3E-01	2.9E-10	1.6E-11	3.3E-11	1.0E-03	2E-08	3E-08	1E-10	5E-13			
		Arsenic	2.8E+00	6.4E-09	3.6E-10	7.2E-10	1.5E-05	2E-05	5E-05	3E-09	1E-11	4E-03	1E-11	4E-14
		Barium	1.4E+02	3.3E-07	1.8E-08	3.7E-08	5.0E-03	4E-06	7E-06	1E-07	5E-10			
		Cadmium	1.2E-01	2.7E-10	1.5E-11	3.0E-11	1.0E-05	2E-06	3E-06	1E-10	4E-13	2E-03	2E-13	8E-16
		Chromium	9.1E+00	2.1E-08	1.2E-09	2.4E-09	3.0E-04	4E-06	8E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	3.3E+00	7.4E-09	4.2E-10	8.4E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.7E+02	3.9E-07	2.2E-08	4.4E-08	5.0E-05	4E-04	9E-04	2E-07	6E-10			
		Mercury	2.2E-02	5.1E-11	2.9E-12	5.8E-12	3.0E-04	1E-08	2E-08	2E-11	8E-14			
		Vanadium	1.0E+01	2.3E-08	1.3E-09	2.6E-09	1.0E-04	1E-05	3E-05	9E-09	4E-11			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	1.4E-15	7.7E-17	1.5E-16	4.0E-08	2E-09	4E-09	5E-16	2E-18	4E+01	2E-14	8E-17
		Aluminum	6.8E+03	1.5E-05	8.7E-07	1.7E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	1.0E-01	2.3E-10	1.3E-11	2.6E-11	1.0E-03	1E-08	3E-08	9E-11	4E-13			
		Arsenic	4.4E+00	1.0E-08	5.7E-10	1.1E-09	1.5E-05	4E-05	8E-05	4E-09	2E-11	4E-03	2E-11	7E-14
		Barium	1.8E+02	4.1E-07	2.3E-08	4.6E-08	5.0E-03	5E-06	9E-06	2E-07	7E-10			
		Cadmium	3.1E-01	6.9E-10	3.9E-11	7.9E-11	1.0E-05	4E-06	8E-06	3E-10	1E-12	2E-03	5E-13	2E-15
		Chromium	8.2E+00	1.9E-08	1.0E-09	2.1E-09	3.0E-04	3E-06	7E-06	7E-09	3E-11	8E-02	6E-10	3E-12
		Cobalt	3.8E+00	8.6E-09	4.9E-10	9.8E-10	2.0E-05	2E-05	5E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	2.8E+02	6.3E-07	3.6E-08	7.1E-08	5.0E-05	7E-04	1E-03	3E-07	1E-09			
		Mercury	3.2E-02	7.2E-11	4.1E-12	8.1E-12	3.0E-04	1E-08	3E-08	3E-11	1E-13			
		Vanadium	1.2E+01	2.8E-08	1.6E-09	3.1E-09	1.0E-04	2E-05	3E-05	1E-08	4E-11			
Floodplain	85	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	9.1E-16	5.2E-17	1.0E-16	4.0E-08	1E-09	3E-09	4E-16	1E-18	4E+01	1E-14	6E-17
		Aluminum	2.9E+03	6.7E-06	3.8E-07	7.6E-07	5.0E-03	8E-05	2E-04	3E-06	1E-08			
		Antimony	8.5E-02	1.9E-10	1.1E-11	2.2E-11	1.0E-03	1E-08	2E-08	8E-11	3E-13			
		Arsenic	1.9E+00	4.3E-09	2.4E-10	4.9E-10	1.5E-05	2E-05	3E-05	2E-09	7E-12	4E-03	8E-12	3E-14
		Barium	2.9E+01	6.7E-08	3.8E-09	7.5E-09	5.0E-03	8E-07	2E-06	3E-08	1E-10			
		Cadmium	1.6E-02	3.6E-11	2.1E-12	4.1E-12	1.0E-05	2E-07	4E-07	1E-11	6E-14	2E-03	3E-14	1E-16
		Chromium	3.9E+00	8.9E-09	5.0E-10	1.0E-09	3.0E-04	2E-06	3E-06	4E-09	1E-11	8E-02	3E-10	1E-12
		Cobalt	1.8E+00	4.1E-09	2.3E-10	4.6E-10	2.0E-05	1E-05	2E-05	2E-09	7E-12	9E-03	1E-11	6E-14
		Manganese	6.4E+01	1.5E-07	8.2E-09	1.6E-08	5.0E-05	2E-04	3E-04	6E-08	2E-10			
		Mercury	4.4E-03	9.9E-12	5.6E-13	1.1E-12	3.0E-04	2E-09	4E-09	4E-12	2E-14			
		Vanadium	5.1E+00	1.2E-08	6.6E-10	1.3E-09	1.0E-04	7E-06	1E-05	5E-09	2E-11			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	3.7E-14	2.1E-15	4.1E-15	4.0E-08	5E-08	1E-07	1E-14	6E-17	4E+01	6E-13	2E-15
		Aluminum	1.7E+04	3.9E-05	2.2E-06	4.4E-06	5.0E-03	4E-04	9E-04	2E-05	6E-08			
		Antimony	3.8E-01	8.7E-10	4.9E-11	9.8E-11	1.0E-03	5E-08	1E-07	4E-10	1E-12			
		Arsenic	4.0E+00	9.1E-09	5.1E-10	1.0E-09	1.5E-05	3E-05	7E-05	4E-09	1E-11	4E-03	2E-11	6E-14
		Barium	4.0E+02	9.0E-07	5.1E-08	1.0E-07	5.0E-03	1E-05	2E-05	4E-07	1E-09			
		Cadmium	4.7E-01	1.1E-09	6.0E-11	1.2E-10	1.0E-05	6E-06	1E-05	4E-10	2E-12	2E-03	8E-13	3E-15
		Chromium	1.7E+01	4.0E-08	2.2E-09	4.5E-09	3.0E-04	7E-06	1E-05	2E-08	6E-11	8E-02	1E-09	5E-12
		Cobalt	5.0E+00	1.1E-08	6.4E-10	1.3E-09	2.0E-05	3E-05	6E-05	5E-09	2E-11	9E-03	4E-11	2E-13
		Manganese	4.8E+02	1.1E-06	6.2E-08	1.2E-07	5.0E-05	1E-03	2E-03	4E-07	2E-09			
		Mercury	4.6E-01	1.0E-09	5.9E-11	1.2E-10	3.0E-04	2E-07	4E-07	4E-10	2E-12			
		Vanadium	1.9E+01	4.3E-08	2.4E-09	4.9E-09	1.0E-04	2E-05	5E-05	2E-08	7E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC mg/kg	Air EPC mg/m^3	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	Non-Cancer HQ CTE	Non-Cancer HQ RME	Cancer EC ($\mu g/m^3$) CTE	Cancer EC ($\mu g/m^3$) RME	Cancer UR $(\mu g/m^3)^{-1}$	Cancer Risk CTE	Cancer Risk RME
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	1.3E-14	7.4E-16	1.5E-15	4.0E-08	2E-08	4E-08	5E-15	2E-17	4E+01	2E-13	8E-16
		Aluminum	9.5E+03	2.1E-05	1.2E-06	2.4E-06	5.0E-03	2E-04	5E-04	9E-06	3E-08			
		Antimony	1.1E-01	2.4E-10	1.4E-11	2.7E-11	1.0E-03	1E-08	3E-08	1E-10	4E-13			
		Arsenic	4.0E+00	9.1E-09	5.2E-10	1.0E-09	1.5E-05	3E-05	7E-05	4E-09	1E-11	4E-03	2E-11	6E-14
		Barium	6.5E+02	1.5E-06	8.4E-08	1.7E-07	5.0E-03	2E-05	3E-05	6E-07	2E-09			
		Cadmium	6.7E-01	1.5E-09	8.6E-11	1.7E-10	1.0E-05	9E-06	2E-05	6E-10	2E-12	2E-03	1E-12	4E-15
		Chromium	1.3E+01	3.1E-08	1.7E-09	3.5E-09	3.0E-04	6E-06	1E-05	1E-08	5E-11	8E-02	1E-09	4E-12
		Cobalt	3.6E+00	8.2E-09	4.6E-10	9.3E-10	2.0E-05	2E-05	5E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	2.4E+02	5.4E-07	3.1E-08	6.2E-08	5.0E-05	6E-04	1E-03	2E-07	9E-10			
		Mercury	8.8E-02	2.0E-10	1.1E-11	2.3E-11	3.0E-04	4E-08	8E-08	8E-11	3E-13			
		Vanadium	1.8E+01	4.1E-08	2.3E-09	4.6E-09	1.0E-04	2E-05	5E-05	2E-08	7E-11			
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	1.3E-13	7.2E-15	1.4E-14	4.0E-08	2E-07	4E-07	5E-14	2E-16	4E+01	2E-12	8E-15
		Aluminum	1.2E+04	2.7E-05	1.5E-06	3.0E-06	5.0E-03	3E-04	6E-04	1E-05	4E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	5.5E+00	1.3E-08	7.1E-10	1.4E-09	1.5E-05	5E-05	9E-05	5E-09	2E-11	4E-03	2E-11	9E-14
		Barium	1.5E+03	3.3E-06	1.9E-07	3.7E-07	5.0E-03	4E-05	7E-05	1E-06	5E-09			
		Cadmium	1.8E+00	4.1E-09	2.3E-10	4.6E-10	1.0E-05	2E-05	5E-05	2E-09	7E-12	2E-03	3E-12	1E-14
		Chromium	2.6E+01	6.0E-08	3.4E-09	6.8E-09	3.0E-04	1E-05	2E-05	2E-08	1E-10	8E-02	2E-09	8E-12
		Cobalt	2.6E+00	5.9E-09	3.3E-10	6.7E-10	2.0E-05	2E-05	3E-05	2E-09	1E-11	9E-03	2E-11	9E-14
		Manganese	5.3E+02	1.2E-06	6.8E-08	1.4E-07	5.0E-05	1E-03	3E-03	5E-07	2E-09			
		Mercury	6.9E-01	1.6E-09	8.9E-11	1.8E-10	3.0E-04	3E-07	6E-07	6E-10	3E-12			
		Vanadium	1.4E+01	3.1E-08	1.8E-09	3.5E-09	1.0E-04	2E-05	4E-05	1E-08	5E-11			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.3E-06	2.1E-14	1.2E-15	2.4E-15	4.0E-08	3E-08	6E-08	9E-15	3E-17	4E+01	3E-13	1E-15
		Aluminum	1.1E+04	2.5E-05	1.4E-06	2.8E-06	5.0E-03	3E-04	6E-04	1E-05	4E-08			
		Antimony	3.6E-01	8.1E-10	4.6E-11	9.2E-11	1.0E-03	5E-08	9E-08	3E-10	1E-12			
		Arsenic	4.7E+00	1.1E-08	6.0E-10	1.2E-09	1.5E-05	4E-05	8E-05	4E-09	2E-11	4E-03	2E-11	7E-14
		Barium	4.9E+02	1.1E-06	6.3E-08	1.3E-07	5.0E-03	1E-05	3E-05	4E-07	2E-09			
		Cadmium	5.3E-01	1.2E-09	6.8E-11	1.4E-10	1.0E-05	7E-06	1E-05	5E-10	2E-12	2E-03	9E-13	3E-15
		Chromium	1.7E+01	3.8E-08	2.2E-09	4.3E-09	3.0E-04	7E-06	1E-05	2E-08	6E-11	8E-02	1E-09	5E-12
		Cobalt	4.4E+00	1.0E-08	5.7E-10	1.1E-09	2.0E-05	3E-05	6E-05	4E-09	2E-11	9E-03	4E-11	1E-13
		Manganese	3.6E+02	8.1E-07	4.6E-08	9.2E-08	5.0E-05	9E-04	2E-03	3E-07	1E-09			
		Mercury	1.7E-01	3.9E-10	2.2E-11	4.4E-11	3.0E-04	7E-08	1E-07	2E-10	6E-13			
		Vanadium	1.9E+01	4.2E-08	2.4E-09	4.8E-09	1.0E-04	2E-05	5E-05	2E-08	7E-11			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.3E-13	7.1E-15	1.4E-14	4.0E-08	2E-07	4E-07	5E-14	2E-16	4E+01	2E-12	8E-15
		Aluminum	1.1E+04	2.5E-05	1.4E-06	2.9E-06	5.0E-03	3E-04	6E-04	1E-05	4E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	1.0E+01	2.3E-08	1.3E-09	2.6E-09	1.5E-05	9E-05	2E-04	9E-09	4E-11	4E-03	4E-11	2E-13
		Barium	7.6E+02	1.7E-06	9.8E-08	2.0E-07	5.0E-03	2E-05	4E-05	7E-07	3E-09			
		Cadmium	2.8E+00	6.4E-09	3.6E-10	7.2E-10	1.0E-05	4E-05	7E-05	3E-09	1E-11	2E-03	5E-12	2E-14
		Chromium	2.8E+01	6.3E-08	3.6E-09	7.2E-09	3.0E-04	1E-05	2E-05	3E-08	1E-10	8E-02	2E-09	9E-12
		Cobalt	3.1E+00	7.0E-09	4.0E-10	8.0E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	1.1E+03	2.5E-06	1.4E-07	2.9E-07	5.0E-05	3E-03	6E-03	1E-06	4E-09			
		Mercury	1.5E+00	3.4E-09	1.9E-10	3.8E-10	3.0E-04	6E-07	1E-06	1E-09	5E-12			
		Vanadium	3.1E+01	7.1E-08	4.0E-09	8.1E-09	1.0E-04	4E-05	8E-05	3E-08	1E-10			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	5.1E-14	2.9E-15	5.8E-15	4.0E-08	7E-08	1E-07	2E-14	8E-17	4E+01	8E-13	3E-15
		Aluminum	1.5E+04	3.3E-05	1.9E-06	3.8E-06	5.0E-03	4E-04	8E-04	1E-05	5E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	6.3E+00	1.4E-08	8.1E-10	1.6E-09	1.5E-05	5E-05	1E-04	6E-09	2E-11	4E-03	2E-11	1E-13
		Barium	9.2E+02	2.1E-06	1.2E-07	2.4E-07	5.0E-03	2E-05	5E-05	8E-07	3E-09			
		Cadmium	1.7E+00	3.9E-09	2.2E-10	4.4E-10	1.0E-05	2E-05	4E-05	2E-09	6E-12	2E-03	3E-12	1E-14
		Chromium	2.6E+01	6.0E-08	3.4E-09	6.8E-09	3.0E-04	1E-05	2E-05	2E-08	1E-10	8E-02	2E-09	8E-12
		Cobalt	5.3E+00	1.2E-08	6.8E-10	1.4E-09	2.0E-05	3E-05	7E-05	5E-09	2E-11	9E-03	4E-11	2E-13
		Manganese	4.0E+02	9.1E-07	5.1E-08	1.0E-07	5.0E-05	1E-03	2E-03	4E-07	1E-09			
		Mercury	8.3E-01	1.9E-09	1.1E-10	2.1E-10	3.0E-04	4E-07	7E-07	8E-10	3E-12			
		Vanadium	2.6E+01	6.0E-08	3.4E-09	6.8E-09	1.0E-04	3E-05	7E-05	2E-08	1E-10			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	1.0E-13	5.9E-15	1.2E-14	4.0E-08	1E-07	3E-07	4E-14	2E-16	4E+01	2E-12	6E-15
		Aluminum	1.5E+04	3.4E-05	1.9E-06	3.9E-06	5.0E-03	4E-04	8E-04	1E-05	6E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	7.8E+00	1.8E-08	1.0E-09	2.0E-09	1.5E-05	7E-05	1E-04	7E-09	3E-11	4E-03	3E-11	1E-13
		Barium	4.3E+02	9.8E-07	5.5E-08	1.1E-07	5.0E-03	1E-05	2E-05	4E-07	2E-09			
		Cadmium	2.1E+00	4.8E-09	2.7E-10	5.5E-10	1.0E-05	3E-05	5E-05	2E-09	8E-12	2E-03	4E-12	1E-14
		Chromium	2.5E+01	5.7E-08	3.2E-09	6.5E-09	3.0E-04	1E-05	2E-05	2E-08	9E-11	8E-02	2E-09	8E-12
		Cobalt	3.2E+00	7.3E-09	4.1E-10	8.2E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	8.8E+02	2.0E-06	1.1E-07	2.3E-07	5.0E-05	2E-03	5E-03	8E-07	3E-09			
		Mercury	3.2E+00	7.2E-09	4.1E-10	8.1E-10	3.0E-04	1E-06	3E-06	3E-09	1E-11			
		Vanadium	2.9E+01	6.5E-08	3.7E-09	7.4E-09	1.0E-04	4E-05	7E-05	3E-08	1E-10			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Hypothetical Future Construction Workers**
Exposure Area **Random grids across OU3 Upland Area**
Medium **Surface Soil + Subsurface Soil**
Exposure Route **Inhalation of Soil Particulates**

TWFs	CTE	RME	
Noncancer	5.66E-02	1.13E-01	PEF
Cancer	4.04E-04	1.62E-03	4.40E+08 m^3/kg

Area	Grid	COPC	Soil EPC mg/kg	Air EPC mg/m^3	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	HQ CTE	HQ RME	Cancer EC ($\mu g/m^3$) CTE	Cancer EC ($\mu g/m^3$) RME	UR $(\mu g/m^3)^{-1}$	Risk CTE	Risk RME
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	4.9E-14	2.8E-15	5.6E-15	4.0E-08	7E-08	1E-07	2E-14	8E-17	4E+01	8E-13	3E-15
		Aluminum	1.0E+04	2.3E-05	1.3E-06	2.6E-06	5.0E-03	3E-04	5E-04	9E-06	4E-08			
		Antimony	4.5E-01	1.0E-09	5.8E-11	1.2E-10	1.0E-03	6E-08	1E-07	4E-10	2E-12			
		Arsenic	3.9E+00	8.8E-09	5.0E-10	1.0E-09	1.5E-05	3E-05	7E-05	4E-09	1E-11	4E-03	2E-11	6E-14
		Barium	4.0E+02	9.1E-07	5.1E-08	1.0E-07	5.0E-03	1E-05	2E-05	4E-07	1E-09			
		Cadmium	1.1E+00	2.5E-09	1.4E-10	2.9E-10	1.0E-05	1E-05	3E-05	1E-09	4E-12	2E-03	2E-12	7E-15
		Chromium	1.9E+01	4.4E-08	2.5E-09	5.0E-09	3.0E-04	8E-06	2E-05	2E-08	7E-11	8E-02	1E-09	6E-12
		Cobalt	3.1E+00	7.1E-09	4.0E-10	8.0E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	3.9E+02	8.8E-07	5.0E-08	1.0E-07	5.0E-05	1E-03	2E-03	4E-07	1E-09			
		Mercury	9.0E-01	2.0E-09	1.2E-10	2.3E-10	3.0E-04	4E-07	8E-07	8E-10	3E-12			
		Vanadium	1.7E+01	4.0E-08	2.2E-09	4.5E-09	1.0E-04	2E-05	4E-05	2E-08	6E-11			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	4.8E-14	2.7E-15	5.4E-15	4.0E-08	7E-08	1E-07	2E-14	8E-17	4E+01	7E-13	3E-15
		Aluminum	9.8E+03	2.2E-05	1.3E-06	2.5E-06	5.0E-03	3E-04	5E-04	9E-06	4E-08			
		Antimony	no data	--	--	--	1.0E-03	--	--	--	--			
		Arsenic	5.6E+00	1.3E-08	7.2E-10	1.4E-09	1.5E-05	5E-05	1E-04	5E-09	2E-11	4E-03	2E-11	9E-14
		Barium	3.9E+02	9.0E-07	5.1E-08	1.0E-07	5.0E-03	1E-05	2E-05	4E-07	1E-09			
		Cadmium	1.2E+00	2.8E-09	1.6E-10	3.2E-10	1.0E-05	2E-05	3E-05	1E-09	5E-12	2E-03	2E-12	8E-15
		Chromium	1.8E+01	4.0E-08	2.3E-09	4.6E-09	3.0E-04	8E-06	2E-05	2E-08	7E-11	8E-02	1E-09	5E-12
		Cobalt	3.5E+00	8.0E-09	4.5E-10	9.0E-10	2.0E-05	2E-05	5E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	7.4E+02	1.7E-06	9.5E-08	1.9E-07	5.0E-05	2E-03	4E-03	7E-07	3E-09			
		Mercury	1.0E+00	2.4E-09	1.3E-10	2.7E-10	3.0E-04	4E-07	9E-07	1E-09	4E-12			
		Vanadium	2.3E+01	5.3E-08	3.0E-09	6.0E-09	1.0E-04	3E-05	6E-05	2E-08	9E-11			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	5.4E-15	3.1E-16	6.1E-16	4.0E-08	8E-09	2E-08	2E-15	9E-18	4E+01	8E-14	3E-16
		Aluminum	6.7E+03	1.5E-05	8.7E-07	1.7E-06	5.0E-03	2E-04	3E-04	6E-06	2E-08			
		Antimony	4.7E-02	1.1E-10	6.1E-12	1.2E-11	1.0E-03	6E-09	1E-08	4E-11	2E-13			
		Arsenic	2.0E+00	4.6E-09	2.6E-10	5.2E-10	1.5E-05	2E-05	3E-05	2E-09	7E-12	4E-03	8E-12	3E-14
		Barium	2.1E+02	4.7E-07	2.7E-08	5.4E-08	5.0E-03	5E-06	1E-05	2E-07	8E-10			
		Cadmium	2.2E-01	5.0E-10	2.8E-11	5.7E-11	1.0E-05	3E-06	6E-06	2E-10	8E-13	2E-03	4E-13	1E-15
		Chromium	8.7E+00	2.0E-08	1.1E-09	2.2E-09	3.0E-04	4E-06	7E-06	8E-09	3E-11	8E-02	7E-10	3E-12
		Cobalt	1.9E+00	4.2E-09	2.4E-10	4.8E-10	2.0E-05	1E-05	2E-05	2E-09	7E-12	9E-03	2E-11	6E-14
		Manganese	8.5E+01	1.9E-07	1.1E-08	2.2E-08	5.0E-05	2E-04	4E-04	8E-08	3E-10			
		Mercury	4.3E-02	9.7E-11	5.5E-12	1.1E-11	3.0E-04	2E-08	4E-08	4E-11	2E-13			
		Vanadium	8.8E+00	2.0E-08	1.1E-09	2.3E-09	1.0E-04	1E-05	2E-05	8E-09	3E-11			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.2E-05	2.8E-14	1.6E-15	3.2E-15	4.0E-08	4E-08	8E-08	1E-14	5E-17	4E+01	4E-13	2E-15
		Aluminum	1.5E+04	3.4E-05	1.9E-06	3.8E-06	5.0E-03	4E-04	8E-04	1E-05	5E-08			
		Antimony	9.0E-02	2.0E-10	1.2E-11	2.3E-11	1.0E-03	1E-08	2E-08	8E-11	3E-13			
		Arsenic	4.2E+00	9.6E-09	5.5E-10	1.1E-09	1.5E-05	4E-05	7E-05	4E-09	2E-11	4E-03	2E-11	7E-14
		Barium	1.9E+03	4.2E-06	2.4E-07	4.8E-07	5.0E-03	5E-05	1E-04	2E-06	7E-09			
		Cadmium	1.0E+00	2.3E-09	1.3E-10	2.6E-10	1.0E-05	1E-05	3E-05	9E-10	4E-12	2E-03	2E-12	7E-15
		Chromium	1.9E+01	4.2E-08	2.4E-09	4.8E-09	3.0E-04	8E-06	2E-05	2E-08	7E-11	8E-02	1E-09	6E-12
		Cobalt	3.3E+00	7.6E-09	4.3E-10	8.6E-10	2.0E-05	2E-05	4E-05	3E-09	1E-11	9E-03	3E-11	1E-13
		Manganese	2.6E+02	6.0E-07	3.4E-08	6.8E-08	5.0E-05	7E-04	1E-03	2E-07	1E-09			
		Mercury	2.6E-01	5.9E-10	3.3E-11	6.6E-11	3.0E-04	1E-07	2E-07	2E-10	9E-13			
		Vanadium	2.0E+01	4.6E-08	2.6E-09	5.3E-09	1.0E-04	3E-05	5E-05	2E-08	8E-11			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-06	1.00	2.7E-13	1.0E-12	7.0E-10	4E-04	1E-03	6E-14	4E-13	1E+05	7E-09	6E-08
		Aluminum	1.9E+04	1.00	1.4E-03	5.3E-03	1.0E+00	1E-03	5E-03	3E-04	2E-03			
		Antimony	1.5E+00	1.00	1.1E-07	4.2E-07	4.0E-04	3E-04	1E-03	2E-08	2E-07			
		Arsenic	9.3E+00	0.60	4.1E-07	1.6E-06	3.0E-04	1E-03	5E-03	9E-08	7E-07	2E+00	1E-07	1E-06
		Barium	1.0E+03	1.00	7.6E-05	2.9E-04	2.0E-01	4E-04	1E-03	2E-05	1E-04			
		Cadmium	7.0E-01	1.00	5.1E-08	2.0E-07	1.0E-03	5E-05	2E-04	1E-08	8E-08			
		Chromium	2.0E+01	1.00	1.5E-06	5.6E-06	3.0E-03	5E-04	2E-03	3E-07	2E-06	5E-01	2E-07	1E-06
		Cobalt	5.3E+00	1.00	3.9E-07	1.5E-06	3.0E-04	1E-03	5E-03	8E-08	6E-07			
		Iron	1.7E+04	1.00	1.3E-03	4.8E-03	7.0E-01	2E-03	7E-03	3E-04	2E-03			
		Manganese	4.8E+02	1.00	3.5E-05	1.3E-04	2.4E-02	1E-03	6E-03	8E-06	6E-05			
		Mercury	1.4E-01	1.00	1.0E-08	3.9E-08	3.0E-04	3E-05	1E-04	2E-09	2E-08			
		Thallium	2.1E-01	1.00	1.5E-08	5.9E-08	1.0E-05	2E-03	6E-03	3E-09	3E-08			
		Vanadium	4.2E+01	1.00	3.0E-06	1.2E-05	5.0E-03	6E-04	2E-03	6E-07	5E-06			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	1.00	1.8E-13	7.0E-13	7.0E-10	3E-04	1E-03	4E-14	3E-13	1E+05	5E-09	4E-08
		Aluminum	6.7E+03	1.00	4.9E-04	1.9E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	9.0E-02	1.00	6.5E-09	2.5E-08	4.0E-04	2E-05	6E-05	1E-09	1E-08			
		Arsenic	1.0E+00	0.60	4.4E-08	1.7E-07	3.0E-04	1E-04	6E-04	9E-09	7E-08	2E+00	1E-08	1E-07
		Barium	2.0E+02	1.00	1.5E-05	5.6E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	6.4E-02	1.00	4.7E-09	1.8E-08	1.0E-03	5E-06	2E-05	1E-09	8E-09			
		Chromium	8.7E+00	1.00	6.3E-07	2.4E-06	3.0E-03	2E-04	8E-04	1E-07	1E-06	5E-01	7E-08	5E-07
		Cobalt	2.6E+00	1.00	1.9E-07	7.3E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	8.1E+03	1.00	5.9E-04	2.3E-03	7.0E-01	8E-04	3E-03	1E-04	1E-03			
		Manganese	1.1E+02	1.00	7.9E-06	3.0E-05	2.4E-02	3E-04	1E-03	2E-06	1E-05			
		Mercury	1.2E-02	1.00	8.7E-10	3.3E-09	3.0E-04	3E-06	1E-05	2E-10	1E-09			
		Thallium	8.5E-02	1.00	6.2E-09	2.4E-08	1.0E-05	6E-04	2E-03	1E-09	1E-08			
		Vanadium	9.4E+00	1.00	6.8E-07	2.6E-06	5.0E-03	1E-04	5E-04	1E-07	1E-06			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	1.00	4.8E-14	1.8E-13	7.0E-10	7E-05	3E-04	1E-14	8E-14	1E+05	1E-09	1E-08
		Aluminum	6.4E+03	1.00	4.6E-04	1.8E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	9.0E-02	1.00	6.5E-09	2.5E-08	4.0E-04	2E-05	6E-05	1E-09	1E-08			
		Arsenic	9.5E-01	0.60	4.1E-08	1.6E-07	3.0E-04	1E-04	5E-04	9E-09	7E-08	2E+00	1E-08	1E-07
		Barium	2.0E+02	1.00	1.5E-05	5.6E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	7.3E-02	1.00	5.3E-09	2.0E-08	1.0E-03	5E-06	2E-05	1E-09	9E-09			
		Chromium	7.2E+00	1.00	5.2E-07	2.0E-06	3.0E-03	2E-04	7E-04	1E-07	9E-07	5E-01	6E-08	4E-07
		Cobalt	2.4E+00	1.00	1.7E-07	6.7E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	7.5E+03	1.00	5.4E-04	2.1E-03	7.0E-01	8E-04	3E-03	1E-04	9E-04			
		Manganese	8.4E+01	1.00	6.1E-06	2.4E-05	2.4E-02	3E-04	1E-03	1E-06	1E-05			
		Mercury	1.6E-02	1.00	1.2E-09	4.5E-09	3.0E-04	4E-06	1E-05	2E-10	2E-09			
		Thallium	8.5E-02	1.00	6.2E-09	2.4E-08	1.0E-05	6E-04	2E-03	1E-09	1E-08			
		Vanadium	8.7E+00	1.00	6.3E-07	2.4E-06	5.0E-03	1E-04	5E-04	1E-07	1E-06			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	1.00	2.1E-13	8.2E-13	7.0E-10	3E-04	1E-03	5E-14	3E-13	1E+05	6E-09	5E-08
		Aluminum	7.6E+03	1.00	5.5E-04	2.1E-03	1.0E+00	5E-04	2E-03	1E-04	9E-04			
		Antimony	1.9E-01	1.00	1.4E-08	5.3E-08	4.0E-04	3E-05	1E-04	3E-09	2E-08			
		Arsenic	1.7E+00	0.60	7.4E-08	2.8E-07	3.0E-04	2E-04	9E-04	2E-08	1E-07	2E+00	2E-08	2E-07
		Barium	1.9E+02	1.00	1.4E-05	5.3E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	1.4E-01	1.00	1.0E-08	3.9E-08	1.0E-03	1E-05	4E-05	2E-09	2E-08			
		Chromium	1.1E+01	1.00	7.9E-07	3.0E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	8E-08	6E-07
		Cobalt	3.1E+00	1.00	2.3E-07	8.6E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	8.5E+03	1.00	6.2E-04	2.4E-03	7.0E-01	9E-04	3E-03	1E-04	1E-03			
		Manganese	1.5E+02	1.00	1.1E-05	4.3E-05	2.4E-02	5E-04	2E-03	2E-06	2E-05			
		Mercury	3.3E-02	1.00	2.4E-09	9.2E-09	3.0E-04	8E-06	3E-05	5E-10	4E-09			
		Thallium	1.1E-01	1.00	8.0E-09	3.1E-08	1.0E-05	8E-04	3E-03	2E-09	1E-08			
		Vanadium	1.9E+01	1.00	1.4E-06	5.3E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	1.00	1.2E-13	4.8E-13	7.0E-10	2E-04	7E-04	3E-14	2E-13	1E+05	3E-09	3E-08
		Aluminum	8.2E+03	1.00	6.0E-04	2.3E-03	1.0E+00	6E-04	2E-03	1E-04	1E-03			
		Antimony	2.0E-01	1.00	1.5E-08	5.6E-08	4.0E-04	4E-05	1E-04	3E-09	2E-08			
		Arsenic	1.2E+00	0.60	5.2E-08	2.0E-07	3.0E-04	2E-04	7E-04	1E-08	9E-08	2E+00	2E-08	1E-07
		Barium	3.6E+02	1.00	2.6E-05	1.0E-04	2.0E-01	1E-04	5E-04	6E-06	4E-05			
		Cadmium	1.3E-01	1.00	9.5E-09	3.6E-08	1.0E-03	9E-06	4E-05	2E-09	2E-08			
		Chromium	1.0E+01	1.00	7.3E-07	2.8E-06	3.0E-03	2E-04	9E-04	2E-07	1E-06	5E-01	8E-08	6E-07
		Cobalt	2.6E+00	1.00	1.9E-07	7.3E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	8.7E+03	1.00	6.3E-04	2.4E-03	7.0E-01	9E-04	3E-03	1E-04	1E-03			
		Manganese	1.1E+02	1.00	7.9E-06	3.0E-05	2.4E-02	3E-04	1E-03	2E-06	1E-05			
		Mercury	2.4E-02	1.00	1.7E-09	6.7E-09	3.0E-04	6E-06	2E-05	4E-10	3E-09			
		Thallium	1.2E-01	1.00	8.7E-09	3.3E-08	1.0E-05	9E-04	3E-03	2E-09	1E-08			
		Vanadium	1.2E+01	1.00	8.6E-07	3.3E-06	5.0E-03	2E-04	7E-04	2E-07	1E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	7.1E-07	1.00	5.2E-14	2.0E-13	7.0E-10	7E-05	3E-04	1E-14	9E-14	1E+05	1E-09	1E-08
		Aluminum	6.6E+03	1.00	4.8E-04	1.9E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	4.1E-02	1.00	2.9E-09	1.1E-08	4.0E-04	7E-06	3E-05	6E-10	5E-09			
		Arsenic	1.9E+00	0.60	8.1E-08	3.1E-07	3.0E-04	3E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Barium	8.5E+01	1.00	6.2E-06	2.4E-05	2.0E-01	3E-05	1E-04	1E-06	1E-05			
		Cadmium	4.4E-02	1.00	3.2E-09	1.2E-08	1.0E-03	3E-06	1E-05	7E-10	5E-09			
		Chromium	1.0E+01	1.00	7.5E-07	2.9E-06	3.0E-03	2E-04	1E-03	2E-07	1E-06	5E-01	8E-08	6E-07
		Cobalt	2.9E+00	1.00	2.1E-07	8.0E-07	3.0E-04	7E-04	3E-03	4E-08	3E-07			
		Iron	7.9E+03	1.00	5.8E-04	2.2E-03	7.0E-01	8E-04	3E-03	1E-04	9E-04			
		Manganese	1.3E+02	1.00	9.1E-06	3.5E-05	2.4E-02	4E-04	1E-03	2E-06	1E-05			
		Mercury	3.4E-03	1.00	2.5E-10	9.6E-10	3.0E-04	8E-07	3E-06	5E-11	4E-10			
		Thallium	1.1E-01	1.00	7.6E-09	2.9E-08	1.0E-05	8E-04	3E-03	2E-09	1E-08			
		Vanadium	9.4E+00	1.00	6.8E-07	2.6E-06	5.0E-03	1E-04	5E-04	1E-07	1E-06			
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	1.00	3.9E-14	1.5E-13	7.0E-10	6E-05	2E-04	8E-15	6E-14	1E+05	1E-09	8E-09
		Aluminum	4.8E+03	1.00	3.5E-04	1.4E-03	1.0E+00	4E-04	1E-03	8E-05	6E-04			
		Antimony	1.5E-01	1.00	1.1E-08	4.2E-08	4.0E-04	3E-05	1E-04	2E-09	2E-08			
		Arsenic	1.1E+00	0.60	4.8E-08	1.8E-07	3.0E-04	2E-04	6E-04	1E-08	8E-08	2E+00	2E-08	1E-07
		Barium	1.2E+02	1.00	8.8E-06	3.4E-05	2.0E-01	4E-05	2E-04	2E-06	1E-05			
		Cadmium	4.6E-02	1.00	3.3E-09	1.3E-08	1.0E-03	3E-06	1E-05	7E-10	5E-09			
		Chromium	6.3E+00	1.00	4.6E-07	1.8E-06	3.0E-03	2E-04	6E-04	1E-07	8E-07	5E-01	5E-08	4E-07
		Cobalt	2.2E+00	1.00	1.6E-07	6.1E-07	3.0E-04	5E-04	2E-03	3E-08	3E-07			
		Iron	7.6E+03	1.00	5.5E-04	2.1E-03	7.0E-01	8E-04	3E-03	1E-04	9E-04			
		Manganese	9.1E+01	1.00	6.6E-06	2.5E-05	2.4E-02	3E-04	1E-03	1E-06	1E-05			
		Mercury	3.1E-03	1.00	2.3E-10	8.6E-10	3.0E-04	8E-07	3E-06	5E-11	4E-10			
		Thallium	6.9E-02	1.00	5.0E-09	1.9E-08	1.0E-05	5E-04	2E-03	1E-09	8E-09			
		Vanadium	8.3E+00	1.00	6.0E-07	2.3E-06	5.0E-03	1E-04	5E-04	1E-07	1E-06			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	1.0E-06	1.00	7.4E-14	2.8E-13	7.0E-10	1E-04	4E-04	2E-14	1E-13	1E+05	2E-09	2E-08
		Aluminum	8.8E+03	1.00	6.4E-04	2.4E-03	1.0E+00	6E-04	2E-03	1E-04	1E-03			
		Antimony	9.0E-02	1.00	6.5E-09	2.5E-08	4.0E-04	2E-05	6E-05	1E-09	1E-08			
		Arsenic	4.0E+00	0.60	1.7E-07	6.7E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07	2E+00	6E-08	4E-07
		Barium	2.3E+02	1.00	1.7E-05	6.3E-05	2.0E-01	8E-05	3E-04	4E-06	3E-05			
		Cadmium	1.3E-01	1.00	9.5E-09	3.6E-08	1.0E-03	9E-06	4E-05	2E-09	2E-08			
		Chromium	1.1E+01	1.00	7.7E-07	3.0E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	8E-08	6E-07
		Cobalt	4.2E+00	1.00	3.1E-07	1.2E-06	3.0E-04	1E-03	4E-03	7E-08	5E-07			
		Iron	1.2E+04	1.00	8.4E-04	3.2E-03	7.0E-01	1E-03	5E-03	2E-04	1E-03			
		Manganese	3.9E+02	1.00	2.8E-05	1.1E-04	2.4E-02	1E-03	5E-03	6E-06	5E-05			
		Mercury	1.7E-02	1.00	1.2E-09	4.7E-09	3.0E-04	4E-06	2E-05	3E-10	2E-09			
		Thallium	1.3E-01	1.00	9.5E-09	3.6E-08	1.0E-05	9E-04	4E-03	2E-09	2E-08			
		Vanadium	1.7E+01	1.00	1.2E-06	4.6E-06	5.0E-03	2E-04	9E-04	3E-07	2E-06			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	1.00	6.1E-14	2.3E-13	7.0E-10	9E-05	3E-04	1E-14	1E-13	1E+05	2E-09	1E-08
		Aluminum	7.2E+03	1.00	5.2E-04	2.0E-03	1.0E+00	5E-04	2E-03	1E-04	9E-04			
		Antimony	8.5E-02	1.00	6.2E-09	2.4E-08	4.0E-04	2E-05	6E-05	1E-09	1E-08			
		Arsenic	1.6E+00	0.60	7.0E-08	2.7E-07	3.0E-04	2E-04	9E-04	1E-08	1E-07	2E+00	2E-08	2E-07
		Barium	2.0E+02	1.00	1.4E-05	5.6E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	9.3E-02	1.00	6.8E-09	2.6E-08	1.0E-03	7E-06	3E-05	1E-09	1E-08			
		Chromium	8.2E+00	1.00	6.0E-07	2.3E-06	3.0E-03	2E-04	8E-04	1E-07	1E-06	5E-01	6E-08	5E-07
		Cobalt	3.2E+00	1.00	2.3E-07	8.9E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	8.8E+03	1.00	6.4E-04	2.4E-03	7.0E-01	9E-04	3E-03	1E-04	1E-03			
		Manganese	1.6E+02	1.00	1.1E-05	4.4E-05	2.4E-02	5E-04	2E-03	2E-06	2E-05			
		Mercury	1.3E-02	1.00	9.5E-10	3.6E-09	3.0E-04	3E-06	1E-05	2E-10	2E-09			
		Thallium	9.9E-02	1.00	7.2E-09	2.8E-08	1.0E-05	7E-04	3E-03	2E-09	1E-08			
		Vanadium	1.1E+01	1.00	7.8E-07	3.0E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	1.00	5.3E-14	2.0E-13	7.0E-10	8E-05	3E-04	1E-14	9E-14	1E+05	1E-09	1E-08
		Aluminum	9.5E+03	1.00	6.9E-04	2.7E-03	1.0E+00	7E-04	3E-03	1E-04	1E-03			
		Antimony	2.3E-01	1.00	1.7E-08	6.4E-08	4.0E-04	4E-05	2E-04	4E-09	3E-08			
		Arsenic	2.1E+00	0.60	9.2E-08	3.5E-07	3.0E-04	3E-04	1E-03	2E-08	2E-07	2E+00	3E-08	2E-07
		Barium	2.3E+02	1.00	1.7E-05	6.3E-05	2.0E-01	8E-05	3E-04	4E-06	3E-05			
		Cadmium	1.9E-01	1.00	1.4E-08	5.3E-08	1.0E-03	1E-05	5E-05	3E-09	2E-08			
		Chromium	8.9E+00	1.00	6.5E-07	2.5E-06	3.0E-03	2E-04	8E-04	1E-07	1E-06	5E-01	7E-08	5E-07
		Cobalt	4.5E+00	1.00	3.3E-07	1.3E-06	3.0E-04	1E-03	4E-03	7E-08	5E-07			
		Iron	1.1E+04	1.00	8.2E-04	3.2E-03	7.0E-01	1E-03	5E-03	2E-04	1E-03			
		Manganese	4.9E+02	1.00	3.5E-05	1.4E-04	2.4E-02	1E-03	6E-03	8E-06	6E-05			
		Mercury	1.8E-02	1.00	1.3E-09	5.0E-09	3.0E-04	4E-06	2E-05	3E-10	2E-09			
		Thallium	1.2E-01	1.00	8.7E-09	3.3E-08	1.0E-05	9E-04	3E-03	2E-09	1E-08			
		Vanadium	1.2E+01	1.00	8.4E-07	3.2E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	1.00	6.7E-13	2.6E-12	7.0E-10	1E-03	4E-03	1E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	1.3E+04	1.00	9.1E-04	3.5E-03	1.0E+00	9E-04	3E-03	2E-04	1E-03			
		Antimony	8.0E-01	1.00	5.8E-08	2.2E-07	4.0E-04	1E-04	6E-04	1E-08	1E-07			
		Arsenic	5.1E+00	0.60	2.2E-07	8.5E-07	3.0E-04	7E-04	3E-03	5E-08	4E-07	2E+00	7E-08	5E-07
		Barium	4.9E+02	1.00	3.6E-05	1.4E-04	2.0E-01	2E-04	7E-04	8E-06	6E-05			
		Cadmium	8.5E-01	1.00	6.2E-08	2.4E-07	1.0E-03	6E-05	2E-04	1E-08	1E-07			
		Chromium	1.8E+01	1.00	1.3E-06	4.9E-06	3.0E-03	4E-04	2E-03	3E-07	2E-06	5E-01	1E-07	1E-06
		Cobalt	4.9E+00	1.00	3.6E-07	1.4E-06	3.0E-04	1E-03	5E-03	8E-08	6E-07			
		Iron	1.3E+04	1.00	9.3E-04	3.6E-03	7.0E-01	1E-03	5E-03	2E-04	2E-03			
		Manganese	4.1E+02	1.00	3.0E-05	1.1E-04	2.4E-02	1E-03	5E-03	6E-06	5E-05			
		Mercury	2.7E-01	1.00	2.0E-08	7.5E-08	3.0E-04	7E-05	3E-04	4E-09	3E-08			
		Thallium	1.4E-01	1.00	1.0E-08	3.9E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	3.1E+01	1.00	2.3E-06	8.6E-06	5.0E-03	5E-04	2E-03	5E-07	4E-06			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	1.00	1.1E-13	4.3E-13	7.0E-10	2E-04	6E-04	2E-14	2E-13	1E+05	3E-09	2E-08
		Aluminum	7.9E+03	1.00	5.8E-04	2.2E-03	1.0E+00	6E-04	2E-03	1E-04	9E-04			
		Antimony	3.3E-01	1.00	2.4E-08	9.2E-08	4.0E-04	6E-05	2E-04	5E-09	4E-08			
		Arsenic	2.5E+00	0.60	1.1E-07	4.2E-07	3.0E-04	4E-04	1E-03	2E-08	2E-07	2E+00	4E-08	3E-07
		Barium	2.0E+02	1.00	1.5E-05	5.7E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	2.6E-01	1.00	1.9E-08	7.1E-08	1.0E-03	2E-05	7E-05	4E-09	3E-08			
		Chromium	1.0E+01	1.00	7.3E-07	2.8E-06	3.0E-03	2E-04	9E-04	2E-07	1E-06	5E-01	8E-08	6E-07
		Cobalt	3.5E+00	1.00	2.5E-07	9.8E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	9.9E+03	1.00	7.2E-04	2.8E-03	7.0E-01	1E-03	4E-03	2E-04	1E-03			
		Manganese	2.6E+02	1.00	1.9E-05	7.4E-05	2.4E-02	8E-04	3E-03	4E-06	3E-05			
		Mercury	4.0E-02	1.00	2.9E-09	1.1E-08	3.0E-04	1E-05	4E-05	6E-10	5E-09			
		Thallium	8.7E-02	1.00	6.3E-09	2.4E-08	1.0E-05	6E-04	2E-03	1E-09	1E-08			
		Vanadium	1.1E+01	1.00	8.3E-07	3.2E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			
Upland	38[a]	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	1.00	1.5E-13	5.9E-13	7.0E-10	2E-04	8E-04	3E-14	3E-13	1E+05	4E-09	3E-08
		Aluminum	2.7E+03	1.00	2.0E-04	7.5E-04	1.0E+00	2E-04	8E-04	4E-05	3E-04			
		Antimony	8.5E-02	1.00	6.2E-09	2.4E-08	4.0E-04	2E-05	6E-05	1E-09	1E-08			
		Arsenic	1.0E+00	0.60	4.4E-08	1.7E-07	3.0E-04	1E-04	6E-04	9E-09	7E-08	2E+00	1E-08	1E-07
		Barium	4.4E+01	1.00	3.2E-06	1.2E-05	2.0E-01	2E-05	6E-05	7E-07	5E-06			
		Cadmium	1.6E-02	1.00	1.2E-09	4.5E-09	1.0E-03	1E-06	4E-06	2E-10	2E-09			
		Chromium	3.8E+00	1.00	2.8E-07	1.1E-06	3.0E-03	9E-05	4E-04	6E-08	5E-07	5E-01	3E-08	2E-07
		Cobalt	1.5E+00	1.00	1.1E-07	4.2E-07	3.0E-04	4E-04	1E-03	2E-08	2E-07			
		Iron	5.2E+03	1.00	3.8E-04	1.5E-03	7.0E-01	5E-04	2E-03	8E-05	6E-04			
		Manganese	3.9E+01	1.00	2.8E-06	1.1E-05	2.4E-02	1E-04	4E-04	6E-07	5E-06			
		Mercury	4.6E-03	1.00	3.3E-10	1.3E-09	3.0E-04	1E-06	4E-06	7E-11	5E-10			
		Thallium	1.7E-02	1.00	1.2E-09	4.6E-09	1.0E-05	1E-04	5E-04	3E-10	2E-09			
		Vanadium	5.3E+00	1.00	3.9E-07	1.5E-06	5.0E-03	8E-05	3E-04	8E-08	6E-07			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	2.0E-13	7.8E-13	7.0E-10	3E-04	1E-03	4E-14	3E-13	1E+05	6E-09	4E-08
		Aluminum	9.7E+03	1.00	7.1E-04	2.7E-03	1.0E+00	7E-04	3E-03	2E-04	1E-03			
		Antimony	4.3E-01	1.00	3.1E-08	1.2E-07	4.0E-04	8E-05	3E-04	7E-09	5E-08			
		Arsenic	2.2E+00	0.60	9.4E-08	3.6E-07	3.0E-04	3E-04	1E-03	2E-08	2E-07	2E+00	3E-08	2E-07
		Barium	4.3E+02	1.00	3.1E-05	1.2E-04	2.0E-01	2E-04	6E-04	7E-06	5E-05			
		Cadmium	3.3E-01	1.00	2.4E-08	9.3E-08	1.0E-03	2E-05	9E-05	5E-09	4E-08			
		Chromium	1.2E+01	1.00	8.7E-07	3.3E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	9E-08	7E-07
		Cobalt	3.3E+00	1.00	2.4E-07	9.1E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	9.9E+03	1.00	7.2E-04	2.8E-03	7.0E-01	1E-03	4E-03	2E-04	1E-03			
		Manganese	1.3E+02	1.00	9.7E-06	3.7E-05	2.4E-02	4E-04	2E-03	2E-06	2E-05			
		Mercury	7.4E-02	1.00	5.4E-09	2.1E-08	3.0E-04	2E-05	7E-05	1E-09	9E-09			
		Thallium	1.3E-01	1.00	9.7E-09	3.7E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	1.8E+01	1.00	1.3E-06	5.0E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	1.00	2.6E-13	9.9E-13	7.0E-10	4E-04	1E-03	6E-14	4E-13	1E+05	7E-09	6E-08
		Aluminum	6.0E+03	1.00	4.3E-04	1.7E-03	1.0E+00	4E-04	2E-03	9E-05	7E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.4E+00	0.60	6.1E-08	2.3E-07	3.0E-04	2E-04	8E-04	1E-08	1E-07	2E+00	2E-08	2E-07
		Barium	2.1E+02	1.00	1.5E-05	5.7E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	2.8E-01	1.00	2.0E-08	7.8E-08	1.0E-03	2E-05	8E-05	4E-09	3E-08			
		Chromium	1.1E+01	1.00	8.1E-07	3.1E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	9E-08	7E-07
		Cobalt	2.2E+00	1.00	1.6E-07	6.1E-07	3.0E-04	5E-04	2E-03	3E-08	3E-07			
		Iron	6.3E+03	1.00	4.6E-04	1.7E-03	7.0E-01	7E-04	2E-03	1E-04	7E-04			
		Manganese	9.2E+01	1.00	6.7E-06	2.6E-05	2.4E-02	3E-04	1E-03	1E-06	1E-05			
		Mercury	4.0E-02	1.00	2.9E-09	1.1E-08	3.0E-04	1E-05	4E-05	6E-10	5E-09			
		Thallium	6.8E-02	1.00	4.9E-09	1.9E-08	1.0E-05	5E-04	2E-03	1E-09	8E-09			
		Vanadium	7.6E+00	1.00	5.5E-07	2.1E-06	5.0E-03	1E-04	4E-04	1E-07	9E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	2.9E-13	1.1E-12	7.0E-10	4E-04	2E-03	6E-14	5E-13	1E+05	8E-09	6E-08
		Aluminum	5.7E+03	1.00	4.2E-04	1.6E-03	1.0E+00	4E-04	2E-03	9E-05	7E-04			
		Antimony	4.2E-02	1.00	3.1E-09	1.2E-08	4.0E-04	8E-06	3E-05	7E-10	5E-09			
		Arsenic	1.3E+00	0.60	5.7E-08	2.2E-07	3.0E-04	2E-04	7E-04	1E-08	9E-08	2E+00	2E-08	1E-07
		Barium	3.2E+02	1.00	2.3E-05	8.9E-05	2.0E-01	1E-04	4E-04	5E-06	4E-05			
		Cadmium	2.8E-01	1.00	2.0E-08	7.8E-08	1.0E-03	2E-05	8E-05	4E-09	3E-08			
		Chromium	8.3E+00	1.00	6.0E-07	2.3E-06	3.0E-03	2E-04	8E-04	1E-07	1E-06	5E-01	6E-08	5E-07
		Cobalt	1.6E+00	1.00	1.2E-07	4.5E-07	3.0E-04	4E-04	1E-03	2E-08	2E-07			
		Iron	4.7E+03	1.00	3.4E-04	1.3E-03	7.0E-01	5E-04	2E-03	7E-05	6E-04			
		Manganese	1.3E+02	1.00	9.2E-06	3.5E-05	2.4E-02	4E-04	1E-03	2E-06	2E-05			
		Mercury	5.7E-02	1.00	4.1E-09	1.6E-08	3.0E-04	1E-05	5E-05	9E-10	7E-09			
		Thallium	6.5E-03	1.00	4.7E-10	1.8E-09	1.0E-05	5E-05	2E-04	1E-10	8E-10			
		Vanadium	5.3E+00	1.00	3.9E-07	1.5E-06	5.0E-03	8E-05	3E-04	8E-08	6E-07			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	1.00	5.4E-13	2.1E-12	7.0E-10	8E-04	3E-03	1E-13	9E-13	1E+05	2E-08	1E-07
		Aluminum	1.3E+04	1.00	9.4E-04	3.6E-03	1.0E+00	9E-04	4E-03	2E-04	2E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.1E+00	0.60	1.4E-07	5.2E-07	3.0E-04	5E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	3.0E+02	1.00	2.2E-05	8.3E-05	2.0E-01	1E-04	4E-04	5E-06	4E-05			
		Cadmium	3.2E-01	1.00	2.3E-08	8.9E-08	1.0E-03	2E-05	9E-05	5E-09	4E-08			
		Chromium	2.1E+01	1.00	1.5E-06	5.7E-06	3.0E-03	5E-04	2E-03	3E-07	2E-06	5E-01	2E-07	1E-06
		Cobalt	4.9E+00	1.00	3.6E-07	1.4E-06	3.0E-04	1E-03	5E-03	8E-08	6E-07			
		Iron	1.6E+04	1.00	1.2E-03	4.5E-03	7.0E-01	2E-03	6E-03	2E-04	2E-03			
		Manganese	3.0E+02	1.00	2.2E-05	8.3E-05	2.4E-02	9E-04	3E-03	5E-06	4E-05			
		Mercury	1.6E-01	1.00	1.2E-08	4.5E-08	3.0E-04	4E-05	1E-04	2E-09	2E-08			
		Thallium	1.7E-01	1.00	1.2E-08	4.7E-08	1.0E-05	1E-03	5E-03	3E-09	2E-08			
		Vanadium	1.8E+01	1.00	1.3E-06	5.1E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	2.8E-13	1.1E-12	7.0E-10	4E-04	2E-03	6E-14	5E-13	1E+05	8E-09	6E-08
		Aluminum	9.1E+03	1.00	6.6E-04	2.5E-03	1.0E+00	7E-04	3E-03	1E-04	1E-03			
		Antimony	7.6E-01	1.00	5.5E-08	2.1E-07	4.0E-04	1E-04	5E-04	1E-08	9E-08			
		Arsenic	2.8E+00	0.60	1.2E-07	4.7E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	5.8E+02	1.00	4.2E-05	1.6E-04	2.0E-01	2E-04	8E-04	9E-06	7E-05			
		Cadmium	4.7E-01	1.00	3.4E-08	1.3E-07	1.0E-03	3E-05	1E-04	7E-09	6E-08			
		Chromium	1.3E+01	1.00	9.7E-07	3.7E-06	3.0E-03	3E-04	1E-03	2E-07	2E-06	5E-01	1E-07	8E-07
		Cobalt	2.8E+00	1.00	2.0E-07	7.8E-07	3.0E-04	7E-04	3E-03	4E-08	3E-07			
		Iron	7.8E+03	1.00	5.7E-04	2.2E-03	7.0E-01	8E-04	3E-03	1E-04	9E-04			
		Manganese	1.5E+02	1.00	1.1E-05	4.1E-05	2.4E-02	4E-04	2E-03	2E-06	2E-05			
		Mercury	1.2E-01	1.00	8.7E-09	3.3E-08	3.0E-04	3E-05	1E-04	2E-09	1E-08			
		Thallium	9.6E-02	1.00	7.0E-09	2.7E-08	1.0E-05	7E-04	3E-03	1E-09	1E-08			
		Vanadium	2.7E+01	1.00	1.9E-06	7.5E-06	5.0E-03	4E-04	1E-03	4E-07	3E-06			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	1.6E-13	6.0E-13	7.0E-10	2E-04	9E-04	3E-14	3E-13	1E+05	4E-09	3E-08
		Aluminum	9.9E+03	1.00	7.2E-04	2.8E-03	1.0E+00	7E-04	3E-03	2E-04	1E-03			
		Antimony	1.2E+00	1.00	8.5E-08	3.2E-07	4.0E-04	2E-04	8E-04	2E-08	1E-07			
		Arsenic	4.4E+00	0.60	1.9E-07	7.4E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07	2E+00	6E-08	5E-07
		Barium	2.9E+02	1.00	2.1E-05	8.1E-05	2.0E-01	1E-04	4E-04	5E-06	3E-05			
		Cadmium	8.0E-01	1.00	5.8E-08	2.2E-07	1.0E-03	6E-05	2E-04	1E-08	1E-07			
		Chromium	1.2E+01	1.00	8.7E-07	3.3E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	9E-08	7E-07
		Cobalt	3.0E+00	1.00	2.2E-07	8.4E-07	3.0E-04	7E-04	3E-03	5E-08	4E-07			
		Iron	8.1E+03	1.00	5.9E-04	2.3E-03	7.0E-01	8E-04	3E-03	1E-04	1E-03			
		Manganese	3.3E+02	1.00	2.4E-05	9.3E-05	2.4E-02	1E-03	4E-03	5E-06	4E-05			
		Mercury	1.6E-01	1.00	1.1E-08	4.4E-08	3.0E-04	4E-05	1E-04	2E-09	2E-08			
		Thallium	9.5E-02	1.00	6.9E-09	2.6E-08	1.0E-05	7E-04	3E-03	1E-09	1E-08			
		Vanadium	3.4E+01	1.00	2.5E-06	9.5E-06	5.0E-03	5E-04	2E-03	5E-07	4E-06			
Upland	45[a]	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	1.00	2.7E-14	1.0E-13	7.0E-10	4E-05	1E-04	6E-15	4E-14	1E+05	7E-10	6E-09
		Aluminum	2.1E+04	1.00	1.5E-03	5.9E-03	1.0E+00	2E-03	6E-03	3E-04	3E-03			
		Antimony	2.3E-01	1.00	1.7E-08	6.4E-08	4.0E-04	4E-05	2E-04	4E-09	3E-08			
		Arsenic	3.1E+00	0.60	1.4E-07	5.2E-07	3.0E-04	5E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	3.1E+02	1.00	2.3E-05	8.7E-05	2.0E-01	1E-04	4E-04	5E-06	4E-05			
		Cadmium	8.0E-02	1.00	5.8E-09	2.2E-08	1.0E-03	6E-06	2E-05	1E-09	1E-08			
		Chromium	1.8E+01	1.00	1.3E-06	5.1E-06	3.0E-03	4E-04	2E-03	3E-07	2E-06	5E-01	1E-07	1E-06
		Cobalt	6.9E+00	1.00	5.0E-07	1.9E-06	3.0E-04	2E-03	6E-03	1E-07	8E-07			
		Iron	2.0E+04	1.00	1.5E-03	5.7E-03	7.0E-01	2E-03	8E-03	3E-04	2E-03			
		Manganese	1.8E+02	1.00	1.3E-05	4.9E-05	2.4E-02	5E-04	2E-03	3E-06	2E-05			
		Mercury	1.9E-02	1.00	1.4E-09	5.3E-09	3.0E-04	5E-06	2E-05	3E-10	2E-09			
		Thallium	2.1E-01	1.00	1.5E-08	5.9E-08	1.0E-05	2E-03	6E-03	3E-09	3E-08			
		Vanadium	1.9E+01	1.00	1.4E-06	5.2E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-06	1.00	2.2E-13	8.4E-13	7.0E-10	3E-04	1E-03	5E-14	4E-13	1E+05	6E-09	5E-08
		Aluminum	1.2E+04	1.00	8.5E-04	3.3E-03	1.0E+00	9E-04	3E-03	2E-04	1E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.3E+00	0.60	1.0E-07	3.8E-07	3.0E-04	3E-04	1E-03	2E-08	2E-07	2E+00	3E-08	2E-07
		Barium	4.2E+02	1.00	3.0E-05	1.2E-04	2.0E-01	2E-04	6E-04	7E-06	5E-05			
		Cadmium	2.4E-01	1.00	1.7E-08	6.7E-08	1.0E-03	2E-05	7E-05	4E-09	3E-08			
		Chromium	1.7E+01	1.00	1.3E-06	4.8E-06	3.0E-03	4E-04	2E-03	3E-07	2E-06	5E-01	1E-07	1E-06
		Cobalt	4.9E+00	1.00	3.6E-07	1.4E-06	3.0E-04	1E-03	5E-03	8E-08	6E-07			
		Iron	1.4E+04	1.00	1.0E-03	3.9E-03	7.0E-01	1E-03	6E-03	2E-04	2E-03			
		Manganese	2.4E+02	1.00	1.7E-05	6.6E-05	2.4E-02	7E-04	3E-03	4E-06	3E-05			
		Mercury	4.1E-02	1.00	3.0E-09	1.1E-08	3.0E-04	1E-05	4E-05	6E-10	5E-09			
		Thallium	1.6E-01	1.00	1.2E-08	4.5E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	1.8E+01	1.00	1.3E-06	4.9E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	1.2E-12	4.5E-12	7.0E-10	2E-03	6E-03	3E-13	2E-12	1E+05	3E-08	3E-07
		Aluminum	1.8E+04	1.00	1.3E-03	4.9E-03	1.0E+00	1E-03	5E-03	3E-04	2E-03			
		Antimony	1.6E+00	1.00	1.2E-07	4.5E-07	4.0E-04	3E-04	1E-03	2E-08	2E-07			
		Arsenic	1.3E+01	0.60	5.6E-07	2.1E-06	3.0E-04	2E-03	7E-03	1E-07	9E-07	2E+00	2E-07	1E-06
		Barium	5.6E+02	1.00	4.1E-05	1.6E-04	2.0E-01	2E-04	8E-04	9E-06	7E-05			
		Cadmium	5.2E+00	1.00	3.8E-07	1.5E-06	1.0E-03	4E-04	1E-03	8E-08	6E-07			
		Chromium	2.2E+01	1.00	1.6E-06	6.2E-06	3.0E-03	5E-04	2E-03	3E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	2.0E+00	1.00	1.5E-07	5.6E-07	3.0E-04	5E-04	2E-03	3E-08	2E-07			
		Iron	2.9E+03	1.00	2.1E-04	8.2E-04	7.0E-01	3E-04	1E-03	5E-05	4E-04			
		Manganese	1.1E+03	1.00	8.3E-05	3.2E-04	2.4E-02	3E-03	1E-02	2E-05	1E-04			
		Mercury	8.1E-01	1.00	5.9E-08	2.3E-07	3.0E-04	2E-04	8E-04	1E-08	1E-07			
		Thallium	2.1E-01	1.00	1.5E-08	5.9E-08	1.0E-05	2E-03	6E-03	3E-09	3E-08			
		Vanadium	5.1E+01	1.00	3.7E-06	1.4E-05	5.0E-03	7E-04	3E-03	8E-07	6E-06			
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	1.00	3.6E-12	1.4E-11	7.0E-10	5E-03	2E-02	8E-13	6E-12	1E+05	1E-07	8E-07
		Aluminum	1.9E+04	1.00	1.4E-03	5.2E-03	1.0E+00	1E-03	5E-03	3E-04	2E-03			
		Antimony	2.4E+00	1.00	1.7E-07	6.7E-07	4.0E-04	4E-04	2E-03	4E-08	3E-07			
		Arsenic	1.4E+01	0.60	6.2E-07	2.4E-06	3.0E-04	2E-03	8E-03	1E-07	1E-06	2E+00	2E-07	2E-06
		Barium	8.0E+02	1.00	5.8E-05	2.2E-04	2.0E-01	3E-04	1E-03	1E-05	1E-04			
		Cadmium	8.3E+00	1.00	6.0E-07	2.3E-06	1.0E-03	6E-04	2E-03	1E-07	1E-06			
		Chromium	5.8E+01	1.00	4.2E-06	1.6E-05	3.0E-03	1E-03	5E-03	9E-07	7E-06	5E-01	5E-07	3E-06
		Cobalt	2.0E+00	1.00	1.5E-07	5.6E-07	3.0E-04	5E-04	2E-03	3E-08	2E-07			
		Iron	3.6E+03	1.00	2.6E-04	1.0E-03	7.0E-01	4E-04	1E-03	6E-05	4E-04			
		Manganese	1.7E+03	1.00	1.2E-04	4.6E-04	2.4E-02	5E-03	2E-02	3E-05	2E-04			
		Mercury	2.5E+00	1.00	1.8E-07	7.0E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Thallium	3.3E-01	1.00	2.4E-08	9.2E-08	1.0E-05	2E-03	9E-03	5E-09	4E-08			
		Vanadium	7.1E+01	1.00	5.1E-06	2.0E-05	5.0E-03	1E-03	4E-03	1E-06	8E-06			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	1.00	2.9E-12	1.1E-11	7.0E-10	4E-03	2E-02	6E-13	5E-12	1E+05	8E-08	6E-07
		Aluminum	1.4E+04	1.00	1.0E-03	4.0E-03	1.0E+00	1E-03	4E-03	2E-04	2E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.6E+00	0.60	1.6E-07	6.0E-07	3.0E-04	5E-04	2E-03	3E-08	3E-07	2E+00	5E-08	4E-07
		Barium	1.0E+03	1.00	7.3E-05	2.8E-04	2.0E-01	4E-04	1E-03	2E-05	1E-04			
		Cadmium	2.0E+00	1.00	1.5E-07	5.6E-07	1.0E-03	1E-04	6E-04	3E-08	2E-07			
		Chromium	2.9E+01	1.00	2.1E-06	8.0E-06	3.0E-03	7E-04	3E-03	4E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	4.5E+00	1.00	3.3E-07	1.3E-06	3.0E-04	1E-03	4E-03	7E-08	5E-07			
		Iron	1.5E+04	1.00	1.1E-03	4.2E-03	7.0E-01	2E-03	6E-03	2E-04	2E-03			
		Manganese	5.8E+02	1.00	4.2E-05	1.6E-04	2.4E-02	2E-03	7E-03	9E-06	7E-05			
		Mercury	8.0E+00	1.00	5.8E-07	2.2E-06	3.0E-04	2E-03	7E-03	1E-07	1E-06			
		Thallium	1.6E-01	1.00	1.2E-08	4.5E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	2.2E+01	1.00	1.6E-06	6.1E-06	5.0E-03	3E-04	1E-03	3E-07	3E-06			
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	1.00	1.8E-12	6.8E-12	7.0E-10	3E-03	1E-02	4E-13	3E-12	1E+05	5E-08	4E-07
		Aluminum	1.2E+04	1.00	8.4E-04	3.2E-03	1.0E+00	8E-04	3E-03	2E-04	1E-03			
		Antimony	1.2E+00	1.00	8.4E-08	3.2E-07	4.0E-04	2E-04	8E-04	2E-08	1E-07			
		Arsenic	7.9E+00	0.60	3.4E-07	1.3E-06	3.0E-04	1E-03	4E-03	7E-08	6E-07	2E+00	1E-07	8E-07
		Barium	5.2E+02	1.00	3.8E-05	1.4E-04	2.0E-01	2E-04	7E-04	8E-06	6E-05			
		Cadmium	3.9E+00	1.00	2.8E-07	1.1E-06	1.0E-03	3E-04	1E-03	6E-08	5E-07			
		Chromium	2.4E+01	1.00	1.8E-06	6.8E-06	3.0E-03	6E-04	2E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	2.2E+00	1.00	1.6E-07	6.1E-07	3.0E-04	5E-04	2E-03	3E-08	3E-07			
		Iron	4.4E+03	1.00	3.2E-04	1.2E-03	7.0E-01	5E-04	2E-03	7E-05	5E-04			
		Manganese	1.3E+03	1.00	9.1E-05	3.5E-04	2.4E-02	4E-03	1E-02	2E-05	2E-04			
		Mercury	7.5E-01	1.00	5.5E-08	2.1E-07	3.0E-04	2E-04	7E-04	1E-08	9E-08			
		Thallium	1.9E-01	1.00	1.4E-08	5.3E-08	1.0E-05	1E-03	5E-03	3E-09	2E-08			
		Vanadium	2.9E+01	1.00	2.1E-06	8.0E-06	5.0E-03	4E-04	2E-03	4E-07	3E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	1.00	2.3E-13	8.7E-13	7.0E-10	3E-04	1E-03	5E-14	4E-13	1E+05	6E-09	5E-08
		Aluminum	3.2E+03	1.00	2.3E-04	9.0E-04	1.0E+00	2E-04	9E-04	5E-05	4E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.2E+00	0.60	9.6E-08	3.7E-07	3.0E-04	3E-04	1E-03	2E-08	2E-07	2E+00	3E-08	2E-07
		Barium	1.1E+02	1.00	7.9E-06	3.0E-05	2.0E-01	4E-05	2E-04	2E-06	1E-05			
		Cadmium	5.2E-01	1.00	3.8E-08	1.5E-07	1.0E-03	4E-05	1E-04	8E-09	6E-08			
		Chromium	9.0E+00	1.00	6.5E-07	2.5E-06	3.0E-03	2E-04	8E-04	1E-07	1E-06	5E-01	7E-08	5E-07
		Cobalt	2.0E+00	1.00	1.5E-07	5.6E-07	3.0E-04	5E-04	2E-03	3E-08	2E-07			
		Iron	5.2E+03	1.00	3.8E-04	1.4E-03	7.0E-01	5E-04	2E-03	8E-05	6E-04			
		Manganese	2.2E+02	1.00	1.6E-05	6.2E-05	2.4E-02	7E-04	3E-03	3E-06	3E-05			
		Mercury	1.6E-01	1.00	1.2E-08	4.5E-08	3.0E-04	4E-05	1E-04	2E-09	2E-08			
		Thallium	5.2E-02	1.00	3.8E-09	1.5E-08	1.0E-05	4E-04	1E-03	8E-10	6E-09			
		Vanadium	9.2E+00	1.00	6.7E-07	2.6E-06	5.0E-03	1E-04	5E-04	1E-07	1E-06			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	1.6E-13	6.0E-13	7.0E-10	2E-04	9E-04	3E-14	3E-13	1E+05	4E-09	3E-08
		Aluminum	4.9E+03	1.00	3.6E-04	1.4E-03	1.0E+00	4E-04	1E-03	8E-05	6E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.8E+00	0.60	7.7E-08	3.0E-07	3.0E-04	3E-04	1E-03	2E-08	1E-07	2E+00	2E-08	2E-07
		Barium	9.6E+01	1.00	7.0E-06	2.7E-05	2.0E-01	4E-05	1E-04	2E-06	1E-05			
		Cadmium	1.6E-01	1.00	1.2E-08	4.4E-08	1.0E-03	1E-05	4E-05	2E-09	2E-08			
		Chromium	6.8E+00	1.00	5.0E-07	1.9E-06	3.0E-03	2E-04	6E-04	1E-07	8E-07	5E-01	5E-08	4E-07
		Cobalt	2.7E+00	1.00	1.9E-07	7.4E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	6.8E+03	1.00	5.0E-04	1.9E-03	7.0E-01	7E-04	3E-03	1E-04	8E-04			
		Manganese	1.3E+02	1.00	9.6E-06	3.7E-05	2.4E-02	4E-04	2E-03	2E-06	2E-05			
		Mercury	5.5E-02	1.00	4.0E-09	1.5E-08	3.0E-04	1E-05	5E-05	9E-10	7E-09			
		Thallium	6.6E-02	1.00	4.8E-09	1.8E-08	1.0E-05	5E-04	2E-03	1E-09	8E-09			
		Vanadium	7.7E+00	1.00	5.6E-07	2.2E-06	5.0E-03	1E-04	4E-04	1E-07	9E-07			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.7E-12	6.3E-12	7.0E-10	2E-03	9E-03	4E-13	3E-12	1E+05	5E-08	4E-07
		Aluminum	1.2E+04	1.00	8.8E-04	3.4E-03	1.0E+00	9E-04	3E-03	2E-04	1E-03			
		Antimony	4.6E-01	1.00	3.3E-08	1.3E-07	4.0E-04	8E-05	3E-04	7E-09	5E-08			
		Arsenic	2.6E+00	0.60	1.1E-07	4.4E-07	3.0E-04	4E-04	1E-03	2E-08	2E-07	2E+00	4E-08	3E-07
		Barium	5.7E+02	1.00	4.1E-05	1.6E-04	2.0E-01	2E-04	8E-04	9E-06	7E-05			
		Cadmium	1.2E+00	1.00	8.7E-08	3.3E-07	1.0E-03	9E-05	3E-04	2E-08	1E-07			
		Chromium	2.2E+01	1.00	1.6E-06	6.0E-06	3.0E-03	5E-04	2E-03	3E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	3.8E+00	1.00	2.8E-07	1.1E-06	3.0E-04	9E-04	4E-03	6E-08	5E-07			
		Iron	1.2E+04	1.00	8.7E-04	3.3E-03	7.0E-01	1E-03	5E-03	2E-04	1E-03			
		Manganese	4.4E+02	1.00	3.2E-05	1.2E-04	2.4E-02	1E-03	5E-03	7E-06	5E-05			
		Mercury	4.3E+00	1.00	3.1E-07	1.2E-06	3.0E-04	1E-03	4E-03	7E-08	5E-07			
		Thallium	1.5E-01	1.00	1.1E-08	4.2E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	1.4E+01	1.00	1.0E-06	3.9E-06	5.0E-03	2E-04	8E-04	2E-07	2E-06			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	1.1E-12	4.0E-12	7.0E-10	2E-03	6E-03	2E-13	2E-12	1E+05	3E-08	2E-07
		Aluminum	1.1E+04	1.00	7.8E-04	3.0E-03	1.0E+00	8E-04	3E-03	2E-04	1E-03			
		Antimony	1.9E+00	1.00	1.4E-07	5.3E-07	4.0E-04	3E-04	1E-03	3E-08	2E-07			
		Arsenic	1.1E+01	0.60	4.7E-07	1.8E-06	3.0E-04	2E-03	6E-03	1E-07	8E-07	2E+00	2E-07	1E-06
		Barium	7.1E+02	1.00	5.1E-05	2.0E-04	2.0E-01	3E-04	1E-03	1E-05	8E-05			
		Cadmium	4.7E+00	1.00	3.4E-07	1.3E-06	1.0E-03	3E-04	1E-03	7E-08	6E-07			
		Chromium	2.4E+01	1.00	1.7E-06	6.6E-06	3.0E-03	6E-04	2E-03	4E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	2.3E+00	1.00	1.7E-07	6.4E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	3.7E+03	1.00	2.7E-04	1.0E-03	7.0E-01	4E-04	1E-03	6E-05	4E-04			
		Manganese	2.0E+03	1.00	1.4E-04	5.5E-04	2.4E-02	6E-03	2E-02	3E-05	2E-04			
		Mercury	7.2E-01	1.00	5.2E-08	2.0E-07	3.0E-04	2E-04	7E-04	1E-08	9E-08			
		Thallium	1.9E-01	1.00	1.4E-08	5.3E-08	1.0E-05	1E-03	5E-03	3E-09	2E-08			
		Vanadium	1.4E+01	1.00	1.0E-06	3.9E-06	5.0E-03	2E-04	8E-04	2E-07	2E-06			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	4.0E-12	1.5E-11	7.0E-10	6E-03	2E-02	9E-13	7E-12	1E+05	1E-07	9E-07
		Aluminum	1.5E+04	1.00	1.1E-03	4.3E-03	1.0E+00	1E-03	4E-03	2E-04	2E-03			
		Antimony	1.2E+00	1.00	8.7E-08	3.3E-07	4.0E-04	2E-04	8E-04	2E-08	1E-07			
		Arsenic	1.4E+01	0.60	5.9E-07	2.3E-06	3.0E-04	2E-03	8E-03	1E-07	1E-06	2E+00	2E-07	1E-06
		Barium	1.1E+03	1.00	8.1E-05	3.1E-04	2.0E-01	4E-04	2E-03	2E-05	1E-04			
		Cadmium	5.6E+00	1.00	4.1E-07	1.6E-06	1.0E-03	4E-04	2E-03	9E-08	7E-07			
		Chromium	4.2E+01	1.00	3.0E-06	1.2E-05	3.0E-03	1E-03	4E-03	6E-07	5E-06	5E-01	3E-07	2E-06
		Cobalt	1.6E+00	1.00	1.2E-07	4.5E-07	3.0E-04	4E-04	1E-03	2E-08	2E-07			
		Iron	2.7E+03	1.00	2.0E-04	7.6E-04	7.0E-01	3E-04	1E-03	4E-05	3E-04			
		Manganese	2.7E+03	1.00	2.0E-04	7.5E-04	2.4E-02	8E-03	3E-02	4E-05	3E-04			
		Mercury	1.1E+00	1.00	8.0E-08	3.1E-07	3.0E-04	3E-04	1E-03	2E-08	1E-07			
		Thallium	2.7E-01	1.00	2.0E-08	7.5E-08	1.0E-05	2E-03	8E-03	4E-09	3E-08			
		Vanadium	4.9E+01	1.00	3.6E-06	1.4E-05	5.0E-03	7E-04	3E-03	8E-07	6E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.9E-05	1.00	4.3E-12	1.6E-11	7.0E-10	6E-03	2E-02	9E-13	7E-12	1E+05	1E-07	9E-07
		Aluminum	1.6E+04	1.00	1.2E-03	4.4E-03	1.0E+00	1E-03	4E-03	2E-04	2E-03			
		Antimony	1.7E+00	1.00	1.2E-07	4.8E-07	4.0E-04	3E-04	1E-03	3E-08	2E-07			
		Arsenic	1.2E+01	0.60	5.4E-07	2.1E-06	3.0E-04	2E-03	7E-03	1E-07	9E-07	2E+00	2E-07	1E-06
		Barium	7.8E+02	1.00	5.7E-05	2.2E-04	2.0E-01	3E-04	1E-03	1E-05	9E-05			
		Cadmium	6.7E+00	1.00	4.8E-07	1.9E-06	1.0E-03	5E-04	2E-03	1E-07	8E-07			
		Chromium	4.9E+01	1.00	3.5E-06	1.4E-05	3.0E-03	1E-03	5E-03	8E-07	6E-06	5E-01	4E-07	3E-06
		Cobalt	2.4E+00	1.00	1.8E-07	6.7E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	5.2E+03	1.00	3.8E-04	1.5E-03	7.0E-01	5E-04	2E-03	8E-05	6E-04			
		Manganese	1.8E+03	1.00	1.3E-04	5.1E-04	2.4E-02	6E-03	2E-02	3E-05	2E-04			
		Mercury	1.3E+00	1.00	9.4E-08	3.6E-07	3.0E-04	3E-04	1E-03	2E-08	2E-07			
		Thallium	3.5E-01	1.00	2.6E-08	9.8E-08	1.0E-05	3E-03	1E-02	5E-09	4E-08			
		Vanadium	5.8E+01	1.00	4.2E-06	1.6E-05	5.0E-03	8E-04	3E-03	9E-07	7E-06			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	6.1E-12	2.3E-11	7.0E-10	9E-03	3E-02	1E-12	1E-11	1E+05	2E-07	1E-06
		Aluminum	1.6E+04	1.00	1.2E-03	4.5E-03	1.0E+00	1E-03	4E-03	3E-04	2E-03			
		Antimony	2.3E+00	1.00	1.7E-07	6.4E-07	4.0E-04	4E-04	2E-03	4E-08	3E-07			
		Arsenic	1.2E+01	0.60	5.2E-07	2.0E-06	3.0E-04	2E-03	7E-03	1E-07	9E-07	2E+00	2E-07	1E-06
		Barium	8.0E+02	1.00	5.8E-05	2.2E-04	2.0E-01	3E-04	1E-03	1E-05	1E-04			
		Cadmium	4.8E+00	1.00	3.5E-07	1.3E-06	1.0E-03	3E-04	1E-03	7E-08	6E-07			
		Chromium	4.0E+01	1.00	2.9E-06	1.1E-05	3.0E-03	1E-03	4E-03	6E-07	5E-06	5E-01	3E-07	2E-06
		Cobalt	2.6E+00	1.00	1.9E-07	7.3E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	8.0E+03	1.00	5.8E-04	2.2E-03	7.0E-01	8E-04	3E-03	1E-04	1E-03			
		Manganese	1.5E+03	1.00	1.1E-04	4.3E-04	2.4E-02	5E-03	2E-02	2E-05	2E-04			
		Mercury	1.2E+00	1.00	8.7E-08	3.3E-07	3.0E-04	3E-04	1E-03	2E-08	1E-07			
		Thallium	2.0E-01	1.00	1.5E-08	5.6E-08	1.0E-05	1E-03	6E-03	3E-09	2E-08			
		Vanadium	4.7E+01	1.00	3.4E-06	1.3E-05	5.0E-03	7E-04	3E-03	7E-07	6E-06			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	1.2E-12	4.4E-12	7.0E-10	2E-03	6E-03	2E-13	2E-12	1E+05	3E-08	2E-07
		Aluminum	8.6E+03	1.00	6.3E-04	2.4E-03	1.0E+00	6E-04	2E-03	1E-04	1E-03			
		Antimony	8.2E-01	1.00	6.0E-08	2.3E-07	4.0E-04	1E-04	6E-04	1E-08	1E-07			
		Arsenic	6.2E+00	0.60	2.7E-07	1.0E-06	3.0E-04	9E-04	3E-03	6E-08	4E-07	2E+00	9E-08	7E-07
		Barium	7.4E+02	1.00	5.4E-05	2.1E-04	2.0E-01	3E-04	1E-03	1E-05	9E-05			
		Cadmium	3.3E+00	1.00	2.4E-07	9.3E-07	1.0E-03	2E-04	9E-04	5E-08	4E-07			
		Chromium	2.1E+01	1.00	1.5E-06	5.9E-06	3.0E-03	5E-04	2E-03	3E-07	3E-06	5E-01	2E-07	1E-06
		Cobalt	2.1E+00	1.00	1.5E-07	5.9E-07	3.0E-04	5E-04	2E-03	3E-08	3E-07			
		Iron	5.1E+03	1.00	3.7E-04	1.4E-03	7.0E-01	5E-04	2E-03	8E-05	6E-04			
		Manganese	1.6E+03	1.00	1.2E-04	4.5E-04	2.4E-02	5E-03	2E-02	3E-05	2E-04			
		Mercury	1.0E+00	1.00	7.3E-08	2.8E-07	3.0E-04	2E-04	9E-04	2E-08	1E-07			
		Thallium	1.6E-01	1.00	1.2E-08	4.5E-08	1.0E-05	1E-03	5E-03	3E-09	2E-08			
		Vanadium	1.5E+01	1.00	1.1E-06	4.1E-06	5.0E-03	2E-04	8E-04	2E-07	2E-06			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.7E-06	1.00	6.3E-13	2.4E-12	7.0E-10	9E-04	3E-03	1E-13	1E-12	1E+05	2E-08	1E-07
		Aluminum	8.0E+03	1.00	5.8E-04	2.2E-03	1.0E+00	6E-04	2E-03	1E-04	1E-03			
		Antimony	3.1E-01	1.00	2.3E-08	8.6E-08	4.0E-04	6E-05	2E-04	5E-09	4E-08			
		Arsenic	4.6E+00	0.60	2.0E-07	7.7E-07	3.0E-04	7E-04	3E-03	4E-08	3E-07	2E+00	6E-08	5E-07
		Barium	2.8E+02	1.00	2.1E-05	7.9E-05	2.0E-01	1E-04	4E-04	4E-06	3E-05			
		Cadmium	1.7E+00	1.00	1.2E-07	4.7E-07	1.0E-03	1E-04	5E-04	3E-08	2E-07			
		Chromium	1.5E+01	1.00	1.1E-06	4.2E-06	3.0E-03	4E-04	1E-03	2E-07	2E-06	5E-01	1E-07	9E-07
		Cobalt	3.4E+00	1.00	2.5E-07	9.5E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	8.4E+03	1.00	6.1E-04	2.3E-03	7.0E-01	9E-04	3E-03	1E-04	1E-03			
		Manganese	8.5E+02	1.00	6.2E-05	2.4E-04	2.4E-02	3E-03	1E-02	1E-05	1E-04			
		Mercury	1.9E-01	1.00	1.4E-08	5.3E-08	3.0E-04	5E-05	2E-04	3E-09	2E-08			
		Thallium	1.1E-01	1.00	8.0E-09	3.1E-08	1.0E-05	8E-04	3E-03	2E-09	1E-08			
		Vanadium	1.4E+01	1.00	1.0E-06	3.8E-06	5.0E-03	2E-04	8E-04	2E-07	2E-06			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	1.00	4.2E-13	1.6E-12	7.0E-10	6E-04	2E-03	9E-14	7E-13	1E+05	1E-08	9E-08
		Aluminum	8.2E+03	1.00	6.0E-04	2.3E-03	1.0E+00	6E-04	2E-03	1E-04	1E-03			
		Antimony	2.0E-01	1.00	1.5E-08	5.6E-08	4.0E-04	4E-05	1E-04	3E-09	2E-08			
		Arsenic	3.7E+00	0.60	1.6E-07	6.2E-07	3.0E-04	5E-04	2E-03	3E-08	3E-07	2E+00	5E-08	4E-07
		Barium	2.0E+02	1.00	1.4E-05	5.4E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	1.1E+00	1.00	8.0E-08	3.1E-07	1.0E-03	8E-05	3E-04	2E-08	1E-07			
		Chromium	1.2E+01	1.00	9.0E-07	3.5E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	1E-07	7E-07
		Cobalt	3.8E+00	1.00	2.8E-07	1.1E-06	3.0E-04	9E-04	4E-03	6E-08	5E-07			
		Iron	9.9E+03	1.00	7.2E-04	2.8E-03	7.0E-01	1E-03	4E-03	2E-04	1E-03			
		Manganese	4.8E+02	1.00	3.5E-05	1.3E-04	2.4E-02	1E-03	6E-03	7E-06	6E-05			
		Mercury	1.1E-01	1.00	8.0E-09	3.1E-08	3.0E-04	3E-05	1E-04	2E-09	1E-08			
		Thallium	1.1E-01	1.00	8.0E-09	3.1E-08	1.0E-05	8E-04	3E-03	2E-09	1E-08			
		Vanadium	1.3E+01	1.00	9.7E-07	3.7E-06	5.0E-03	2E-04	7E-04	2E-07	2E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	1.00	8.0E-14	3.1E-13	7.0E-10	1E-04	4E-04	2E-14	1E-13	1E+05	2E-09	2E-08
		Aluminum	7.7E+03	1.00	5.6E-04	2.2E-03	1.0E+00	6E-04	2E-03	1E-04	9E-04			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.6E+00	0.60	1.1E-07	4.4E-07	3.0E-04	4E-04	1E-03	2E-08	2E-07	2E+00	4E-08	3E-07
		Barium	1.6E+02	1.00	1.2E-05	4.5E-05	2.0E-01	6E-05	2E-04	3E-06	2E-05			
		Cadmium	3.7E-01	1.00	2.7E-08	1.0E-07	1.0E-03	3E-05	1E-04	6E-09	4E-08			
		Chromium	1.1E+01	1.00	7.9E-07	3.0E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	8E-08	6E-07
		Cobalt	4.0E+00	1.00	2.9E-07	1.1E-06	3.0E-04	1E-03	4E-03	6E-08	5E-07			
		Iron	1.1E+04	1.00	7.7E-04	3.0E-03	7.0E-01	1E-03	4E-03	2E-04	1E-03			
		Manganese	2.7E+02	1.00	2.0E-05	7.6E-05	2.4E-02	8E-04	3E-03	4E-06	3E-05			
		Mercury	9.6E-02	1.00	7.0E-09	2.7E-08	3.0E-04	2E-05	9E-05	1E-09	1E-08			
		Thallium	1.2E-01	1.00	8.7E-09	3.3E-08	1.0E-05	9E-04	3E-03	2E-09	1E-08			
		Vanadium	1.1E+01	1.00	8.2E-07	3.2E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	1.2E-12	4.6E-12	7.0E-10	2E-03	7E-03	3E-13	2E-12	1E+05	3E-08	3E-07
		Aluminum	7.6E+03	1.00	5.5E-04	2.1E-03	1.0E+00	6E-04	2E-03	1E-04	9E-04			
		Antimony	1.1E-01	1.00	7.6E-09	2.9E-08	4.0E-04	2E-05	7E-05	2E-09	1E-08			
		Arsenic	3.0E+00	0.60	1.3E-07	5.0E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	2.7E+02	1.00	1.9E-05	7.4E-05	2.0E-01	1E-04	4E-04	4E-06	3E-05			
		Cadmium	7.9E-01	1.00	5.7E-08	2.2E-07	1.0E-03	6E-05	2E-04	1E-08	9E-08			
		Chromium	1.2E+01	1.00	8.6E-07	3.3E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	9E-08	7E-07
		Cobalt	3.4E+00	1.00	2.5E-07	9.5E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	9.9E+03	1.00	7.2E-04	2.8E-03	7.0E-01	1E-03	4E-03	2E-04	1E-03			
		Manganese	5.2E+02	1.00	3.8E-05	1.5E-04	2.4E-02	2E-03	6E-03	8E-06	6E-05			
		Mercury	3.6E+00	1.00	2.6E-07	1.0E-06	3.0E-04	9E-04	3E-03	6E-08	4E-07			
		Thallium	1.0E-01	1.00	7.3E-09	2.8E-08	1.0E-05	7E-04	3E-03	2E-09	1E-08			
		Vanadium	1.2E+01	1.00	8.4E-07	3.2E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			
Upland	65[a]	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	1.00	9.4E-13	3.6E-12	7.0E-10	1E-03	5E-03	2E-13	2E-12	1E+05	3E-08	2E-07
		Aluminum	8.7E+03	1.00	6.4E-04	2.4E-03	1.0E+00	6E-04	2E-03	1E-04	1E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.3E+00	0.60	1.9E-07	7.2E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07	2E+00	6E-08	5E-07
		Barium	4.5E+02	1.00	3.3E-05	1.3E-04	2.0E-01	2E-04	6E-04	7E-06	5E-05			
		Cadmium	2.5E+00	1.00	1.8E-07	7.0E-07	1.0E-03	2E-04	7E-04	4E-08	3E-07			
		Chromium	2.7E+01	1.00	2.0E-06	7.5E-06	3.0E-03	7E-04	3E-03	4E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	3.1E+00	1.00	2.3E-07	8.6E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	9.6E+03	1.00	7.0E-04	2.7E-03	7.0E-01	1E-03	4E-03	1E-04	1E-03			
		Manganese	1.4E+03	1.00	9.8E-05	3.8E-04	2.4E-02	4E-03	2E-02	2E-05	2E-04			
		Mercury	3.0E-01	1.00	2.2E-08	8.4E-08	3.0E-04	7E-05	3E-04	5E-09	4E-08			
		Thallium	1.2E-01	1.00	8.7E-09	3.3E-08	1.0E-05	9E-04	3E-03	2E-09	1E-08			
		Vanadium	1.3E+01	1.00	9.6E-07	3.7E-06	5.0E-03	2E-04	7E-04	2E-07	2E-06			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	1.00	1.1E-13	4.3E-13	7.0E-10	2E-04	6E-04	2E-14	2E-13	1E+05	3E-09	2E-08
		Aluminum	4.6E+03	1.00	3.4E-04	1.3E-03	1.0E+00	3E-04	1E-03	7E-05	6E-04			
		Antimony	2.2E-01	1.00	1.6E-08	6.1E-08	4.0E-04	4E-05	2E-04	3E-09	3E-08			
		Arsenic	3.2E+00	0.60	1.4E-07	5.4E-07	3.0E-04	5E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	2.6E+02	1.00	1.9E-05	7.3E-05	2.0E-01	1E-04	4E-04	4E-06	3E-05			
		Cadmium	9.0E-01	1.00	6.5E-08	2.5E-07	1.0E-03	7E-05	3E-04	1E-08	1E-07			
		Chromium	1.2E+01	1.00	8.7E-07	3.3E-06	3.0E-03	3E-04	1E-03	2E-07	1E-06	5E-01	9E-08	7E-07
		Cobalt	2.4E+00	1.00	1.8E-07	6.8E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	6.3E+03	1.00	4.6E-04	1.8E-03	7.0E-01	7E-04	3E-03	1E-04	8E-04			
		Manganese	5.1E+02	1.00	3.7E-05	1.4E-04	2.4E-02	2E-03	6E-03	8E-06	6E-05			
		Mercury	6.6E-02	1.00	4.8E-09	1.8E-08	3.0E-04	2E-05	6E-05	1E-09	8E-09			
		Thallium	7.1E-02	1.00	5.1E-09	2.0E-08	1.0E-05	5E-04	2E-03	1E-09	8E-09			
		Vanadium	7.5E+00	1.00	5.5E-07	2.1E-06	5.0E-03	1E-04	4E-04	1E-07	9E-07			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	6.0E-12	2.3E-11	7.0E-10	9E-03	3E-02	1E-12	1E-11	1E+05	2E-07	1E-06
		Aluminum	6.0E+03	1.00	4.4E-04	1.7E-03	1.0E+00	4E-04	2E-03	9E-05	7E-04			
		Antimony	1.6E+00	1.00	1.2E-07	4.5E-07	4.0E-04	3E-04	1E-03	2E-08	2E-07			
		Arsenic	1.5E+01	0.60	6.5E-07	2.5E-06	3.0E-04	2E-03	8E-03	1E-07	1E-06	2E+00	2E-07	2E-06
		Barium	6.1E+02	1.00	4.5E-05	1.7E-04	2.0E-01	2E-04	9E-04	1E-05	7E-05			
		Cadmium	4.8E+00	1.00	3.5E-07	1.3E-06	1.0E-03	3E-04	1E-03	7E-08	6E-07			
		Chromium	1.9E+01	1.00	1.4E-06	5.2E-06	3.0E-03	5E-04	2E-03	3E-07	2E-06	5E-01	1E-07	1E-06
		Cobalt	2.2E+00	1.00	1.6E-07	6.1E-07	3.0E-04	5E-04	2E-03	3E-08	3E-07			
		Iron	3.5E+03	1.00	2.6E-04	9.8E-04	7.0E-01	4E-04	1E-03	5E-05	4E-04			
		Manganese	2.0E+03	1.00	1.5E-04	5.7E-04	2.4E-02	6E-03	2E-02	3E-05	2E-04			
		Mercury	1.0E-02	1.00	7.3E-10	2.8E-09	3.0E-04	2E-06	9E-06	2E-10	1E-09			
		Thallium	3.8E-01	1.00	2.8E-08	1.1E-07	1.0E-05	3E-03	1E-02	6E-09	5E-08			
		Vanadium	5.6E+00	1.00	4.1E-07	1.6E-06	5.0E-03	8E-05	3E-04	9E-08	7E-07			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	6.0E-12	2.3E-11	7.0E-10	9E-03	3E-02	1E-12	1E-11	1E+05	2E-07	1E-06
		Aluminum	6.0E+03	1.00	4.4E-04	1.7E-03	1.0E+00	4E-04	2E-03	9E-05	7E-04			
		Antimony	1.6E+00	1.00	1.2E-07	4.5E-07	4.0E-04	3E-04	1E-03	2E-08	2E-07			
		Arsenic	1.5E+01	0.60	6.5E-07	2.5E-06	3.0E-04	2E-03	8E-03	1E-07	1E-06	2E+00	2E-07	2E-06
		Barium	6.1E+02	1.00	4.5E-05	1.7E-04	2.0E-01	2E-04	9E-04	1E-05	7E-05			
		Cadmium	4.8E+00	1.00	3.5E-07	1.3E-06	1.0E-03	3E-04	1E-03	7E-08	6E-07			
		Chromium	1.9E+01	1.00	1.4E-06	5.2E-06	3.0E-03	5E-04	2E-03	3E-07	2E-06	5E-01	1E-07	1E-06
		Cobalt	2.2E+00	1.00	1.6E-07	6.1E-07	3.0E-04	5E-04	2E-03	3E-08	3E-07			
		Iron	3.5E+03	1.00	2.6E-04	9.8E-04	7.0E-01	4E-04	1E-03	5E-05	4E-04			
		Manganese	2.0E+03	1.00	1.5E-04	5.7E-04	2.4E-02	6E-03	2E-02	3E-05	2E-04			
		Mercury	1.0E-02	1.00	7.3E-10	2.8E-09	3.0E-04	2E-06	9E-06	2E-10	1E-09			
		Thallium	3.8E-01	1.00	2.8E-08	1.1E-07	1.0E-05	3E-03	1E-02	6E-09	5E-08			
		Vanadium	5.6E+00	1.00	4.1E-07	1.6E-06	5.0E-03	8E-05	3E-04	9E-08	7E-07			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.1E-06	1.00	3.0E-13	1.1E-12	7.0E-10	4E-04	2E-03	6E-14	5E-13	1E+05	8E-09	6E-08
		Aluminum	3.4E+03	1.00	2.4E-04	9.4E-04	1.0E+00	2E-04	9E-04	5E-05	4E-04			
		Antimony	4.7E-01	1.00	3.4E-08	1.3E-07	4.0E-04	9E-05	3E-04	7E-09	6E-08			
		Arsenic	6.0E+00	0.60	2.6E-07	1.0E-06	3.0E-04	9E-04	3E-03	6E-08	4E-07	2E+00	8E-08	6E-07
		Barium	4.5E+02	1.00	3.3E-05	1.3E-04	2.0E-01	2E-04	6E-04	7E-06	5E-05			
		Cadmium	1.8E+00	1.00	1.3E-07	5.0E-07	1.0E-03	1E-04	5E-04	3E-08	2E-07			
		Chromium	1.4E+01	1.00	1.0E-06	3.9E-06	3.0E-03	3E-04	1E-03	2E-07	2E-06	5E-01	1E-07	8E-07
		Cobalt	1.7E+00	1.00	1.2E-07	4.7E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07			
		Iron	3.8E+03	1.00	2.7E-04	1.0E-03	7.0E-01	4E-04	1E-03	6E-05	4E-04			
		Manganese	1.0E+03	1.00	7.2E-05	2.8E-04	2.4E-02	3E-03	1E-02	2E-05	1E-04			
		Mercury	1.1E-01	1.00	8.0E-09	3.1E-08	3.0E-04	3E-05	1E-04	2E-09	1E-08			
		Thallium	1.4E-01	1.00	1.0E-08	3.9E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	1.2E+01	1.00	8.4E-07	3.2E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	1.00	1.7E-13	6.7E-13	7.0E-10	2E-04	1E-03	4E-14	3E-13	1E+05	5E-09	4E-08
		Aluminum	1.1E+03	1.00	7.9E-05	3.0E-04	1.0E+00	8E-05	3E-04	2E-05	1E-04			
		Antimony	7.5E-02	1.00	5.5E-09	2.1E-08	4.0E-04	1E-05	5E-05	1E-09	9E-09			
		Arsenic	5.8E+00	0.60	2.5E-07	9.7E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07	2E+00	8E-08	6E-07
		Barium	5.0E+02	1.00	3.6E-05	1.4E-04	2.0E-01	2E-04	7E-04	8E-06	6E-05			
		Cadmium	1.3E+00	1.00	9.5E-08	3.6E-07	1.0E-03	9E-05	4E-04	2E-08	2E-07			
		Chromium	3.4E+01	1.00	2.5E-06	9.6E-06	3.0E-03	8E-04	3E-03	5E-07	4E-06	5E-01	3E-07	2E-06
		Cobalt	2.5E+00	1.00	1.8E-07	7.0E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	3.0E+03	1.00	2.2E-04	8.3E-04	7.0E-01	3E-04	1E-03	5E-05	4E-04			
		Manganese	7.2E+02	1.00	5.2E-05	2.0E-04	2.4E-02	2E-03	8E-03	1E-05	9E-05			
		Mercury	5.0E-03	1.00	3.6E-10	1.4E-09	3.0E-04	1E-06	5E-06	8E-11	6E-10			
		Thallium	8.3E-02	1.00	6.0E-09	2.3E-08	1.0E-05	6E-04	2E-03	1E-09	1E-08			
		Vanadium	3.5E+00	1.00	2.5E-07	9.8E-07	5.0E-03	5E-05	2E-04	5E-08	4E-07			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.7E-12	6.5E-12	7.0E-10	2E-03	9E-03	4E-13	3E-12	1E+05	5E-08	4E-07
		Aluminum	2.3E+03	1.00	1.7E-04	6.3E-04	1.0E+00	2E-04	6E-04	4E-05	3E-04			
		Antimony	2.4E-01	1.00	1.7E-08	6.7E-08	4.0E-04	4E-05	2E-04	4E-09	3E-08			
		Arsenic	7.0E+00	0.60	3.1E-07	1.2E-06	3.0E-04	1E-03	4E-03	7E-08	5E-07	2E+00	1E-07	8E-07
		Barium	5.4E+02	1.00	3.9E-05	1.5E-04	2.0E-01	2E-04	8E-04	8E-06	6E-05			
		Cadmium	2.2E+00	1.00	1.6E-07	6.1E-07	1.0E-03	2E-04	6E-04	3E-08	3E-07			
		Chromium	1.9E+01	1.00	1.4E-06	5.3E-06	3.0E-03	5E-04	2E-03	3E-07	2E-06	5E-01	1E-07	1E-06
		Cobalt	1.3E+00	1.00	9.5E-08	3.6E-07	3.0E-04	3E-04	1E-03	2E-08	2E-07			
		Iron	1.3E+03	1.00	9.2E-05	3.5E-04	7.0E-01	1E-04	5E-04	2E-05	2E-04			
		Manganese	2.3E+03	1.00	1.6E-04	6.3E-04	2.4E-02	7E-03	3E-02	4E-05	3E-04			
		Mercury	4.9E-03	1.00	3.5E-10	1.4E-09	3.0E-04	1E-06	5E-06	8E-11	6E-10			
		Thallium	6.6E-02	1.00	4.8E-09	1.8E-08	1.0E-05	5E-04	2E-03	1E-09	8E-09			
		Vanadium	4.7E+00	1.00	3.4E-07	1.3E-06	5.0E-03	7E-05	3E-04	7E-08	6E-07			
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-04	1.00	2.2E-11	8.6E-11	7.0E-10	3E-02	1E-01	5E-12	4E-11	1E+05	6E-07	5E-06
		Aluminum	1.8E+04	1.00	1.3E-03	5.1E-03	1.0E+00	1E-03	5E-03	3E-04	2E-03			
		Antimony	2.4E+00	1.00	1.7E-07	6.6E-07	4.0E-04	4E-04	2E-03	4E-08	3E-07			
		Arsenic	4.1E+01	0.60	1.8E-06	6.8E-06	3.0E-04	6E-03	2E-02	4E-07	3E-06	2E+00	6E-07	4E-06
		Barium	8.3E+02	1.00	6.0E-05	2.3E-04	2.0E-01	3E-04	1E-03	1E-05	1E-04			
		Cadmium	6.4E+00	1.00	4.7E-07	1.8E-06	1.0E-03	5E-04	2E-03	1E-07	8E-07			
		Chromium	3.0E+01	1.00	2.2E-06	8.3E-06	3.0E-03	7E-04	3E-03	5E-07	4E-06	5E-01	2E-07	2E-06
		Cobalt	7.3E+00	1.00	5.3E-07	2.0E-06	3.0E-04	2E-03	7E-03	1E-07	9E-07			
		Iron	1.3E+04	1.00	9.8E-04	3.7E-03	7.0E-01	1E-03	5E-03	2E-04	2E-03			
		Manganese	2.3E+03	1.00	1.7E-04	6.5E-04	2.4E-02	7E-03	3E-02	4E-05	3E-04			
		Mercury	2.2E-01	1.00	1.6E-08	6.2E-08	3.0E-04	5E-05	2E-04	3E-09	3E-08			
		Thallium	7.7E-01	1.00	5.6E-08	2.1E-07	1.0E-05	6E-03	2E-02	1E-08	9E-08			
		Vanadium	2.2E+01	1.00	1.6E-06	6.2E-06	5.0E-03	3E-04	1E-03	3E-07	3E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	2.5E-14	9.6E-14	7.0E-10	4E-05	1E-04	5E-15	4E-14	1E+05	7E-10	5E-09
		Aluminum	1.2E+04	1.00	9.0E-04	3.5E-03	1.0E+00	9E-04	3E-03	2E-04	1E-03			
		Antimony	9.5E-02	1.00	6.9E-09	2.7E-08	4.0E-04	2E-05	7E-05	1E-09	1E-08			
		Arsenic	4.3E+00	0.60	1.9E-07	7.2E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07	2E+00	6E-08	5E-07
		Barium	2.1E+02	1.00	1.5E-05	5.7E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	1.5E-01	1.00	1.1E-08	4.2E-08	1.0E-03	1E-05	4E-05	2E-09	2E-08			
		Chromium	1.3E+01	1.00	9.7E-07	3.7E-06	3.0E-03	3E-04	1E-03	2E-07	2E-06	5E-01	1E-07	8E-07
		Cobalt	6.4E+00	1.00	4.7E-07	1.8E-06	3.0E-04	2E-03	6E-03	1E-07	8E-07			
		Iron	1.6E+04	1.00	1.1E-03	4.4E-03	7.0E-01	2E-03	6E-03	2E-04	2E-03			
		Manganese	3.7E+02	1.00	2.7E-05	1.0E-04	2.4E-02	1E-03	4E-03	6E-06	4E-05			
		Mercury	1.4E-02	1.00	1.0E-09	3.9E-09	3.0E-04	3E-06	1E-05	2E-10	2E-09			
		Thallium	1.8E-01	1.00	1.3E-08	5.0E-08	1.0E-05	1E-03	5E-03	3E-09	2E-08			
		Vanadium	1.7E+01	1.00	1.3E-06	4.8E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	1.5E-13	5.7E-13	7.0E-10	2E-04	8E-04	3E-14	2E-13	1E+05	4E-09	3E-08
		Aluminum	6.8E+03	1.00	5.0E-04	1.9E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	1.2E-01	1.00	8.7E-09	3.3E-08	4.0E-04	2E-05	8E-05	2E-09	1E-08			
		Arsenic	2.9E+00	0.60	1.2E-07	4.8E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	1.5E+02	1.00	1.1E-05	4.1E-05	2.0E-01	5E-05	2E-04	2E-06	2E-05			
		Cadmium	1.2E-01	1.00	8.8E-09	3.4E-08	1.0E-03	9E-06	3E-05	2E-09	1E-08			
		Chromium	9.3E+00	1.00	6.7E-07	2.6E-06	3.0E-03	2E-04	9E-04	1E-07	1E-06	5E-01	7E-08	6E-07
		Cobalt	3.3E+00	1.00	2.4E-07	9.3E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	8.8E+03	1.00	6.4E-04	2.5E-03	7.0E-01	9E-04	4E-03	1E-04	1E-03			
		Manganese	1.7E+02	1.00	1.3E-05	4.9E-05	2.4E-02	5E-04	2E-03	3E-06	2E-05			
		Mercury	2.2E-02	1.00	1.6E-09	6.1E-09	3.0E-04	5E-06	2E-05	3E-10	3E-09			
		Thallium	8.5E-02	1.00	6.2E-09	2.4E-08	1.0E-05	6E-04	2E-03	1E-09	1E-08			
		Vanadium	1.0E+01	1.00	7.6E-07	2.9E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	1.5E-13	5.7E-13	7.0E-10	2E-04	8E-04	3E-14	2E-13	1E+05	4E-09	3E-08
		Aluminum	6.8E+03	1.00	5.0E-04	1.9E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	1.2E-01	1.00	8.7E-09	3.3E-08	4.0E-04	2E-05	8E-05	2E-09	1E-08			
		Arsenic	2.9E+00	0.60	1.2E-07	4.8E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	1.5E+02	1.00	1.1E-05	4.1E-05	2.0E-01	5E-05	2E-04	2E-06	2E-05			
		Cadmium	1.2E-01	1.00	8.8E-09	3.4E-08	1.0E-03	9E-06	3E-05	2E-09	1E-08			
		Chromium	9.3E+00	1.00	6.7E-07	2.6E-06	3.0E-03	2E-04	9E-04	1E-07	1E-06	5E-01	7E-08	6E-07
		Cobalt	3.3E+00	1.00	2.4E-07	9.3E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	8.8E+03	1.00	6.4E-04	2.5E-03	7.0E-01	9E-04	4E-03	1E-04	1E-03			
		Manganese	1.7E+02	1.00	1.3E-05	4.9E-05	2.4E-02	5E-04	2E-03	3E-06	2E-05			
		Mercury	2.2E-02	1.00	1.6E-09	6.1E-09	3.0E-04	5E-06	2E-05	3E-10	3E-09			
		Thallium	8.5E-02	1.00	6.2E-09	2.4E-08	1.0E-05	6E-04	2E-03	1E-09	1E-08			
		Vanadium	1.0E+01	1.00	7.6E-07	2.9E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	2.5E-14	9.6E-14	7.0E-10	4E-05	1E-04	5E-15	4E-14	1E+05	7E-10	5E-09
		Aluminum	1.2E+04	1.00	9.0E-04	3.5E-03	1.0E+00	9E-04	3E-03	2E-04	1E-03			
		Antimony	9.5E-02	1.00	6.9E-09	2.7E-08	4.0E-04	2E-05	7E-05	1E-09	1E-08			
		Arsenic	4.3E+00	0.60	1.9E-07	7.2E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07	2E+00	6E-08	5E-07
		Barium	2.1E+02	1.00	1.5E-05	5.7E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	1.5E-01	1.00	1.1E-08	4.2E-08	1.0E-03	1E-05	4E-05	2E-09	2E-08			
		Chromium	1.3E+01	1.00	9.7E-07	3.7E-06	3.0E-03	3E-04	1E-03	2E-07	2E-06	5E-01	1E-07	8E-07
		Cobalt	6.4E+00	1.00	4.7E-07	1.8E-06	3.0E-04	2E-03	6E-03	1E-07	8E-07			
		Iron	1.6E+04	1.00	1.1E-03	4.4E-03	7.0E-01	2E-03	6E-03	2E-04	2E-03			
		Manganese	3.7E+02	1.00	2.7E-05	1.0E-04	2.4E-02	1E-03	4E-03	6E-06	4E-05			
		Mercury	1.4E-02	1.00	1.0E-09	3.9E-09	3.0E-04	3E-06	1E-05	2E-10	2E-09			
		Thallium	1.8E-01	1.00	1.3E-08	5.0E-08	1.0E-05	1E-03	5E-03	3E-09	2E-08			
		Vanadium	1.7E+01	1.00	1.3E-06	4.8E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	1.5E-13	5.7E-13	7.0E-10	2E-04	8E-04	3E-14	2E-13	1E+05	4E-09	3E-08
		Aluminum	6.8E+03	1.00	5.0E-04	1.9E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	1.2E-01	1.00	8.7E-09	3.3E-08	4.0E-04	2E-05	8E-05	2E-09	1E-08			
		Arsenic	2.9E+00	0.60	1.2E-07	4.8E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	1.5E+02	1.00	1.1E-05	4.1E-05	2.0E-01	5E-05	2E-04	2E-06	2E-05			
		Cadmium	1.2E-01	1.00	8.8E-09	3.4E-08	1.0E-03	9E-06	3E-05	2E-09	1E-08			
		Chromium	9.3E+00	1.00	6.7E-07	2.6E-06	3.0E-03	2E-04	9E-04	1E-07	1E-06	5E-01	7E-08	6E-07
		Cobalt	3.3E+00	1.00	2.4E-07	9.3E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	8.8E+03	1.00	6.4E-04	2.5E-03	7.0E-01	9E-04	4E-03	1E-04	1E-03			
		Manganese	1.7E+02	1.00	1.3E-05	4.9E-05	2.4E-02	5E-04	2E-03	3E-06	2E-05			
		Mercury	2.2E-02	1.00	1.6E-09	6.1E-09	3.0E-04	5E-06	2E-05	3E-10	3E-09			
		Thallium	8.5E-02	1.00	6.2E-09	2.4E-08	1.0E-05	6E-04	2E-03	1E-09	1E-08			
		Vanadium	1.0E+01	1.00	7.6E-07	2.9E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	1.5E-13	5.7E-13	7.0E-10	2E-04	8E-04	3E-14	2E-13	1E+05	4E-09	3E-08
		Aluminum	6.8E+03	1.00	5.0E-04	1.9E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	1.2E-01	1.00	8.7E-09	3.3E-08	4.0E-04	2E-05	8E-05	2E-09	1E-08			
		Arsenic	2.9E+00	0.60	1.2E-07	4.8E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07	2E+00	4E-08	3E-07
		Barium	1.5E+02	1.00	1.1E-05	4.1E-05	2.0E-01	5E-05	2E-04	2E-06	2E-05			
		Cadmium	1.2E-01	1.00	8.8E-09	3.4E-08	1.0E-03	9E-06	3E-05	2E-09	1E-08			
		Chromium	9.3E+00	1.00	6.7E-07	2.6E-06	3.0E-03	2E-04	9E-04	1E-07	1E-06	5E-01	7E-08	6E-07
		Cobalt	3.3E+00	1.00	2.4E-07	9.3E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	8.8E+03	1.00	6.4E-04	2.5E-03	7.0E-01	9E-04	4E-03	1E-04	1E-03			
		Manganese	1.7E+02	1.00	1.3E-05	4.9E-05	2.4E-02	5E-04	2E-03	3E-06	2E-05			
		Mercury	2.2E-02	1.00	1.6E-09	6.1E-09	3.0E-04	5E-06	2E-05	3E-10	3E-09			
		Thallium	8.5E-02	1.00	6.2E-09	2.4E-08	1.0E-05	6E-04	2E-03	1E-09	1E-08			
		Vanadium	1.0E+01	1.00	7.6E-07	2.9E-06	5.0E-03	2E-04	6E-04	2E-07	1E-06			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	1.00	4.4E-14	1.7E-13	7.0E-10	6E-05	2E-04	9E-15	7E-14	1E+05	1E-09	9E-09
		Aluminum	7.0E+03	1.00	5.1E-04	2.0E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	1.0E-01	1.00	7.3E-09	2.8E-08	4.0E-04	2E-05	7E-05	2E-09	1E-08			
		Arsenic	4.5E+00	0.60	2.0E-07	7.5E-07	3.0E-04	7E-04	3E-03	4E-08	3E-07	2E+00	6E-08	5E-07
		Barium	1.9E+02	1.00	1.4E-05	5.2E-05	2.0E-01	7E-05	3E-04	3E-06	2E-05			
		Cadmium	3.2E-01	1.00	2.3E-08	8.9E-08	1.0E-03	2E-05	9E-05	5E-09	4E-08			
		Chromium	8.4E+00	1.00	6.1E-07	2.3E-06	3.0E-03	2E-04	8E-04	1E-07	1E-06	5E-01	7E-08	5E-07
		Cobalt	3.9E+00	1.00	2.8E-07	1.1E-06	3.0E-04	9E-04	4E-03	6E-08	5E-07			
		Iron	9.6E+03	1.00	7.0E-04	2.7E-03	7.0E-01	1E-03	4E-03	1E-04	1E-03			
		Manganese	2.8E+02	1.00	2.1E-05	7.9E-05	2.4E-02	9E-04	3E-03	4E-06	3E-05			
		Mercury	3.3E-02	1.00	2.4E-09	9.2E-09	3.0E-04	8E-06	3E-05	5E-10	4E-09			
		Thallium	1.1E-01	1.00	8.0E-09	3.1E-08	1.0E-05	8E-04	3E-03	2E-09	1E-08			
		Vanadium	1.3E+01	1.00	9.1E-07	3.5E-06	5.0E-03	2E-04	7E-04	2E-07	1E-06			
Floodplain	85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	1.00	2.9E-14	1.1E-13	7.0E-10	4E-05	2E-04	6E-15	5E-14	1E+05	8E-10	6E-09
		Aluminum	2.9E+03	1.00	2.1E-04	8.2E-04	1.0E+00	2E-04	8E-04	5E-05	4E-04			
		Antimony	8.5E-02	1.00	6.2E-09	2.4E-08	4.0E-04	2E-05	6E-05	1E-09	1E-08			
		Arsenic	1.9E+00	0.60	8.3E-08	3.2E-07	3.0E-04	3E-04	1E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Barium	2.9E+01	1.00	2.1E-06	8.2E-06	2.0E-01	1E-05	4E-05	5E-07	4E-06			
		Cadmium	1.6E-02	1.00	1.2E-09	4.5E-09	1.0E-03	1E-06	4E-06	2E-10	2E-09			
		Chromium	3.9E+00	1.00	2.8E-07	1.1E-06	3.0E-03	9E-05	4E-04	6E-08	5E-07	5E-01	3E-08	2E-07
		Cobalt	1.8E+00	1.00	1.3E-07	5.0E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07			
		Iron	5.2E+03	1.00	3.7E-04	1.4E-03	7.0E-01	5E-04	2E-03	8E-05	6E-04			
		Manganese	6.4E+01	1.00	4.7E-06	1.8E-05	2.4E-02	2E-04	7E-04	1E-06	8E-06			
		Mercury	4.4E-03	1.00	3.2E-10	1.2E-09	3.0E-04	1E-06	4E-06	7E-11	5E-10			
		Thallium	4.4E-02	1.00	3.2E-09	1.2E-08	1.0E-05	3E-04	1E-03	7E-10	5E-09			
		Vanadium	5.1E+00	1.00	3.7E-07	1.4E-06	5.0E-03	7E-05	3E-04	8E-08	6E-07			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	1.00	1.3E-12	5.1E-12	7.0E-10	2E-03	7E-03	3E-13	2E-12	1E+05	4E-08	3E-07
		Aluminum	2.0E+04	1.00	1.4E-03	5.5E-03	1.0E+00	1E-03	5E-03	3E-04	2E-03			
		Antimony	4.5E-01	1.00	3.3E-08	1.3E-07	4.0E-04	8E-05	3E-04	7E-09	5E-08			
		Arsenic	4.6E+00	0.60	2.0E-07	7.7E-07	3.0E-04	7E-04	3E-03	4E-08	3E-07	2E+00	6E-08	5E-07
		Barium	4.6E+02	1.00	3.3E-05	1.3E-04	2.0E-01	2E-04	6E-04	7E-06	5E-05			
		Cadmium	5.4E-01	1.00	3.9E-08	1.5E-07	1.0E-03	4E-05	2E-04	8E-09	6E-08			
		Chromium	2.0E+01	1.00	1.4E-06	5.4E-06	3.0E-03	5E-04	2E-03	3E-07	2E-06	5E-01	2E-07	1E-06
		Cobalt	5.6E+00	1.00	4.1E-07	1.6E-06	3.0E-04	1E-03	5E-03	9E-08	7E-07			
		Iron	2.3E+04	1.00	1.7E-03	6.4E-03	7.0E-01	2E-03	9E-03	4E-04	3E-03			
		Manganese	5.6E+02	1.00	4.1E-05	1.6E-04	2.4E-02	2E-03	6E-03	9E-06	7E-05			
		Mercury	5.3E-01	1.00	3.9E-08	1.5E-07	3.0E-04	1E-04	5E-04	8E-09	6E-08			
		Thallium	2.0E-01	1.00	1.5E-08	5.6E-08	1.0E-05	1E-03	6E-03	3E-09	2E-08			
		Vanadium	2.1E+01	1.00	1.6E-06	6.0E-06	5.0E-03	3E-04	1E-03	3E-07	3E-06			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	1.00	5.0E-13	1.9E-12	7.0E-10	7E-04	3E-03	1E-13	8E-13	1E+05	1E-08	1E-07
		Aluminum	1.1E+04	1.00	7.9E-04	3.0E-03	1.0E+00	8E-04	3E-03	2E-04	1E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.7E+00	0.60	2.1E-07	7.9E-07	3.0E-04	7E-04	3E-03	4E-08	3E-07	2E+00	7E-08	5E-07
		Barium	7.7E+02	1.00	5.6E-05	2.2E-04	2.0E-01	3E-04	1E-03	1E-05	9E-05			
		Cadmium	7.9E-01	1.00	5.7E-08	2.2E-07	1.0E-03	6E-05	2E-04	1E-08	9E-08			
		Chromium	1.6E+01	1.00	1.1E-06	4.3E-06	3.0E-03	4E-04	1E-03	2E-07	2E-06	5E-01	1E-07	9E-07
		Cobalt	4.0E+00	1.00	2.9E-07	1.1E-06	3.0E-04	1E-03	4E-03	6E-08	5E-07			
		Iron	1.2E+04	1.00	8.9E-04	3.4E-03	7.0E-01	1E-03	5E-03	2E-04	1E-03			
		Manganese	2.7E+02	1.00	2.0E-05	7.6E-05	2.4E-02	8E-04	3E-03	4E-06	3E-05			
		Mercury	1.0E-01	1.00	7.3E-09	2.8E-08	3.0E-04	2E-05	9E-05	2E-09	1E-08			
		Thallium	2.0E-01	1.00	1.5E-08	5.6E-08	1.0E-05	1E-03	6E-03	3E-09	2E-08			
		Vanadium	2.1E+01	1.00	1.5E-06	5.7E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	1.00	4.1E-12	1.6E-11	7.0E-10	6E-03	2E-02	9E-13	7E-12	1E+05	1E-07	9E-07
		Aluminum	1.2E+04	1.00	8.6E-04	3.3E-03	1.0E+00	9E-04	3E-03	2E-04	1E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.5E+00	0.60	2.4E-07	9.2E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07	2E+00	8E-08	6E-07
		Barium	1.5E+03	1.00	1.1E-04	4.0E-04	2.0E-01	5E-04	2E-03	2E-05	2E-04			
		Cadmium	1.8E+00	1.00	1.3E-07	5.0E-07	1.0E-03	1E-04	5E-04	3E-08	2E-07			
		Chromium	2.6E+01	1.00	1.9E-06	7.4E-06	3.0E-03	6E-04	2E-03	4E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	2.6E+00	1.00	1.9E-07	7.3E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07			
		Iron	8.7E+03	1.00	6.3E-04	2.4E-03	7.0E-01	9E-04	3E-03	1E-04	1E-03			
		Manganese	5.3E+02	1.00	3.8E-05	1.5E-04	2.4E-02	2E-03	6E-03	8E-06	6E-05			
		Mercury	6.9E-01	1.00	5.0E-08	1.9E-07	3.0E-04	2E-04	6E-04	1E-08	8E-08			
		Thallium	1.5E-01	1.00	1.1E-08	4.2E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	1.4E+01	1.00	1.0E-06	3.8E-06	5.0E-03	2E-04	8E-04	2E-07	2E-06			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	1.00	7.1E-13	2.7E-12	7.0E-10	1E-03	4E-03	2E-13	1E-12	1E+05	2E-08	2E-07
		Aluminum	1.1E+04	1.00	8.2E-04	3.1E-03	1.0E+00	8E-04	3E-03	2E-04	1E-03			
		Antimony	3.7E-01	1.00	2.7E-08	1.0E-07	4.0E-04	7E-05	3E-04	6E-09	4E-08			
		Arsenic	4.8E+00	0.60	2.1E-07	8.0E-07	3.0E-04	7E-04	3E-03	4E-08	3E-07	2E+00	7E-08	5E-07
		Barium	5.0E+02	1.00	3.7E-05	1.4E-04	2.0E-01	2E-04	7E-04	8E-06	6E-05			
		Cadmium	5.5E-01	1.00	4.0E-08	1.5E-07	1.0E-03	4E-05	2E-04	9E-09	7E-08			
		Chromium	1.7E+01	1.00	1.3E-06	4.8E-06	3.0E-03	4E-04	2E-03	3E-07	2E-06	5E-01	1E-07	1E-06
		Cobalt	4.5E+00	1.00	3.3E-07	1.2E-06	3.0E-04	1E-03	4E-03	7E-08	5E-07			
		Iron	1.3E+04	1.00	9.2E-04	3.5E-03	7.0E-01	1E-03	5E-03	2E-04	2E-03			
		Manganese	3.7E+02	1.00	2.7E-05	1.0E-04	2.4E-02	1E-03	4E-03	6E-06	4E-05			
		Mercury	1.8E-01	1.00	1.3E-08	5.0E-08	3.0E-04	4E-05	2E-04	3E-09	2E-08			
		Thallium	1.6E-01	1.00	1.1E-08	4.4E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	1.9E+01	1.00	1.4E-06	5.2E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	4.0E-12	1.5E-11	7.0E-10	6E-03	2E-02	9E-13	7E-12	1E+05	1E-07	9E-07
		Aluminum	1.1E+04	1.00	8.1E-04	3.1E-03	1.0E+00	8E-04	3E-03	2E-04	1E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.0E+01	0.60	4.4E-07	1.7E-06	3.0E-04	1E-03	6E-03	9E-08	7E-07	2E+00	1E-07	1E-06
		Barium	7.6E+02	1.00	5.6E-05	2.1E-04	2.0E-01	3E-04	1E-03	1E-05	9E-05			
		Cadmium	2.8E+00	1.00	2.0E-07	7.8E-07	1.0E-03	2E-04	8E-04	4E-08	3E-07			
		Chromium	2.8E+01	1.00	2.0E-06	7.8E-06	3.0E-03	7E-04	3E-03	4E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	3.1E+00	1.00	2.3E-07	8.6E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	9.3E+03	1.00	6.7E-04	2.6E-03	7.0E-01	1E-03	4E-03	1E-04	1E-03			
		Manganese	1.1E+03	1.00	8.1E-05	3.1E-04	2.4E-02	3E-03	1E-02	2E-05	1E-04			
		Mercury	1.5E+00	1.00	1.1E-07	4.2E-07	3.0E-04	4E-04	1E-03	2E-08	2E-07			
		Thallium	1.6E-01	1.00	1.1E-08	4.3E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	3.1E+01	1.00	2.3E-06	8.7E-06	5.0E-03	5E-04	2E-03	5E-07	4E-06			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.6E-12	6.3E-12	7.0E-10	2E-03	9E-03	4E-13	3E-12	1E+05	5E-08	4E-07
		Aluminum	1.5E+04	1.00	1.1E-03	4.1E-03	1.0E+00	1E-03	4E-03	2E-04	2E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	6.3E+00	0.60	2.7E-07	1.1E-06	3.0E-04	9E-04	4E-03	6E-08	5E-07	2E+00	9E-08	7E-07
		Barium	9.2E+02	1.00	6.7E-05	2.6E-04	2.0E-01	3E-04	1E-03	1E-05	1E-04			
		Cadmium	1.7E+00	1.00	1.2E-07	4.7E-07	1.0E-03	1E-04	5E-04	3E-08	2E-07			
		Chromium	2.6E+01	1.00	1.9E-06	7.3E-06	3.0E-03	6E-04	2E-03	4E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	5.3E+00	1.00	3.9E-07	1.5E-06	3.0E-04	1E-03	5E-03	8E-08	6E-07			
		Iron	1.4E+04	1.00	1.0E-03	4.0E-03	7.0E-01	1E-03	6E-03	2E-04	2E-03			
		Manganese	4.0E+02	1.00	2.9E-05	1.1E-04	2.4E-02	1E-03	5E-03	6E-06	5E-05			
		Mercury	8.3E-01	1.00	6.0E-08	2.3E-07	3.0E-04	2E-04	8E-04	1E-08	1E-07			
		Thallium	1.9E-01	1.00	1.4E-08	5.3E-08	1.0E-05	1E-03	5E-03	3E-09	2E-08			
		Vanadium	2.6E+01	1.00	1.9E-06	7.4E-06	5.0E-03	4E-04	1E-03	4E-07	3E-06			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	1.00	3.4E-12	1.3E-11	7.0E-10	5E-03	2E-02	7E-13	6E-12	1E+05	9E-08	7E-07
		Aluminum	1.5E+04	1.00	1.1E-03	4.2E-03	1.0E+00	1E-03	4E-03	2E-04	2E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	7.8E+00	0.60	3.4E-07	1.3E-06	3.0E-04	1E-03	4E-03	7E-08	6E-07	2E+00	1E-07	8E-07
		Barium	4.3E+02	1.00	3.1E-05	1.2E-04	2.0E-01	2E-04	6E-04	7E-06	5E-05			
		Cadmium	2.1E+00	1.00	1.5E-07	5.9E-07	1.0E-03	2E-04	6E-04	3E-08	3E-07			
		Chromium	2.5E+01	1.00	1.8E-06	7.0E-06	3.0E-03	6E-04	2E-03	4E-07	3E-06	5E-01	2E-07	2E-06
		Cobalt	3.2E+00	1.00	2.3E-07	8.9E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	7.9E+03	1.00	5.8E-04	2.2E-03	7.0E-01	8E-04	3E-03	1E-04	9E-04			
		Manganese	8.8E+02	1.00	6.4E-05	2.5E-04	2.4E-02	3E-03	1E-02	1E-05	1E-04			
		Mercury	3.2E+00	1.00	2.3E-07	8.8E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Thallium	1.2E-01	1.00	8.9E-09	3.4E-08	1.0E-05	9E-04	3E-03	2E-09	1E-08			
		Vanadium	2.9E+01	1.00	2.1E-06	8.0E-06	5.0E-03	4E-04	2E-03	4E-07	3E-06			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	7.27E-08	2.79E-07
Cancer	1.56E-08	1.20E-07

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	1.00	1.6E-12	6.3E-12	7.0E-10	2E-03	9E-03	3E-13	3E-12	1E+05	5E-08	3E-07
		Aluminum	1.0E+04	1.00	7.5E-04	2.9E-03	1.0E+00	8E-04	3E-03	2E-04	1E-03			
		Antimony	4.7E-01	1.00	3.4E-08	1.3E-07	4.0E-04	9E-05	3E-04	7E-09	6E-08			
		Arsenic	4.0E+00	0.60	1.8E-07	6.7E-07	3.0E-04	6E-04	2E-03	4E-08	3E-07	2E+00	6E-08	4E-07
		Barium	4.1E+02	1.00	3.0E-05	1.2E-04	2.0E-01	2E-04	6E-04	6E-06	5E-05			
		Cadmium	1.2E+00	1.00	8.4E-08	3.2E-07	1.0E-03	8E-05	3E-04	2E-08	1E-07			
		Chromium	2.0E+01	1.00	1.5E-06	5.6E-06	3.0E-03	5E-04	2E-03	3E-07	2E-06	5E-01	2E-07	1E-06
		Cobalt	3.2E+00	1.00	2.3E-07	8.9E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	9.5E+03	1.00	6.9E-04	2.6E-03	7.0E-01	1E-03	4E-03	1E-04	1E-03			
		Manganese	4.0E+02	1.00	2.9E-05	1.1E-04	2.4E-02	1E-03	5E-03	6E-06	5E-05			
		Mercury	9.4E-01	1.00	6.8E-08	2.6E-07	3.0E-04	2E-04	9E-04	1E-08	1E-07			
		Thallium	1.5E-01	1.00	1.1E-08	4.3E-08	1.0E-05	1E-03	4E-03	2E-09	2E-08			
		Vanadium	1.8E+01	1.00	1.3E-06	5.0E-06	5.0E-03	3E-04	1E-03	3E-07	2E-06			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	1.00	1.5E-12	5.9E-12	7.0E-10	2E-03	8E-03	3E-13	3E-12	1E+05	4E-08	3E-07
		Aluminum	9.8E+03	1.00	7.1E-04	2.7E-03	1.0E+00	7E-04	3E-03	2E-04	1E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.6E+00	0.60	2.4E-07	9.4E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07	2E+00	8E-08	6E-07
		Barium	3.9E+02	1.00	2.9E-05	1.1E-04	2.0E-01	1E-04	6E-04	6E-06	5E-05			
		Cadmium	1.2E+00	1.00	9.0E-08	3.4E-07	1.0E-03	9E-05	3E-04	2E-08	1E-07			
		Chromium	1.8E+01	1.00	1.3E-06	5.0E-06	3.0E-03	4E-04	2E-03	3E-07	2E-06	5E-01	1E-07	1E-06
		Cobalt	3.5E+00	1.00	2.5E-07	9.8E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	9.7E+03	1.00	7.1E-04	2.7E-03	7.0E-01	1E-03	4E-03	2E-04	1E-03			
		Manganese	7.4E+02	1.00	5.4E-05	2.1E-04	2.4E-02	2E-03	9E-03	1E-05	9E-05			
		Mercury	1.0E+00	1.00	7.6E-08	2.9E-07	3.0E-04	3E-04	1E-03	2E-08	1E-07			
		Thallium	1.2E-01	1.00	8.8E-09	3.4E-08	1.0E-05	9E-04	3E-03	2E-09	1E-08			
		Vanadium	2.3E+01	1.00	1.7E-06	6.5E-06	5.0E-03	3E-04	1E-03	4E-07	3E-06			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	2.0E-13	7.8E-13	7.0E-10	3E-04	1E-03	4E-14	3E-13	1E+05	6E-09	4E-08
		Aluminum	6.9E+03	1.00	5.0E-04	1.9E-03	1.0E+00	5E-04	2E-03	1E-04	8E-04			
		Antimony	4.8E-02	1.00	3.5E-09	1.3E-08	4.0E-04	9E-06	3E-05	7E-10	6E-09			
		Arsenic	1.7E+00	0.60	7.4E-08	2.8E-07	3.0E-04	2E-04	9E-04	2E-08	1E-07	2E+00	2E-08	2E-07
		Barium	2.4E+02	1.00	1.7E-05	6.7E-05	2.0E-01	9E-05	3E-04	4E-06	3E-05			
		Cadmium	2.6E-01	1.00	1.9E-08	7.3E-08	1.0E-03	2E-05	7E-05	4E-09	3E-08			
		Chromium	9.3E+00	1.00	6.8E-07	2.6E-06	3.0E-03	2E-04	9E-04	1E-07	1E-06	5E-01	7E-08	6E-07
		Cobalt	1.7E+00	1.00	1.2E-07	4.7E-07	3.0E-04	4E-04	2E-03	3E-08	2E-07			
		Iron	5.5E+03	1.00	4.0E-04	1.5E-03	7.0E-01	6E-04	2E-03	9E-05	7E-04			
		Manganese	9.3E+01	1.00	6.7E-06	2.6E-05	2.4E-02	3E-04	1E-03	1E-06	1E-05			
		Mercury	4.1E-02	1.00	3.0E-09	1.1E-08	3.0E-04	1E-05	4E-05	6E-10	5E-09			
		Thallium	7.5E-03	1.00	5.5E-10	2.1E-09	1.0E-05	5E-05	2E-04	1E-10	9E-10			
		Vanadium	8.7E+00	1.00	6.3E-07	2.4E-06	5.0E-03	1E-04	5E-04	1E-07	1E-06			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	1.1E-12	4.0E-12	7.0E-10	2E-03	6E-03	2E-13	2E-12	1E+05	3E-08	2E-07
		Aluminum	1.5E+04	1.00	1.1E-03	4.2E-03	1.0E+00	1E-03	4E-03	2E-04	2E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.9E+00	0.60	2.1E-07	8.1E-07	3.0E-04	7E-04	3E-03	5E-08	3E-07	2E+00	7E-08	5E-07
		Barium	2.2E+03	1.00	1.6E-04	6.1E-04	2.0E-01	8E-04	3E-03	3E-05	3E-04			
		Cadmium	1.2E+00	1.00	8.9E-08	3.4E-07	1.0E-03	9E-05	3E-04	2E-08	1E-07			
		Chromium	1.9E+01	1.00	1.4E-06	5.4E-06	3.0E-03	5E-04	2E-03	3E-07	2E-06	5E-01	2E-07	1E-06
		Cobalt	3.2E+00	1.00	2.3E-07	8.8E-07	3.0E-04	8E-04	3E-03	5E-08	4E-07			
		Iron	1.1E+04	1.00	7.6E-04	2.9E-03	7.0E-01	1E-03	4E-03	2E-04	1E-03			
		Manganese	2.9E+02	1.00	2.1E-05	8.1E-05	2.4E-02	9E-04	3E-03	5E-06	3E-05			
		Mercury	3.1E-01	1.00	2.2E-08	8.5E-08	3.0E-04	7E-05	3E-04	5E-09	4E-08			
		Thallium	1.3E-01	1.00	9.1E-09	3.5E-08	1.0E-05	9E-04	3E-03	2E-09	1E-08			
		Vanadium	2.1E+01	1.00	1.5E-06	5.9E-06	5.0E-03	3E-04	1E-03	3E-07	3E-06			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	7.14E-08	9.87E-07
Cancer	1.53E-08	4.23E-07

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-06	0.03	7.9E-15	1.1E-13	7.0E-10	1E-05	2E-04	2E-15	5E-14	1E+05	2E-10	6E-09
		Arsenic	9.3E+00	0.03	2.0E-08	2.8E-07	3.0E-04	7E-05	9E-04	4E-09	1E-07	2E+00	6E-09	2E-07
		Cadmium	7.0E-01	0.001	5.0E-11	6.9E-10	2.5E-05	2E-06	3E-05	1E-11	3E-10			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	0.03	5.4E-15	7.5E-14	7.0E-10	8E-06	1E-04	1E-15	3E-14	1E+05	2E-10	4E-09
		Arsenic	1.0E+00	0.03	2.1E-09	3.0E-08	3.0E-04	7E-06	1E-04	5E-10	1E-08	2E+00	7E-10	2E-08
		Cadmium	6.4E-02	0.001	4.6E-12	6.3E-11	2.5E-05	2E-07	3E-06	1E-12	3E-11			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	0.03	1.4E-15	1.9E-14	7.0E-10	2E-06	3E-05	3E-16	8E-15	1E+05	4E-11	1E-09
		Arsenic	9.5E-01	0.03	2.0E-09	2.8E-08	3.0E-04	7E-06	9E-05	4E-10	1E-08	2E+00	7E-10	2E-08
		Cadmium	7.3E-02	0.001	5.2E-12	7.2E-11	2.5E-05	2E-07	3E-06	1E-12	3E-11			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	0.03	6.3E-15	8.7E-14	7.0E-10	9E-06	1E-04	1E-15	4E-14	1E+05	2E-10	5E-09
		Arsenic	1.7E+00	0.03	3.6E-09	5.0E-08	3.0E-04	1E-05	2E-04	8E-10	2E-08	2E+00	1E-09	3E-08
		Cadmium	1.4E-01	0.001	1.0E-11	1.4E-10	2.5E-05	4E-07	6E-06	2E-12	6E-11			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	0.03	3.7E-15	5.1E-14	7.0E-10	5E-06	7E-05	8E-16	2E-14	1E+05	1E-10	3E-09
		Arsenic	1.2E+00	0.03	2.6E-09	3.6E-08	3.0E-04	9E-06	1E-04	6E-10	2E-08	2E+00	8E-10	2E-08
		Cadmium	1.3E-01	0.001	9.3E-12	1.3E-10	2.5E-05	4E-07	5E-06	2E-12	5E-11			
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	7.1E-07	0.03	1.5E-15	2.1E-14	7.0E-10	2E-06	3E-05	3E-16	9E-15	1E+05	4E-11	1E-09
		Arsenic	1.9E+00	0.03	4.0E-09	5.5E-08	3.0E-04	1E-05	2E-04	8E-10	2E-08	2E+00	1E-09	4E-08
		Cadmium	4.4E-02	0.001	3.1E-12	4.3E-11	2.5E-05	1E-07	2E-06	7E-13	2E-11			
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	0.03	1.1E-15	1.6E-14	7.0E-10	2E-06	2E-05	2E-16	7E-15	1E+05	3E-11	9E-10
		Arsenic	1.1E+00	0.03	2.4E-09	3.3E-08	3.0E-04	8E-06	1E-04	5E-10	1E-08	2E+00	8E-10	2E-08
		Cadmium	4.6E-02	0.001	3.3E-12	4.5E-11	2.5E-05	1E-07	2E-06	7E-13	2E-11			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	1.0E-06	0.03	2.2E-15	3.0E-14	7.0E-10	3E-06	4E-05	5E-16	1E-14	1E+05	6E-11	2E-09
		Arsenic	4.0E+00	0.03	8.6E-09	1.2E-07	3.0E-04	3E-05	4E-04	2E-09	5E-08	2E+00	3E-09	8E-08
		Cadmium	1.3E-01	0.001	9.3E-12	1.3E-10	2.5E-05	4E-07	5E-06	2E-12	5E-11			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	0.03	1.8E-15	2.5E-14	7.0E-10	3E-06	4E-05	4E-16	1E-14	1E+05	5E-11	1E-09
		Arsenic	1.6E+00	0.03	3.4E-09	4.7E-08	3.0E-04	1E-05	2E-04	7E-10	2E-08	2E+00	1E-09	3E-08
		Cadmium	9.3E-02	0.001	6.6E-12	9.2E-11	2.5E-05	3E-07	4E-06	1E-12	4E-11			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	0.03	1.6E-15	2.2E-14	7.0E-10	2E-06	3E-05	3E-16	9E-15	1E+05	4E-11	1E-09
		Arsenic	2.1E+00	0.03	4.5E-09	6.2E-08	3.0E-04	1E-05	2E-04	1E-09	3E-08	2E+00	1E-09	4E-08
		Cadmium	1.9E-01	0.001	1.4E-11	1.9E-10	2.5E-05	5E-07	8E-06	3E-12	8E-11			
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	0.03	2.0E-14	2.7E-13	7.0E-10	3E-05	4E-04	4E-15	1E-13	1E+05	5E-10	2E-08
		Arsenic	5.1E+00	0.03	1.1E-08	1.5E-07	3.0E-04	4E-05	5E-04	2E-09	6E-08	2E+00	4E-09	1E-07
		Cadmium	8.5E-01	0.001	6.1E-11	8.4E-10	2.5E-05	2E-06	3E-05	1E-11	4E-10			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	3.3E-15	4.5E-14	7.0E-10	5E-06	6E-05	7E-16	2E-14	1E+05	9E-11	3E-09
		Arsenic	2.5E+00	0.03	5.4E-09	7.5E-08	3.0E-04	2E-05	2E-04	1E-09	3E-08	2E+00	2E-09	5E-08
		Cadmium	2.6E-01	0.001	1.8E-11	2.5E-10	2.5E-05	7E-07	1E-05	4E-12	1E-10			
Upland	38[a]	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	0.03	4.5E-15	6.2E-14	7.0E-10	6E-06	9E-05	1E-15	3E-14	1E+05	1E-10	3E-09
		Arsenic	1.0E+00	0.03	2.1E-09	3.0E-08	3.0E-04	7E-06	1E-04	5E-10	1E-08	2E+00	7E-10	2E-08
		Cadmium	1.6E-02	0.001	1.1E-12	1.6E-11	2.5E-05	5E-08	6E-07	2E-13	7E-12			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	6.0E-15	8.2E-14	7.0E-10	9E-06	1E-04	1E-15	4E-14	1E+05	2E-10	5E-09
		Arsenic	2.2E+00	0.03	4.6E-09	6.4E-08	3.0E-04	2E-05	2E-04	1E-09	3E-08	2E+00	1E-09	4E-08
		Cadmium	3.3E-01	0.001	2.4E-11	3.3E-10	2.5E-05	9E-07	1E-05	5E-12	1E-10			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	0.03	7.6E-15	1.1E-13	7.0E-10	1E-05	2E-04	2E-15	5E-14	1E+05	2E-10	6E-09
		Arsenic	1.4E+00	0.03	3.0E-09	4.1E-08	3.0E-04	1E-05	1E-04	6E-10	2E-08	2E+00	1E-09	3E-08
		Cadmium	2.8E-01	0.001	2.0E-11	2.8E-10	2.5E-05	8E-07	1E-05	4E-12	1E-10			
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	8.4E-15	1.2E-13	7.0E-10	1E-05	2E-04	2E-15	5E-14	1E+05	2E-10	7E-09
		Arsenic	1.3E+00	0.03	2.8E-09	3.8E-08	3.0E-04	9E-06	1E-04	6E-10	2E-08	2E+00	9E-10	2E-08
		Cadmium	2.8E-01	0.001	2.0E-11	2.8E-10	2.5E-05	8E-07	1E-05	4E-12	1E-10			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	0.03	1.6E-14	2.2E-13	7.0E-10	2E-05	3E-04	3E-15	9E-14	1E+05	4E-10	1E-08
		Arsenic	3.1E+00	0.03	6.6E-09	9.2E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	6E-08
		Cadmium	3.2E-01	0.001	2.3E-11	3.2E-10	2.5E-05	9E-07	1E-05	5E-12	1E-10			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	8.4E-15	1.2E-13	7.0E-10	1E-05	2E-04	2E-15	5E-14	1E+05	2E-10	6E-09
		Arsenic	2.8E+00	0.03	6.0E-09	8.3E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	5E-08
		Cadmium	4.7E-01	0.001	3.4E-11	4.6E-10	2.5E-05	1E-06	2E-05	7E-12	2E-10			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	4.6E-15	6.4E-14	7.0E-10	7E-06	9E-05	1E-15	3E-14	1E+05	1E-10	4E-09
		Arsenic	4.4E+00	0.03	9.4E-09	1.3E-07	3.0E-04	3E-05	4E-04	2E-09	6E-08	2E+00	3E-09	8E-08
		Cadmium	8.0E-01	0.001	5.7E-11	7.9E-10	2.5E-05	2E-06	3E-05	1E-11	3E-10			
Upland	45[a]	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	0.03	7.9E-16	1.1E-14	7.0E-10	1E-06	2E-05	2E-16	5E-15	1E+05	2E-11	6E-10
		Arsenic	3.1E+00	0.03	6.6E-09	9.2E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	6E-08
		Cadmium	8.0E-02	0.001	5.7E-12	7.9E-11	2.5E-05	2E-07	3E-06	1E-12	3E-11			
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-06	0.03	6.5E-15	8.9E-14	7.0E-10	9E-06	1E-04	1E-15	4E-14	1E+05	2E-10	5E-09
		Arsenic	2.3E+00	0.03	4.9E-09	6.8E-08	3.0E-04	2E-05	2E-04	1E-09	3E-08	2E+00	2E-09	4E-08
		Cadmium	2.4E-01	0.001	1.7E-11	2.4E-10	2.5E-05	7E-07	9E-06	4E-12	1E-10			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	3.5E-14	4.8E-13	7.0E-10	5E-05	7E-04	7E-15	2E-13	1E+05	1E-09	3E-08
		Arsenic	1.3E+01	0.03	2.7E-08	3.8E-07	3.0E-04	9E-05	1E-03	6E-09	2E-07	2E+00	9E-09	2E-07
		Cadmium	5.2E+00	0.001	3.7E-10	5.1E-09	2.5E-05	1E-05	2E-04	8E-11	2E-09			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	7.14E-08	9.87E-07
Cancer	1.53E-08	4.23E-07

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	0.03	1.1E-13	1.5E-12	7.0E-10	2E-04	2E-03	2E-14	6E-13	1E+05	3E-09	8E-08
		Arsenic	1.4E+01	0.03	3.0E-08	4.2E-07	3.0E-04	1E-04	1E-03	7E-09	2E-07	2E+00	1E-08	3E-07
		Cadmium	8.3E+00	0.001	5.9E-10	8.2E-09	2.5E-05	2E-05	3E-04	1E-10	4E-09			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	0.03	8.5E-14	1.2E-12	7.0E-10	1E-04	2E-03	2E-14	5E-13	1E+05	2E-09	7E-08
		Arsenic	3.6E+00	0.03	7.7E-09	1.1E-07	3.0E-04	3E-05	4E-04	2E-09	5E-08	2E+00	2E-09	7E-08
		Cadmium	2.0E+00	0.001	1.4E-10	2.0E-09	2.5E-05	6E-06	8E-05	3E-11	8E-10			
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	0.03	5.2E-14	7.2E-13	7.0E-10	7E-05	1E-03	1E-14	3E-13	1E+05	1E-09	4E-08
		Arsenic	7.9E+00	0.03	1.7E-08	2.3E-07	3.0E-04	6E-05	8E-04	4E-09	1E-07	2E+00	5E-09	1E-07
		Cadmium	3.9E+00	0.001	2.8E-10	3.8E-09	2.5E-05	1E-05	2E-04	6E-11	2E-09			
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	0.03	6.7E-15	9.2E-14	7.0E-10	1E-05	1E-04	1E-15	4E-14	1E+05	2E-10	5E-09
		Arsenic	2.2E+00	0.03	4.7E-09	6.5E-08	3.0E-04	2E-05	2E-04	1E-09	3E-08	2E+00	2E-09	4E-08
		Cadmium	5.2E-01	0.001	3.7E-11	5.1E-10	2.5E-05	1E-06	2E-05	8E-12	2E-10			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	4.6E-15	6.4E-14	7.0E-10	7E-06	9E-05	1E-15	3E-14	1E+05	1E-10	4E-09
		Arsenic	1.8E+00	0.03	3.8E-09	5.2E-08	3.0E-04	1E-05	2E-04	8E-10	2E-08	2E+00	1E-09	3E-08
		Cadmium	1.6E-01	0.001	1.1E-11	1.6E-10	2.5E-05	5E-07	6E-06	2E-12	7E-11			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	4.9E-14	6.7E-13	7.0E-10	7E-05	1E-03	1E-14	3E-13	1E+05	1E-09	4E-08
		Arsenic	2.6E+00	0.03	5.6E-09	7.7E-08	3.0E-04	2E-05	3E-04	1E-09	3E-08	2E+00	2E-09	5E-08
		Cadmium	1.2E+00	0.001	8.6E-11	1.2E-09	2.5E-05	3E-06	5E-05	2E-11	5E-10			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	3.1E-14	4.3E-13	7.0E-10	4E-05	6E-04	7E-15	2E-13	1E+05	9E-10	2E-08
		Arsenic	1.1E+01	0.03	2.3E-08	3.2E-07	3.0E-04	8E-05	1E-03	5E-09	1E-07	2E+00	7E-09	2E-07
		Cadmium	4.7E+00	0.001	3.4E-10	4.6E-09	2.5E-05	1E-05	2E-04	7E-11	2E-09			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	1.2E-13	1.6E-12	7.0E-10	2E-04	2E-03	3E-14	7E-13	1E+05	3E-09	9E-08
		Arsenic	1.4E+01	0.03	2.9E-08	4.0E-07	3.0E-04	1E-04	1E-03	6E-09	2E-07	2E+00	9E-09	3E-07
		Cadmium	5.6E+00	0.001	4.0E-10	5.5E-09	2.5E-05	2E-05	2E-04	9E-11	2E-09			
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.9E-05	0.03	1.3E-13	1.7E-12	7.0E-10	2E-04	2E-03	3E-14	7E-13	1E+05	3E-09	1E-07
		Arsenic	1.2E+01	0.03	2.6E-08	3.6E-07	3.0E-04	9E-05	1E-03	6E-09	2E-07	2E+00	8E-09	2E-07
		Cadmium	6.7E+00	0.001	4.8E-10	6.6E-09	2.5E-05	2E-05	3E-04	1E-10	3E-09			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.8E-13	2.5E-12	7.0E-10	3E-04	4E-03	4E-14	1E-12	1E+05	5E-09	1E-07
		Arsenic	1.2E+01	0.03	2.5E-08	3.5E-07	3.0E-04	8E-05	1E-03	5E-09	2E-07	2E+00	8E-09	2E-07
		Cadmium	4.8E+00	0.001	3.4E-10	4.7E-09	2.5E-05	1E-05	2E-04	7E-11	2E-09			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	3.4E-14	4.7E-13	7.0E-10	5E-05	7E-04	7E-15	2E-13	1E+05	9E-10	3E-08
		Arsenic	6.2E+00	0.03	1.3E-08	1.8E-07	3.0E-04	4E-05	6E-04	3E-09	8E-08	2E+00	4E-09	1E-07
		Cadmium	3.3E+00	0.001	2.4E-10	3.3E-09	2.5E-05	1E-05	1E-04	5E-11	1E-09			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.7E-06	0.03	1.9E-14	2.6E-13	7.0E-10	3E-05	4E-04	4E-15	1E-13	1E+05	5E-10	1E-08
		Arsenic	4.6E+00	0.03	9.9E-09	1.4E-07	3.0E-04	3E-05	5E-04	2E-09	6E-08	2E+00	3E-09	9E-08
		Cadmium	1.7E+00	0.001	1.2E-10	1.7E-09	2.5E-05	5E-06	7E-05	3E-11	7E-10			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	0.03	1.2E-14	1.7E-13	7.0E-10	2E-05	2E-04	3E-15	7E-14	1E+05	3E-10	1E-08
		Arsenic	3.7E+00	0.03	7.9E-09	1.1E-07	3.0E-04	3E-05	4E-04	2E-09	5E-08	2E+00	3E-09	7E-08
		Cadmium	1.1E+00	0.001	7.9E-11	1.1E-09	2.5E-05	3E-06	4E-05	2E-11	5E-10			
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	0.03	2.4E-15	3.3E-14	7.0E-10	3E-06	5E-05	5E-16	1E-14	1E+05	7E-11	2E-09
		Arsenic	2.6E+00	0.03	5.6E-09	7.7E-08	3.0E-04	2E-05	3E-04	1E-09	3E-08	2E+00	2E-09	5E-08
		Cadmium	3.7E-01	0.001	2.6E-11	3.7E-10	2.5E-05	1E-06	1E-05	6E-12	2E-10			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	3.5E-14	4.9E-13	7.0E-10	5E-05	7E-04	8E-15	2E-13	1E+05	1E-09	3E-08
		Arsenic	3.0E+00	0.03	6.4E-09	8.9E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	6E-08
		Cadmium	7.9E-01	0.001	5.6E-11	7.8E-10	2.5E-05	2E-06	3E-05	1E-11	3E-10			
Upland	65[a]	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	0.03	2.8E-14	3.8E-13	7.0E-10	4E-05	5E-04	6E-15	2E-13	1E+05	8E-10	2E-08
		Arsenic	4.3E+00	0.03	9.2E-09	1.3E-07	3.0E-04	3E-05	4E-04	2E-09	5E-08	2E+00	3E-09	8E-08
		Cadmium	2.5E+00	0.001	1.8E-10	2.5E-09	2.5E-05	7E-06	1E-04	4E-11	1E-09			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	3.3E-15	4.6E-14	7.0E-10	5E-06	7E-05	7E-16	2E-14	1E+05	9E-11	3E-09
		Arsenic	3.2E+00	0.03	6.9E-09	9.5E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	6E-08
		Cadmium	9.0E-01	0.001	6.4E-11	8.9E-10	2.5E-05	3E-06	4E-05	1E-11	4E-10			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.8E-13	2.4E-12	7.0E-10	3E-04	3E-03	4E-14	1E-12	1E+05	5E-09	1E-07
		Arsenic	1.5E+01	0.03	3.2E-08	4.4E-07	3.0E-04	1E-04	1E-03	7E-09	2E-07	2E+00	1E-08	3E-07
		Cadmium	4.8E+00	0.001	3.4E-10	4.7E-09	2.5E-05	1E-05	2E-04	7E-11	2E-09			
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.8E-13	2.4E-12	7.0E-10	3E-04	3E-03	4E-14	1E-12	1E+05	5E-09	1E-07
		Arsenic	1.5E+01	0.03	3.2E-08	4.4E-07	3.0E-04	1E-04	1E-03	7E-09	2E-07	2E+00	1E-08	3E-07
		Cadmium	4.8E+00	0.001	3.4E-10	4.7E-09	2.5E-05	1E-05	2E-04	7E-11	2E-09			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.1E-06	0.03	8.7E-15	1.2E-13	7.0E-10	1E-05	2E-04	2E-15	5E-14	1E+05	2E-10	7E-09
		Arsenic	6.0E+00	0.03	1.3E-08	1.8E-07	3.0E-04	4E-05	6E-04	3E-09	8E-08	2E+00	4E-09	1E-07
		Cadmium	1.8E+00	0.001	1.3E-10	1.8E-09	2.5E-05	5E-06	7E-05	3E-11	8E-10			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	0.03	5.1E-15	7.1E-14	7.0E-10	7E-06	1E-04	1E-15	3E-14	1E+05	1E-10	4E-09
		Arsenic	5.8E+00	0.03	1.2E-08	1.7E-07	3.0E-04	4E-05	6E-04	3E-09	7E-08	2E+00	4E-09	1E-07
		Cadmium	1.3E+00	0.001	9.3E-11	1.3E-09	2.5E-05	4E-06	5E-05	2E-11	5E-10			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	5.0E-14	6.9E-13	7.0E-10	7E-05	1E-03	1E-14	3E-13	1E+05	1E-09	4E-08
		Arsenic	7.0E+00	0.03	1.5E-08	2.1E-07	3.0E-04	5E-05	7E-04	3E-09	9E-08	2E+00	5E-09	1E-07
		Cadmium	2.2E+00	0.001	1.6E-10	2.2E-09	2.5E-05	6E-06	9E-05	3E-11	9E-10			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Hikers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	7.14E-08	9.87E-07
Cancer	1.53E-08	4.23E-07

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-04	0.03	6.6E-13	9.1E-12	7.0E-10	9E-04	1E-02	1E-13	4E-12	1E+05	2E-08	5E-07
		Arsenic	4.1E+01	0.03	8.7E-08	1.2E-06	3.0E-04	3E-04	4E-03	2E-08	5E-07	2E+00	3E-08	8E-07
		Cadmium	6.4E+00	0.001	4.6E-10	6.3E-09	2.5E-05	2E-05	3E-04	1E-10	3E-09			
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	7.3E-16	1.0E-14	7.0E-10	1E-06	1E-05	2E-16	4E-15	1E+05	2E-11	6E-10
		Arsenic	4.3E+00	0.03	9.2E-09	1.3E-07	3.0E-04	3E-05	4E-04	2E-09	5E-08	2E+00	3E-09	8E-08
		Cadmium	1.5E-01	0.001	1.1E-11	1.5E-10	2.5E-05	4E-07	6E-06	2E-12	6E-11			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	4.4E-15	6.0E-14	7.0E-10	6E-06	9E-05	9E-16	3E-14	1E+05	1E-10	3E-09
		Arsenic	2.9E+00	0.03	6.1E-09	8.4E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	5E-08
		Cadmium	1.2E-01	0.001	8.7E-12	1.2E-10	2.5E-05	3E-07	5E-06	2E-12	5E-11			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	4.4E-15	6.0E-14	7.0E-10	6E-06	9E-05	9E-16	3E-14	1E+05	1E-10	3E-09
		Arsenic	2.9E+00	0.03	6.1E-09	8.4E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	5E-08
		Cadmium	1.2E-01	0.001	8.7E-12	1.2E-10	2.5E-05	3E-07	5E-06	2E-12	5E-11			
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	7.3E-16	1.0E-14	7.0E-10	1E-06	1E-05	2E-16	4E-15	1E+05	2E-11	6E-10
		Arsenic	4.3E+00	0.03	9.2E-09	1.3E-07	3.0E-04	3E-05	4E-04	2E-09	5E-08	2E+00	3E-09	8E-08
		Cadmium	1.5E-01	0.001	1.1E-11	1.5E-10	2.5E-05	4E-07	6E-06	2E-12	6E-11			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	4.4E-15	6.0E-14	7.0E-10	6E-06	9E-05	9E-16	3E-14	1E+05	1E-10	3E-09
		Arsenic	2.9E+00	0.03	6.1E-09	8.4E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	5E-08
		Cadmium	1.2E-01	0.001	8.7E-12	1.2E-10	2.5E-05	3E-07	5E-06	2E-12	5E-11			
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	4.4E-15	6.0E-14	7.0E-10	6E-06	9E-05	9E-16	3E-14	1E+05	1E-10	3E-09
		Arsenic	2.9E+00	0.03	6.1E-09	8.4E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	5E-08
		Cadmium	1.2E-01	0.001	8.7E-12	1.2E-10	2.5E-05	3E-07	5E-06	2E-12	5E-11			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	0.03	1.3E-15	1.8E-14	7.0E-10	2E-06	3E-05	3E-16	8E-15	1E+05	4E-11	1E-09
		Arsenic	4.5E+00	0.03	9.6E-09	1.3E-07	3.0E-04	3E-05	4E-04	2E-09	6E-08	2E+00	3E-09	9E-08
		Cadmium	3.2E-01	0.001	2.3E-11	3.2E-10	2.5E-05	9E-07	1E-05	5E-12	1E-10			
Floodplain	85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	0.03	8.6E-16	1.2E-14	7.0E-10	1E-06	2E-05	2E-16	5E-15	1E+05	2E-11	7E-10
		Arsenic	1.9E+00	0.03	4.1E-09	5.6E-08	3.0E-04	1E-05	2E-04	9E-10	2E-08	2E+00	1E-09	4E-08
		Cadmium	1.6E-02	0.001	1.1E-12	1.6E-11	2.5E-05	5E-08	6E-07	2E-13	7E-12			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	0.03	3.9E-14	5.5E-13	7.0E-10	6E-05	8E-04	8E-15	2E-13	1E+05	1E-09	3E-08
		Arsenic	4.6E+00	0.03	9.9E-09	1.4E-07	3.0E-04	3E-05	5E-04	2E-09	6E-08	2E+00	3E-09	9E-08
		Cadmium	5.4E-01	0.001	3.9E-11	5.3E-10	2.5E-05	2E-06	2E-05	8E-12	2E-10			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	0.03	1.5E-14	2.0E-13	7.0E-10	2E-05	3E-04	3E-15	9E-14	1E+05	4E-10	1E-08
		Arsenic	4.7E+00	0.03	1.0E-08	1.4E-07	3.0E-04	3E-05	5E-04	2E-09	6E-08	2E+00	3E-09	9E-08
		Cadmium	7.9E-01	0.001	5.6E-11	7.8E-10	2.5E-05	2E-06	3E-05	1E-11	3E-10			
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	0.03	1.2E-13	1.6E-12	7.0E-10	2E-04	2E-03	3E-14	7E-13	1E+05	3E-09	9E-08
		Arsenic	5.5E+00	0.03	1.2E-08	1.6E-07	3.0E-04	4E-05	5E-04	3E-09	7E-08	2E+00	4E-09	1E-07
		Cadmium	1.8E+00	0.001	1.3E-10	1.8E-09	2.5E-05	5E-06	7E-05	3E-11	8E-10			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	0.03	2.1E-14	2.9E-13	7.0E-10	3E-05	4E-04	4E-15	1E-13	1E+05	6E-10	2E-08
		Arsenic	4.8E+00	0.03	1.0E-08	1.4E-07	3.0E-04	3E-05	5E-04	2E-09	6E-08	2E+00	3E-09	9E-08
		Cadmium	5.5E-01	0.001	3.9E-11	5.4E-10	2.5E-05	2E-06	2E-05	8E-12	2E-10			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	1.2E-13	1.6E-12	7.0E-10	2E-04	2E-03	3E-14	7E-13	1E+05	3E-09	9E-08
		Arsenic	1.0E+01	0.03	2.1E-08	3.0E-07	3.0E-04	7E-05	1E-03	5E-09	1E-07	2E+00	7E-09	2E-07
		Cadmium	2.8E+00	0.001	2.0E-10	2.8E-09	2.5E-05	8E-06	1E-04	4E-11	1E-09			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	4.8E-14	6.7E-13	7.0E-10	7E-05	1E-03	1E-14	3E-13	1E+05	1E-09	4E-08
		Arsenic	6.3E+00	0.03	1.3E-08	1.9E-07	3.0E-04	4E-05	6E-04	3E-09	8E-08	2E+00	4E-09	1E-07
		Cadmium	1.7E+00	0.001	1.2E-10	1.7E-09	2.5E-05	5E-06	7E-05	3E-11	7E-10			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	0.03	9.9E-14	1.4E-12	7.0E-10	1E-04	2E-03	2E-14	6E-13	1E+05	3E-09	8E-08
		Arsenic	7.8E+00	0.03	1.7E-08	2.3E-07	3.0E-04	6E-05	8E-04	4E-09	1E-07	2E+00	5E-09	1E-07
		Cadmium	2.1E+00	0.001	1.5E-10	2.1E-09	2.5E-05	6E-06	8E-05	3E-11	9E-10			
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	0.03	4.8E-14	6.6E-13	7.0E-10	7E-05	9E-04	1E-14	3E-13	1E+05	1E-09	4E-08
		Arsenic	4.0E+00	0.03	8.6E-09	1.2E-07	3.0E-04	3E-05	4E-04	2E-09	5E-08	2E+00	3E-09	8E-08
		Cadmium	1.2E+00	0.001	8.2E-11	1.1E-09	2.5E-05	3E-06	5E-05	2E-11	5E-10			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	0.03	4.5E-14	6.2E-13	7.0E-10	6E-05	9E-04	1E-14	3E-13	1E+05	1E-09	3E-08
		Arsenic	5.6E+00	0.03	1.2E-08	1.7E-07	3.0E-04	4E-05	6E-04	3E-09	7E-08	2E+00	4E-09	1E-07
		Cadmium	1.2E+00	0.001	8.8E-11	1.2E-09	2.5E-05	4E-06	5E-05	2E-11	5E-10			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	6.0E-15	8.2E-14	7.0E-10	9E-06	1E-04	1E-15	4E-14	1E+05	2E-10	5E-09
		Arsenic	1.7E+00	0.03	3.6E-09	5.0E-08	3.0E-04	1E-05	2E-04	8E-10	2E-08	2E+00	1E-09	3E-08
		Cadmium	2.6E-01	0.001	1.9E-11	2.6E-10	2.5E-05	7E-07	1E-05	4E-12	1E-10			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	3.1E-14	4.3E-13	7.0E-10	4E-05	6E-04	7E-15	2E-13	1E+05	9E-10	2E-08
		Arsenic	4.9E+00	0.03	1.0E-08	1.4E-07	3.0E-04	3E-05	5E-04	2E-09	6E-08	2E+00	3E-09	9E-08
		Cadmium	1.2E+00	0.001	8.7E-11	1.2E-09	2.5E-05	3E-06	5E-05	2E-11	5E-10			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Campers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME		MMOA HIFs	
				CTE	RME
Noncancer	5.84E-07	1.75E-06	*Based on Child HIFs*		
Cancer	3.21E-08	1.97E-07	*Based on TWA HIFs*	4.31E-07	1.29E-06

Area	Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
					DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-06	1.00	2.2E-12	6.5E-12	7.0E-10	3E-03	9E-03	1E-13	7E-13	1E+05	2E-08	9E-08
		Aluminum	1.9E+04	1.00	1.1E-02	3.3E-02	1.0E+00	1E-02	3E-02	6E-04	4E-03			
		Antimony	1.5E+00	1.00	8.8E-07	2.6E-06	4.0E-04	2E-03	7E-03	5E-08	3E-07			
		Arsenic	9.3E+00	0.60	3.3E-06	9.8E-06	3.0E-04	1E-02	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
		Barium	1.0E+03	1.00	6.1E-04	1.8E-03	2.0E-01	3E-03	9E-03	3E-05	2E-04			
		Cadmium	7.0E-01	1.00	4.1E-07	1.2E-06	1.0E-03	4E-04	1E-03	2E-08	1E-07			
		Chromium	2.0E+01	1.00	1.2E-05	3.5E-05	3.0E-03	4E-03	1E-02	9E-06	3E-05	5E-01	4E-06	1E-05
		Cobalt	5.3E+00	1.00	3.1E-06	9.3E-06	3.0E-04	1E-02	3E-02	2E-07	1E-06			
		Iron	1.7E+04	1.00	1.0E-02	3.0E-02	7.0E-01	1E-02	4E-02	6E-04	3E-03			
		Manganese	4.8E+02	1.00	2.8E-04	8.5E-04	2.4E-02	1E-02	4E-02	2E-05	1E-04			
		Mercury	1.4E-01	1.00	8.2E-08	2.5E-07	3.0E-04	3E-04	8E-04	4E-09	3E-08			
		Thallium	2.1E-01	1.00	1.2E-07	3.7E-07	1.0E-05	1E-02	4E-02	7E-09	4E-08			
		Vanadium	4.2E+01	1.00	2.4E-05	7.3E-05	5.0E-03	5E-03	1E-02	1E-06	8E-06			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	1.00	1.5E-12	4.4E-12	7.0E-10	2E-03	6E-03	8E-14	5E-13	1E+05	1E-08	6E-08
		Aluminum	6.7E+03	1.00	3.9E-03	1.2E-02	1.0E+00	4E-03	1E-02	2E-04	1E-03			
		Antimony	9.0E-02	1.00	5.3E-08	1.6E-07	4.0E-04	1E-04	4E-04	3E-09	2E-08			
		Arsenic	1.0E+00	0.60	3.5E-07	1.1E-06	3.0E-04	1E-03	4E-03	2E-08	1E-07	2E+00	3E-08	2E-07
		Barium	2.0E+02	1.00	1.2E-04	3.5E-04	2.0E-01	6E-04	2E-03	6E-06	4E-05			
		Cadmium	6.4E-02	1.00	3.7E-08	1.1E-07	1.0E-03	4E-05	1E-04	2E-09	1E-08			
		Chromium	8.7E+00	1.00	5.1E-06	1.5E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	2.6E+00	1.00	1.5E-06	4.6E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06			
		Iron	8.1E+03	1.00	4.7E-03	1.4E-02	7.0E-01	7E-03	2E-02	3E-03	1E-02			
		Manganese	1.1E+02	1.00	6.4E-05	1.9E-04	2.4E-02	3E-03	8E-03	5E-05	1E-04			
		Mercury	1.2E-02	1.00	7.0E-09	2.1E-08	3.0E-04	2E-05	7E-05	5E-09	2E-08			
		Thallium	8.5E-02	1.00	5.0E-08	1.5E-07	1.0E-05	5E-03	1E-02	4E-08	1E-07			
		Vanadium	9.4E+00	1.00	5.5E-06	1.6E-05	5.0E-03	1E-03	3E-03	4E-06	1E-05			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	1.00	3.8E-13	1.1E-12	7.0E-10	5E-04	2E-03	3E-13	8E-13	1E+05	4E-08	1E-07
		Aluminum	6.4E+03	1.00	3.7E-03	1.1E-02	1.0E+00	4E-03	1E-02	3E-03	8E-03			
		Antimony	9.0E-02	1.00	5.3E-08	1.6E-07	4.0E-04	1E-04	4E-04	4E-08	1E-07			
		Arsenic	9.5E-01	0.60	3.3E-07	1.0E-06	3.0E-04	1E-03	3E-03	2E-07	7E-07	2E+00	4E-07	1E-06
		Barium	2.0E+02	1.00	1.2E-04	3.5E-04	2.0E-01	6E-04	2E-03	9E-05	3E-04			
		Cadmium	7.3E-02	1.00	4.3E-08	1.3E-07	1.0E-03	4E-05	1E-04	3E-08	9E-08			
		Chromium	7.2E+00	1.00	4.2E-06	1.3E-05	3.0E-03	1E-03	4E-03	3E-06	9E-06	5E-01	2E-06	5E-06
		Cobalt	2.4E+00	1.00	1.4E-06	4.2E-06	3.0E-04	5E-03	1E-02	1E-06	3E-06			
		Iron	7.5E+03	1.00	4.4E-03	1.3E-02	7.0E-01	6E-03	2E-02	3E-03	1E-02			
		Manganese	8.4E+01	1.00	4.9E-05	1.5E-04	2.4E-02	2E-03	6E-03	4E-05	1E-04			
		Mercury	1.6E-02	1.00	9.4E-09	2.8E-08	3.0E-04	3E-05	9E-05	7E-09	2E-08			
		Thallium	8.5E-02	1.00	5.0E-08	1.5E-07	1.0E-05	5E-03	1E-02	4E-08	1E-07			
		Vanadium	8.7E+00	1.00	5.1E-06	1.5E-05	5.0E-03	1E-03	3E-03	4E-06	1E-05			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	1.00	1.7E-12	5.1E-12	7.0E-10	2E-03	7E-03	1E-12	4E-12	1E+05	2E-07	5E-07
		Aluminum	7.6E+03	1.00	4.4E-03	1.3E-02	1.0E+00	4E-03	1E-02	3E-03	1E-02			
		Antimony	1.9E-01	1.00	1.1E-07	3.3E-07	4.0E-04	3E-04	8E-04	8E-08	2E-07			
		Arsenic	1.7E+00	0.60	6.0E-07	1.8E-06	3.0E-04	2E-03	6E-03	4E-07	1E-06	2E+00	7E-07	2E-06
		Barium	1.9E+02	1.00	1.1E-04	3.3E-04	2.0E-01	6E-04	2E-03	8E-05	2E-04			
		Cadmium	1.4E-01	1.00	8.2E-08	2.5E-07	1.0E-03	8E-05	2E-04	6E-08	2E-07			
		Chromium	1.1E+01	1.00	6.3E-06	1.9E-05	3.0E-03	2E-03	6E-03	5E-06	1E-05	5E-01	2E-06	7E-06
		Cobalt	3.1E+00	1.00	1.8E-06	5.4E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	8.5E+03	1.00	5.0E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	1.5E+02	1.00	9.0E-05	2.7E-04	2.4E-02	4E-03	1E-02	7E-05	2E-04			
		Mercury	3.3E-02	1.00	1.9E-08	5.8E-08	3.0E-04	6E-05	2E-04	1E-08	4E-08			
		Thallium	1.1E-01	1.00	6.4E-08	1.9E-07	1.0E-05	6E-03	2E-02	5E-08	1E-07			
		Vanadium	1.9E+01	1.00	1.1E-05	3.3E-05	5.0E-03	2E-03	7E-03	8E-06	2E-05			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	1.00	1.0E-12	3.0E-12	7.0E-10	1E-03	4E-03	7E-13	2E-12	1E+05	1E-07	3E-07
		Aluminum	8.2E+03	1.00	4.8E-03	1.4E-02	1.0E+00	5E-03	1E-02	4E-03	1E-02			
		Antimony	2.0E-01	1.00	1.2E-07	3.5E-07	4.0E-04	3E-04	9E-04	9E-08	3E-07			
		Arsenic	1.2E+00	0.60	4.2E-07	1.3E-06	3.0E-04	1E-03	4E-03	3E-07	9E-07	2E+00	5E-07	1E-06
		Barium	3.6E+02	1.00	2.1E-04	6.3E-04	2.0E-01	1E-03	3E-03	2E-04	5E-04			
		Cadmium	1.3E-01	1.00	7.6E-08	2.3E-07	1.0E-03	8E-05	2E-04	6E-08	2E-07			
		Chromium	1.0E+01	1.00	5.8E-06	1.8E-05	3.0E-03	2E-03	6E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	2.6E+00	1.00	1.5E-06	4.6E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06			
		Iron	8.7E+03	1.00	5.1E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	1.1E+02	1.00	6.4E-05	1.9E-04	2.4E-02	3E-03	8E-03	5E-05	1E-04			
		Mercury	2.4E-02	1.00	1.4E-08	4.2E-08	3.0E-04	5E-05	1E-04	1E-08	3E-08			
		Thallium	1.2E-01	1.00	7.0E-08	2.1E-07	1.0E-05	7E-03	2E-02	5E-08	2E-07			
		Vanadium	1.2E+01	1.00	6.9E-06	2.1E-05	5.0E-03	1E-03	4E-03	5E-06	2E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	7.1E-07	1.00	4.2E-13	1.3E-12	7.0E-10	6E-04	2E-03	3E-13	9E-13	1E+05	4E-08	1E-07
		Aluminum	6.6E+03	1.00	3.9E-03	1.2E-02	1.0E+00	4E-03	1E-02	3E-03	9E-03			
		Antimony	4.1E-02	1.00	2.4E-08	7.1E-08	4.0E-04	6E-05	2E-04	2E-08	5E-08			
		Arsenic	1.9E+00	0.60	6.5E-07	1.9E-06	3.0E-04	2E-03	6E-03	5E-07	1E-06	2E+00	7E-07	2E-06
		Barium	8.5E+01	1.00	5.0E-05	1.5E-04	2.0E-01	2E-04	7E-04	4E-05	1E-04			
		Cadmium	4.4E-02	1.00	2.6E-08	7.7E-08	1.0E-03	3E-05	8E-05	2E-08	6E-08			
Upland	31	Chromium	1.0E+01	1.00	6.0E-06	1.8E-05	3.0E-03	2E-03	6E-03	4E-06	1E-05	5E-01	2E-06	7E-06
		Cobalt	2.9E+00	1.00	1.7E-06	5.0E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	7.9E+03	1.00	4.6E-03	1.4E-02	7.0E-01	7E-03	2E-02	3E-03	1E-02			
		Manganese	1.3E+02	1.00	7.3E-05	2.2E-04	2.4E-02	3E-03	9E-03	5E-05	2E-04			
		Mercury	3.4E-03	1.00	2.0E-09	6.0E-09	3.0E-04	7E-06	2E-05	1E-09	4E-09			
		Thallium	1.1E-01	1.00	6.1E-08	1.8E-07	1.0E-05	6E-03	2E-02	5E-08	1E-07			
		Vanadium	9.4E+00	1.00	5.5E-06	1.6E-05	5.0E-03	1E-03	3E-03	4E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	1.00	3.1E-13	9.3E-13	7.0E-10	4E-04	1E-03	2E-13	7E-13	1E+05	3E-08	9E-08
		Aluminum	4.8E+03	1.00	2.8E-03	8.5E-03	1.0E+00	3E-03	8E-03	2E-03	6E-03			
		Antimony	1.5E-01	1.00	8.8E-08	2.6E-07	4.0E-04	2E-04	7E-04	6E-08	2E-07			
		Arsenic	1.1E+00	0.60	3.9E-07	1.2E-06	3.0E-04	1E-03	4E-03	3E-07	9E-07	2E+00	4E-07	1E-06
		Barium	1.2E+02	1.00	7.1E-05	2.1E-04	2.0E-01	4E-04	1E-03	5E-05	2E-04			
		Cadmium	4.6E-02	1.00	2.7E-08	8.1E-08	1.0E-03	3E-05	8E-05	2E-08	6E-08			
Upland	32	Chromium	6.3E+00	1.00	3.7E-06	1.1E-05	3.0E-03	1E-03	4E-03	3E-06	8E-06	5E-01	1E-06	4E-06
		Cobalt	2.2E+00	1.00	1.3E-06	3.9E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	7.6E+03	1.00	4.4E-03	1.3E-02	7.0E-01	6E-03	2E-02	3E-03	1E-02			
		Manganese	9.1E+01	1.00	5.3E-05	1.6E-04	2.4E-02	2E-03	7E-03	4E-05	1E-04			
		Mercury	3.1E-03	1.00	1.8E-09	5.4E-09	3.0E-04	6E-06	2E-05	1E-09	4E-09			
		Thallium	6.9E-02	1.00	4.0E-08	1.2E-07	1.0E-05	4E-03	1E-02	3E-08	9E-08			
		Vanadium	8.3E+00	1.00	4.9E-06	1.5E-05	5.0E-03	1E-03	3E-03	4E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.0E-06	1.00	6.0E-13	1.8E-12	7.0E-10	9E-04	3E-03	4E-13	1E-12	1E+05	6E-08	2E-07
		Aluminum	8.8E+03	1.00	5.1E-03	1.5E-02	1.0E+00	5E-03	2E-02	4E-03	1E-02			
		Antimony	9.0E-02	1.00	5.3E-08	1.6E-07	4.0E-04	1E-04	4E-04	4E-08	1E-07			
		Arsenic	4.0E+00	0.60	1.4E-06	4.2E-06	3.0E-04	5E-03	1E-02	1E-06	3E-06	2E+00	2E-06	5E-06
		Barium	2.3E+02	1.00	1.3E-04	4.0E-04	2.0E-01	7E-04	2E-03	1E-04	3E-04			
		Cadmium	1.3E-01	1.00	7.6E-08	2.3E-07	1.0E-03	8E-05	2E-04	6E-08	2E-07			
Upland	33	Chromium	1.1E+01	1.00	6.2E-06	1.9E-05	3.0E-03	2E-03	6E-03	5E-06	1E-05	5E-01	2E-06	7E-06
		Cobalt	4.2E+00	1.00	2.5E-06	7.4E-06	3.0E-04	8E-03	2E-02	2E-06	5E-06			
		Iron	1.2E+04	1.00	6.7E-03	2.0E-02	7.0E-01	1E-02	3E-02	5E-03	1E-02			
		Manganese	3.9E+02	1.00	2.3E-04	6.8E-04	2.4E-02	9E-03	3E-02	2E-04	5E-04			
		Mercury	1.7E-02	1.00	9.9E-09	3.0E-08	3.0E-04	3E-05	1E-04	7E-09	2E-08			
		Thallium	1.3E-01	1.00	7.6E-08	2.3E-07	1.0E-05	8E-03	2E-02	6E-08	2E-07			
		Vanadium	1.7E+01	1.00	9.6E-06	2.9E-05	5.0E-03	2E-03	6E-03	7E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	1.00	4.9E-13	1.5E-12	7.0E-10	7E-04	2E-03	4E-13	1E-12	1E+05	5E-08	1E-07
		Aluminum	7.2E+03	1.00	4.2E-03	1.3E-02	1.0E+00	4E-03	1E-02	3E-03	9E-03			
		Antimony	8.5E-02	1.00	5.0E-08	1.5E-07	4.0E-04	1E-04	4E-04	4E-08	1E-07			
		Arsenic	1.6E+00	0.60	5.6E-07	1.7E-06	3.0E-04	2E-03	6E-03	4E-07	1E-06	2E+00	6E-07	2E-06
		Barium	2.0E+02	1.00	1.2E-04	3.5E-04	2.0E-01	6E-04	2E-03	9E-05	3E-04			
		Cadmium	9.3E-02	1.00	5.4E-08	1.6E-07	1.0E-03	5E-05	2E-04	4E-08	1E-07			
Upland	34	Chromium	8.2E+00	1.00	4.8E-06	1.4E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	5E-06
		Cobalt	3.2E+00	1.00	1.9E-06	5.6E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	8.8E+03	1.00	5.1E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	1.6E+02	1.00	9.2E-05	2.8E-04	2.4E-02	4E-03	1E-02	7E-05	2E-04			
		Mercury	1.3E-02	1.00	7.6E-09	2.3E-08	3.0E-04	3E-05	8E-05	6E-09	2E-08			
		Thallium	9.9E-02	1.00	5.8E-08	1.7E-07	1.0E-05	6E-03	2E-02	4E-08	1E-07			
		Vanadium	1.1E+01	1.00	6.3E-06	1.9E-05	5.0E-03	1E-03	4E-03	5E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	1.00	4.2E-13	1.3E-12	7.0E-10	6E-04	2E-03	3E-13	9E-13	1E+05	4E-08	1E-07
		Aluminum	9.5E+03	1.00	5.6E-03	1.7E-02	1.0E+00	6E-03	2E-02	4E-03	1E-02			
		Antimony	2.3E-01	1.00	1.3E-07	4.0E-07	4.0E-04	3E-04	1E-03	1E-07	3E-07			
		Arsenic	2.1E+00	0.60	7.4E-07	2.2E-06	3.0E-04	2E-03	7E-03	5E-07	2E-06	2E+00	8E-07	2E-06
		Barium	2.3E+02	1.00	1.3E-04	4.0E-04	2.0E-01	7E-04	2E-03	1E-04	3E-04			
		Cadmium	1.9E-01	1.00	1.1E-07	3.3E-07	1.0E-03	1E-04	3E-04	8E-08	2E-07			
Upland	35	Chromium	8.9E+00	1.00	5.2E-06	1.6E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	4.5E+00	1.00	2.6E-06	7.9E-06	3.0E-04	9E-03	3E-02	2E-06	6E-06			
		Iron	1.1E+04	1.00	6.6E-03	2.0E-02	7.0E-01	9E-03	3E-02	5E-03	1E-02			
		Manganese	4.9E+02	1.00	2.8E-04	8.5E-04	2.4E-02	1E-02	4E-02	2E-04	6E-04			
		Mercury	1.8E-02	1.00	1.1E-08	3.2E-08	3.0E-04	4E-05	1E-04	8E-09	2E-08			
		Thallium	1.2E-01	1.00	7.0E-08	2.1E-07	1.0E-05	7E-03	2E-02	5E-08	2E-07			
		Vanadium	1.2E+01	1.00	6.8E-06	2.0E-05	5.0E-03	1E-03	4E-03	5E-06	2E-05			

Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	1.00	5.3E-12	1.6E-11	7.0E-10	8E-03	2E-02	4E-12	1E-11	1E+05	5E-07	2E-06
		Aluminum	1.3E+04	1.00	7.3E-03	2.2E-02	1.0E+00	7E-03	2E-02	5E-03	2E-02			
		Antimony	8.0E-01	1.00	4.7E-07	1.4E-06	4.0E-04	1E-03	4E-03	3E-07	1E-06			
		Arsenic	5.1E+00	0.60	1.8E-06	5.4E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06	2E+00	2E-06	6E-06
		Barium	4.9E+02	1.00	2.9E-04	8.6E-04	2.0E-01	1E-03	4E-03	2E-04	6E-04			
		Cadmium	8.5E-01	1.00	5.0E-07	1.5E-06	1.0E-03	5E-04	1E-03	4E-07	1E-06			
		Chromium	1.8E+01	1.00	1.0E-05	3.1E-05	3.0E-03	3E-03	1E-02	8E-06	2E-05	5E-01	4E-06	1E-05
		Cobalt	4.9E+00	1.00	2.9E-06	8.6E-06	3.0E-04	1E-02	3E-02	2E-06	6E-06			
		Iron	1.3E+04	1.00	7.5E-03	2.2E-02	7.0E-01	1E-02	3E-02	6E-03	2E-02			
		Manganese	4.1E+02	1.00	2.4E-04	7.1E-04	2.4E-02	1E-02	3E-02	2E-04	5E-04			
		Mercury	2.7E-01	1.00	1.6E-07	4.7E-07	3.0E-04	5E-04	2E-03	1E-07	3E-07			
		Thallium	1.4E-01	1.00	8.2E-08	2.5E-07	1.0E-05	8E-03	2E-02	6E-08	2E-07			
		Vanadium	3.1E+01	1.00	1.8E-05	5.4E-05	5.0E-03	4E-03	1E-02	1E-05	4E-05			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	1.00	8.9E-13	2.7E-12	7.0E-10	1E-03	4E-03	7E-13	2E-12	1E+05	9E-08	3E-07
		Aluminum	7.9E+03	1.00	4.6E-03	1.4E-02	1.0E+00	5E-03	1E-02	3E-03	1E-02			
		Antimony	3.3E-01	1.00	1.9E-07	5.8E-07	4.0E-04	5E-04	1E-03	1E-07	4E-07			
		Arsenic	2.5E+00	0.60	8.8E-07	2.7E-06	3.0E-04	3E-03	9E-03	7E-07	2E-06	2E+00	1E-06	3E-06
		Barium	2.0E+02	1.00	1.2E-04	3.6E-04	2.0E-01	6E-04	2E-03	9E-05	3E-04			
		Cadmium	2.6E-01	1.00	1.5E-07	4.5E-07	1.0E-03	1E-04	4E-04	1E-07	3E-07			
		Chromium	1.0E+01	1.00	5.9E-06	1.8E-05	3.0E-03	2E-03	6E-03	4E-06	1E-05	5E-01	2E-06	7E-06
		Cobalt	3.5E+00	1.00	2.0E-06	6.1E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06			
		Iron	9.9E+03	1.00	5.8E-03	1.7E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	2.6E+02	1.00	1.5E-04	4.6E-04	2.4E-02	6E-03	2E-02	1E-04	3E-04			
		Mercury	4.0E-02	1.00	2.3E-08	7.0E-08	3.0E-04	8E-05	2E-04	2E-08	5E-08			
		Thallium	8.7E-02	1.00	5.1E-08	1.5E-07	1.0E-05	5E-03	2E-02	4E-08	1E-07			
		Vanadium	1.1E+01	1.00	6.7E-06	2.0E-05	5.0E-03	1E-03	4E-03	5E-06	1E-05			
Upland	38[a]	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	1.00	1.2E-12	3.7E-12	7.0E-10	2E-03	5E-03	9E-13	3E-12	1E+05	1E-07	4E-07
		Aluminum	2.7E+03	1.00	1.6E-03	4.7E-03	1.0E+00	2E-03	5E-03	1E-03	3E-03			
		Antimony	8.5E-02	1.00	5.0E-08	1.5E-07	4.0E-04	1E-04	4E-04	4E-08	1E-07			
		Arsenic	1.0E+00	0.60	3.5E-07	1.1E-06	3.0E-04	1E-03	4E-03	3E-07	8E-07	2E+00	4E-07	1E-06
		Barium	4.4E+01	1.00	2.6E-05	7.7E-05	2.0E-01	1E-04	4E-04	2E-05	6E-05			
		Cadmium	1.6E-02	1.00	9.4E-09	2.8E-08	1.0E-03	9E-06	3E-05	7E-09	2E-08			
		Chromium	3.8E+00	1.00	2.2E-06	6.7E-06	3.0E-03	7E-04	2E-03	2E-06	5E-06	5E-01	8E-07	2E-06
		Cobalt	1.5E+00	1.00	8.8E-07	2.6E-06	3.0E-04	3E-03	9E-03	6E-07	2E-06			
		Iron	5.2E+03	1.00	3.0E-03	9.1E-03	7.0E-01	4E-03	1E-02	2E-03	7E-03			
		Manganese	3.9E+01	1.00	2.3E-05	6.8E-05	2.4E-02	9E-04	3E-03	2E-05	5E-05			
		Mercury	4.6E-03	1.00	2.7E-09	8.1E-09	3.0E-04	9E-06	3E-05	2E-09	6E-09			
		Thallium	1.7E-02	1.00	9.6E-09	2.9E-08	1.0E-05	1E-03	3E-03	7E-09	2E-08			
		Vanadium	5.3E+00	1.00	3.1E-06	9.3E-06	5.0E-03	6E-04	2E-03	2E-06	7E-06			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	1.6E-12	4.9E-12	7.0E-10	2E-03	7E-03	1E-12	4E-12	1E+05	2E-07	5E-07
		Aluminum	9.7E+03	1.00	5.7E-03	1.7E-02	1.0E+00	6E-03	2E-02	4E-03	1E-02			
		Antimony	4.3E-01	1.00	2.5E-07	7.5E-07	4.0E-04	6E-04	2E-03	2E-07	6E-07			
		Arsenic	2.2E+00	0.60	7.6E-07	2.3E-06	3.0E-04	3E-03	8E-03	6E-07	2E-06	2E+00	8E-07	3E-06
		Barium	4.3E+02	1.00	2.5E-04	7.5E-04	2.0E-01	1E-03	4E-03	2E-04	6E-04			
		Cadmium	3.3E-01	1.00	1.9E-07	5.8E-07	1.0E-03	2E-04	6E-04	1E-07	4E-07			
		Chromium	1.2E+01	1.00	7.0E-06	2.1E-05	3.0E-03	2E-03	7E-03	5E-06	2E-05	5E-01	3E-06	8E-06
		Cobalt	3.3E+00	1.00	1.9E-06	5.8E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	9.9E+03	1.00	5.8E-03	1.7E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	1.3E+02	1.00	7.8E-05	2.3E-04	2.4E-02	3E-03	1E-02	6E-05	2E-04			
		Mercury	7.4E-02	1.00	4.3E-08	1.3E-07	3.0E-04	1E-04	4E-04	3E-08	1E-07			
		Thallium	1.3E-01	1.00	7.8E-08	2.3E-07	1.0E-05	8E-03	2E-02	6E-08	2E-07			
		Vanadium	1.8E+01	1.00	1.1E-05	3.2E-05	5.0E-03	2E-03	6E-03	8E-06	2E-05			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	1.00	2.1E-12	6.2E-12	7.0E-10	3E-03	9E-03	2E-12	5E-12	1E+05	2E-07	6E-07
		Aluminum	6.0E+03	1.00	3.5E-03	1.0E-02	1.0E+00	3E-03	1E-02	3E-03	8E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.4E+00	0.60	4.9E-07	1.5E-06	3.0E-04	2E-03	5E-03	4E-07	1E-06	2E+00	5E-07	2E-06
		Barium	2.1E+02	1.00	1.2E-04	3.6E-04	2.0E-01	6E-04	2E-03	9E-05	3E-04			
		Cadmium	2.8E-01	1.00	1.6E-07	4.9E-07	1.0E-03	2E-04	5E-04	1E-07	4E-07			
		Chromium	1.1E+01	1.00	6.5E-06	1.9E-05	3.0E-03	2E-03	6E-03	5E-06	1E-05	5E-01	2E-06	7E-06
		Cobalt	2.2E+00	1.00	1.3E-06	3.9E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	6.3E+03	1.00	3.7E-03	1.1E-02	7.0E-01	5E-03	2E-02	3E-03	8E-03			
		Manganese	9.2E+01	1.00	5.4E-05	1.6E-04	2.4E-02	2E-03	7E-03	4E-05	1E-04			
		Mercury	4.0E-02	1.00	2.3E-08	7.0E-08	3.0E-04	8E-05	2E-04	2E-08	5E-08			
		Thallium	6.8E-02	1.00	4.0E-08	1.2E-07	1.0E-05	4E-03	1E-02	3E-08	9E-08			
		Vanadium	7.6E+00	1.00	4.4E-06	1.3E-05	5.0E-03	9E-04	3E-03	3E-06	1E-05			

Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	2.3E-12	6.9E-12	7.0E-10	3E-03	1E-02	2E-12	5E-12	1E+05	2E-07	7E-07
		Aluminum	5.7E+03	1.00	3.3E-03	1.0E-02	1.0E+00	3E-03	1E-02	2E-03	7E-03			
		Antimony	4.2E-02	1.00	2.5E-08	7.4E-08	4.0E-04	6E-05	2E-04	2E-08	5E-08			
		Arsenic	1.3E+00	0.60	4.6E-07	1.4E-06	3.0E-04	2E-03	5E-03	3E-07	1E-06	2E+00	5E-07	2E-06
		Barium	3.2E+02	1.00	1.9E-04	5.6E-04	2.0E-01	9E-04	3E-03	1E-04	4E-04			
		Cadmium	2.8E-01	1.00	1.6E-07	4.9E-07	1.0E-03	2E-04	5E-04	1E-07	4E-07			
		Chromium	8.3E+00	1.00	4.9E-06	1.5E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	5E-06
		Cobalt	1.6E+00	1.00	9.4E-07	2.8E-06	3.0E-04	3E-03	9E-03	7E-07	2E-06			
		Iron	4.7E+03	1.00	2.8E-03	8.3E-03	7.0E-01	4E-03	1E-02	2E-03	6E-03			
		Manganese	1.3E+02	1.00	7.4E-05	2.2E-04	2.4E-02	3E-03	9E-03	5E-05	2E-04			
		Mercury	5.7E-02	1.00	3.3E-08	1.0E-07	3.0E-04	1E-04	3E-04	2E-08	7E-08			
		Thallium	6.5E-03	1.00	3.8E-09	1.1E-08	1.0E-05	4E-04	1E-03	3E-09	8E-09			
		Vanadium	5.3E+00	1.00	3.1E-06	9.3E-06	5.0E-03	6E-04	2E-03	2E-06	7E-06			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	1.00	4.4E-12	1.3E-11	7.0E-10	6E-03	2E-02	3E-12	1E-11	1E+05	4E-07	1E-06
		Aluminum	1.3E+04	1.00	7.5E-03	2.3E-02	1.0E+00	8E-03	2E-02	6E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.1E+00	0.60	1.1E-06	3.3E-06	3.0E-04	4E-03	1E-02	8E-07	2E-06	2E+00	1E-06	4E-06
		Barium	3.0E+02	1.00	1.7E-04	5.2E-04	2.0E-01	9E-04	3E-03	1E-04	4E-04			
		Cadmium	3.2E-01	1.00	1.9E-07	5.6E-07	1.0E-03	2E-04	6E-04	1E-07	4E-07			
		Chromium	2.1E+01	1.00	1.2E-05	3.6E-05	3.0E-03	4E-03	1E-02	9E-06	3E-05	5E-01	4E-06	1E-05
		Cobalt	4.9E+00	1.00	2.9E-06	8.6E-06	3.0E-04	1E-02	3E-02	2E-06	6E-06			
		Iron	1.6E+04	1.00	9.4E-03	2.8E-02	7.0E-01	1E-02	4E-02	7E-03	2E-02			
		Manganese	3.0E+02	1.00	1.7E-04	5.2E-04	2.4E-02	7E-03	2E-02	1E-04	4E-04			
		Mercury	1.6E-01	1.00	9.4E-08	2.8E-07	3.0E-04	3E-04	9E-04	7E-08	2E-07			
		Thallium	1.7E-01	1.00	9.9E-08	3.0E-07	1.0E-05	1E-02	3E-02	7E-08	2E-07			
		Vanadium	1.8E+01	1.00	1.1E-05	3.2E-05	5.0E-03	2E-03	6E-03	8E-06	2E-05			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	1.00	2.3E-12	6.8E-12	7.0E-10	3E-03	1E-02	2E-12	5E-12	1E+05	2E-07	7E-07
		Aluminum	9.1E+03	1.00	5.3E-03	1.6E-02	1.0E+00	5E-03	2E-02	4E-03	1E-02			
		Antimony	7.6E-01	1.00	4.4E-07	1.3E-06	4.0E-04	1E-03	3E-03	3E-07	1E-06			
		Arsenic	2.8E+00	0.60	9.8E-07	2.9E-06	3.0E-04	3E-03	1E-02	7E-07	2E-06	2E+00	1E-06	3E-06
		Barium	5.8E+02	1.00	3.4E-04	1.0E-03	2.0E-01	2E-03	5E-03	2E-04	7E-04			
		Cadmium	4.7E-01	1.00	2.7E-07	8.2E-07	1.0E-03	3E-04	8E-04	2E-07	6E-07			
		Chromium	1.3E+01	1.00	7.8E-06	2.3E-05	3.0E-03	3E-03	8E-03	6E-06	2E-05	5E-01	3E-06	9E-06
		Cobalt	2.8E+00	1.00	1.6E-06	4.9E-06	3.0E-04	5E-03	2E-02	1E-06	4E-06			
		Iron	7.8E+03	1.00	4.6E-03	1.4E-02	7.0E-01	7E-03	2E-02	3E-03	1E-02			
		Manganese	1.5E+02	1.00	8.7E-05	2.6E-04	2.4E-02	4E-03	1E-02	6E-05	2E-04			
		Mercury	1.2E-01	1.00	7.0E-08	2.1E-07	3.0E-04	2E-04	7E-04	5E-08	2E-07			
		Thallium	9.6E-02	1.00	5.6E-08	1.7E-07	1.0E-05	6E-03	2E-02	4E-08	1E-07			
		Vanadium	2.7E+01	1.00	1.6E-05	4.7E-05	5.0E-03	3E-03	9E-03	1E-05	3E-05			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	1.3E-12	3.8E-12	7.0E-10	2E-03	5E-03	9E-13	3E-12	1E+05	1E-07	4E-07
		Aluminum	9.9E+03	1.00	5.8E-03	1.7E-02	1.0E+00	6E-03	2E-02	4E-03	1E-02			
		Antimony	1.2E+00	1.00	6.8E-07	2.0E-06	4.0E-04	2E-03	5E-03	5E-07	2E-06			
		Arsenic	4.4E+00	0.60	1.5E-06	4.6E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06	2E+00	2E-06	5E-06
		Barium	2.9E+02	1.00	1.7E-04	5.1E-04	2.0E-01	9E-04	3E-03	1E-04	4E-04			
		Cadmium	8.0E-01	1.00	4.7E-07	1.4E-06	1.0E-03	5E-04	1E-03	3E-07	1E-06			
		Chromium	1.2E+01	1.00	7.0E-06	2.1E-05	3.0E-03	2E-03	7E-03	5E-06	2E-05	5E-01	3E-06	8E-06
		Cobalt	3.0E+00	1.00	1.8E-06	5.3E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	8.1E+03	1.00	4.7E-03	1.4E-02	7.0E-01	7E-03	2E-02	3E-03	1E-02			
		Manganese	3.3E+02	1.00	2.0E-04	5.9E-04	2.4E-02	8E-03	2E-02	1E-04	4E-04			
		Mercury	1.6E-01	1.00	9.1E-08	2.7E-07	3.0E-04	3E-04	9E-04	7E-08	2E-07			
		Thallium	9.5E-02	1.00	5.5E-08	1.7E-07	1.0E-05	6E-03	2E-02	4E-08	1E-07			
		Vanadium	3.4E+01	1.00	2.0E-05	6.0E-05	5.0E-03	4E-03	1E-02	1E-05	4E-05			
Upland	45[a]	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	1.00	2.2E-13	6.5E-13	7.0E-10	3E-04	9E-04	2E-13	5E-13	1E+05	2E-08	6E-08
		Aluminum	2.1E+04	1.00	1.2E-02	3.7E-02	1.0E+00	1E-02	4E-02	9E-03	3E-02			
		Antimony	2.3E-01	1.00	1.3E-07	4.0E-07	4.0E-04	3E-04	1E-03	1E-07	3E-07			
		Arsenic	3.1E+00	0.60	1.1E-06	3.3E-06	3.0E-04	4E-03	1E-02	8E-07	2E-06	2E+00	1E-06	4E-06
		Barium	3.1E+02	1.00	1.8E-04	5.5E-04	2.0E-01	9E-04	3E-03	1E-04	4E-04			
		Cadmium	8.0E-02	1.00	4.7E-08	1.4E-07	1.0E-03	5E-05	1E-04	3E-08	1E-07			
		Chromium	1.8E+01	1.00	1.1E-05	3.2E-05	3.0E-03	4E-03	1E-02	8E-06	2E-05	5E-01	4E-06	1E-05
		Cobalt	6.9E+00	1.00	4.0E-06	1.2E-05	3.0E-04	1E-02	4E-02	3E-06	9E-06			
		Iron	2.0E+04	1.00	1.2E-02	3.6E-02	7.0E-01	2E-02	5E-02	9E-03	3E-02			
		Manganese	1.8E+02	1.00	1.0E-04	3.1E-04	2.4E-02	4E-03	1E-02	8E-05	2E-04			
		Mercury	1.9E-02	1.00	1.1E-08	3.3E-08	3.0E-04	4E-05	1E-04	8E-09	2E-08			
		Thallium	2.1E-01	1.00	1.2E-07	3.7E-07	1.0E-05	1E-02	4E-02	9E-08	3E-07			
		Vanadium	1.9E+01	1.00	1.1E-05	3.3E-05	5.0E-03	2E-03	7E-03	8E-06	2E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-06	1.00	1.8E-12	5.3E-12	7.0E-10	3E-03	8E-03	1E-12	4E-12	1E+05	2E-07	5E-07
		Aluminum	1.2E+04	1.00	6.8E-03	2.1E-02	1.0E+00	7E-03	2E-02	5E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.3E+00	0.60	8.1E-07	2.4E-06	3.0E-04	3E-03	8E-03	6E-07	2E-06	2E+00	9E-07	3E-06
		Barium	4.2E+02	1.00	2.4E-04	7.3E-04	2.0E-01	1E-03	4E-03	2E-04	5E-04			
		Cadmium	2.4E-01	1.00	1.4E-07	4.2E-07	1.0E-03	1E-04	4E-04	1E-07	3E-07			
Upland	46	Chromium	1.7E+01	1.00	1.0E-05	3.0E-05	3.0E-03	3E-03	1E-02	7E-06	2E-05	5E-01	4E-06	1E-05
		Cobalt	4.9E+00	1.00	2.9E-06	8.6E-06	3.0E-04	1E-02	3E-02	2E-06	6E-06			
		Iron	1.4E+04	1.00	8.2E-03	2.5E-02	7.0E-01	1E-02	4E-02	6E-03	2E-02			
		Manganese	2.4E+02	1.00	1.4E-04	4.1E-04	2.4E-02	6E-03	2E-02	1E-04	3E-04			
		Mercury	4.1E-02	1.00	2.4E-08	7.2E-08	3.0E-04	8E-05	2E-04	2E-08	5E-08			
		Thallium	1.6E-01	1.00	9.4E-08	2.8E-07	1.0E-05	9E-03	3E-02	7E-08	2E-07			
		Vanadium	1.8E+01	1.00	1.0E-05	3.1E-05	5.0E-03	2E-03	6E-03	8E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	9.5E-12	2.8E-11	7.0E-10	1E-02	4E-02	7E-12	2E-11	1E+05	9E-07	3E-06
		Aluminum	1.8E+04	1.00	1.0E-02	3.1E-02	1.0E+00	1E-02	3E-02	8E-03	2E-02			
		Antimony	1.6E+00	1.00	9.4E-07	2.8E-06	4.0E-04	2E-03	7E-03	7E-07	2E-06			
		Arsenic	1.3E+01	0.60	4.5E-06	1.3E-05	3.0E-04	1E-02	4E-02	3E-06	1E-05	2E+00	5E-06	1E-05
		Barium	5.6E+02	1.00	3.3E-04	9.8E-04	2.0E-01	2E-03	5E-03	2E-04	7E-04			
		Cadmium	5.2E+00	1.00	3.0E-06	9.1E-06	1.0E-03	3E-03	9E-03	2E-06	7E-06			
Upland	47	Chromium	2.2E+01	1.00	1.3E-05	3.9E-05	3.0E-03	4E-03	1E-02	1E-05	3E-05	5E-01	5E-06	1E-05
		Cobalt	2.0E+00	1.00	1.2E-06	3.5E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	2.9E+03	1.00	1.7E-03	5.1E-03	7.0E-01	2E-03	7E-03	1E-03	4E-03			
		Manganese	1.1E+03	1.00	6.7E-04	2.0E-03	2.4E-02	3E-02	8E-02	5E-04	1E-03			
		Mercury	8.1E-01	1.00	4.7E-07	1.4E-06	3.0E-04	2E-03	5E-03	3E-07	1E-06			
		Thallium	2.1E-01	1.00	1.2E-07	3.7E-07	1.0E-05	1E-02	4E-02	9E-08	3E-07			
		Vanadium	5.1E+01	1.00	3.0E-05	8.9E-05	5.0E-03	6E-03	2E-02	2E-05	7E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	1.00	2.9E-11	8.6E-11	7.0E-10	4E-02	1E-01	2E-11	6E-11	1E+05	3E-06	8E-06
		Aluminum	1.9E+04	1.00	1.1E-02	3.3E-02	1.0E+00	1E-02	3E-02	8E-03	2E-02			
		Antimony	2.4E+00	1.00	1.4E-06	4.2E-06	4.0E-04	4E-03	1E-02	1E-06	3E-06			
		Arsenic	1.4E+01	0.60	5.0E-06	1.5E-05	3.0E-04	2E-02	5E-02	4E-06	1E-05	2E+00	6E-06	2E-05
		Barium	8.0E+02	1.00	4.7E-04	1.4E-03	2.0E-01	2E-03	7E-03	3E-04	1E-03			
		Cadmium	8.3E+00	1.00	4.9E-06	1.5E-05	1.0E-03	5E-03	1E-02	4E-06	1E-05			
Upland	48	Chromium	5.8E+01	1.00	3.4E-05	1.0E-04	3.0E-03	1E-02	3E-02	3E-05	8E-05	5E-01	1E-05	4E-05
		Cobalt	2.0E+00	1.00	1.2E-06	3.5E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	3.6E+03	1.00	2.1E-03	6.3E-03	7.0E-01	3E-03	9E-03	2E-03	5E-03			
		Manganese	1.7E+03	1.00	9.6E-04	2.9E-03	2.4E-02	4E-02	1E-01	7E-04	2E-03			
		Mercury	2.5E+00	1.00	1.5E-06	4.4E-06	3.0E-04	5E-03	1E-02	1E-06	3E-06			
		Thallium	3.3E-01	1.00	1.9E-07	5.8E-07	1.0E-05	2E-02	6E-02	1E-07	4E-07			
		Vanadium	7.1E+01	1.00	4.1E-05	1.2E-04	5.0E-03	8E-03	2E-02	3E-05	9E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	1.00	2.3E-11	7.0E-11	7.0E-10	3E-02	1E-01	2E-11	5E-11	1E+05	2E-06	7E-06
		Aluminum	1.4E+04	1.00	8.4E-03	2.5E-02	1.0E+00	8E-03	3E-02	6E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	3.6E+00	0.60	1.3E-06	3.8E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06	2E+00	1E-06	4E-06
		Barium	1.0E+03	1.00	5.9E-04	1.8E-03	2.0E-01	3E-03	9E-03	4E-04	1E-03			
		Cadmium	2.0E+00	1.00	1.2E-06	3.5E-06	1.0E-03	1E-03	4E-03	9E-07	3E-06			
Upland	49	Chromium	2.9E+01	1.00	1.7E-05	5.0E-05	3.0E-03	6E-03	2E-02	1E-05	4E-05	5E-01	6E-06	2E-05
		Cobalt	4.5E+00	1.00	2.6E-06	7.9E-06	3.0E-04	9E-03	3E-02	2E-06	6E-06			
		Iron	1.5E+04	1.00	8.7E-03	2.6E-02	7.0E-01	1E-02	4E-02	6E-03	2E-02			
		Manganese	5.8E+02	1.00	3.4E-04	1.0E-03	2.4E-02	1E-02	4E-02	2E-04	7E-04			
		Mercury	8.0E+00	1.00	4.7E-06	1.4E-05	3.0E-04	2E-02	5E-02	3E-06	1E-05			
		Thallium	1.6E-01	1.00	9.4E-08	2.8E-07	1.0E-05	9E-03	3E-02	7E-08	2E-07			
		Vanadium	2.2E+01	1.00	1.3E-05	3.8E-05	5.0E-03	3E-03	8E-03	9E-06	3E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	1.00	1.4E-11	4.3E-11	7.0E-10	2E-02	6E-02	1E-11	3E-11	1E+05	1E-06	4E-06
		Aluminum	1.2E+04	1.00	6.8E-03	2.0E-02	1.0E+00	7E-03	2E-02	5E-03	1E-02			
		Antimony	1.2E+00	1.00	6.7E-07	2.0E-06	4.0E-04	2E-03	5E-03	5E-07	1E-06			
		Arsenic	7.9E+00	0.60	2.8E-06	8.3E-06	3.0E-04	9E-03	3E-02	2E-06	6E-06	2E+00	3E-06	9E-06
		Barium	5.2E+02	1.00	3.0E-04	9.1E-04	2.0E-01	2E-03	5E-03	2E-04	7E-04			
		Cadmium	3.9E+00	1.00	2.3E-06	6.8E-06	1.0E-03	2E-03	7E-03	2E-06	5E-06			
Upland	50	Chromium	2.4E+01	1.00	1.4E-05	4.2E-05	3.0E-03	5E-03	1E-02	1E-05	3E-05	5E-01	5E-06	2E-05
		Cobalt	2.2E+00	1.00	1.3E-06	3.9E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	4.4E+03	1.00	2.5E-03	7.6E-03	7.0E-01	4E-03	1E-02	2E-03	6E-03			
		Manganese	1.3E+03	1.00	7.3E-04	2.2E-03	2.4E-02	3E-02	9E-02	5E-04	2E-03			
		Mercury	7.5E-01	1.00	4.4E-07	1.3E-06	3.0E-04	1E-03	4E-03	3E-07	1E-06			
		Thallium	1.9E-01	1.00	1.1E-07	3.3E-07	1.0E-05	1E-02	3E-02	8E-08	2E-07			
		Vanadium	2.9E+01	1.00	1.7E-05	5.0E-05	5.0E-03	3E-03	1E-02	1E-05	4E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	1.00	1.8E-12	5.5E-12	7.0E-10	3E-03	8E-03	1E-12	4E-12	1E+05	2E-07	5E-07
		Aluminum	3.2E+03	1.00	1.9E-03	5.6E-03	1.0E+00	2E-03	6E-03	1E-03	4E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.2E+00	0.60	7.7E-07	2.3E-06	3.0E-04	3E-03	8E-03	6E-07	2E-06	2E+00	9E-07	3E-06
		Barium	1.1E+02	1.00	6.3E-05	1.9E-04	2.0E-01	3E-04	9E-04	5E-05	1E-04			
		Cadmium	5.2E-01	1.00	3.0E-07	9.1E-07	1.0E-03	3E-04	9E-04	2E-07	7E-07			
Upland	51	Chromium	9.0E+00	1.00	5.3E-06	1.6E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	2.0E+00	1.00	1.2E-06	3.5E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	5.2E+03	1.00	3.0E-03	9.0E-03	7.0E-01	4E-03	1E-02	2E-03	7E-03			
		Manganese	2.2E+02	1.00	1.3E-04	3.9E-04	2.4E-02	5E-03	2E-02	1E-04	3E-04			
		Mercury	1.6E-01	1.00	9.4E-08	2.8E-07	3.0E-04	3E-04	9E-04	7E-08	2E-07			
		Thallium	5.2E-02	1.00	3.0E-08	9.1E-08	1.0E-05	3E-03	9E-03	2E-08	7E-08			
		Vanadium	9.2E+00	1.00	5.4E-06	1.6E-05	5.0E-03	1E-03	3E-03	4E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	1.00	1.3E-12	3.8E-12	7.0E-10	2E-03	5E-03	9E-13	3E-12	1E+05	1E-07	4E-07
		Aluminum	4.9E+03	1.00	2.9E-03	8.6E-03	1.0E+00	3E-03	9E-03	2E-03	6E-03			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.8E+00	0.60	6.2E-07	1.9E-06	3.0E-04	2E-03	6E-03	5E-07	1E-06	2E+00	7E-07	2E-06
		Barium	9.6E+01	1.00	5.6E-05	1.7E-04	2.0E-01	3E-04	8E-04	4E-05	1E-04			
		Cadmium	1.6E-01	1.00	9.3E-08	2.8E-07	1.0E-03	9E-05	3E-04	7E-08	2E-07			
Upland	52	Chromium	6.8E+00	1.00	4.0E-06	1.2E-05	3.0E-03	1E-03	4E-03	3E-06	9E-06	5E-01	1E-06	4E-06
		Cobalt	2.7E+00	1.00	1.6E-06	4.7E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06			
		Iron	6.8E+03	1.00	4.0E-03	1.2E-02	7.0E-01	6E-03	2E-02	3E-03	9E-03			
		Manganese	1.3E+02	1.00	7.7E-05	2.3E-04	2.4E-02	3E-03	1E-02	6E-05	2E-04			
		Mercury	5.5E-02	1.00	3.2E-08	9.6E-08	3.0E-04	1E-04	3E-04	2E-08	7E-08			
		Thallium	6.6E-02	1.00	3.8E-08	1.2E-07	1.0E-05	4E-03	1E-02	3E-08	8E-08			
		Vanadium	7.7E+00	1.00	4.5E-06	1.4E-05	5.0E-03	9E-04	3E-03	3E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.3E-11	4.0E-11	7.0E-10	2E-02	6E-02	1E-11	3E-11	1E+05	1E-06	4E-06
		Aluminum	1.2E+04	1.00	7.1E-03	2.1E-02	1.0E+00	7E-03	2E-02	5E-03	2E-02			
		Antimony	4.6E-01	1.00	2.7E-07	8.1E-07	4.0E-04	7E-04	2E-03	2E-07	6E-07			
		Arsenic	2.6E+00	0.60	9.1E-07	2.7E-06	3.0E-04	3E-03	9E-03	7E-07	2E-06	2E+00	1E-06	3E-06
		Barium	5.7E+02	1.00	3.3E-04	1.0E-03	2.0E-01	2E-03	5E-03	2E-04	7E-04			
		Cadmium	1.2E+00	1.00	7.0E-07	2.1E-06	1.0E-03	7E-04	2E-03	5E-07	2E-06			
Upland	53	Chromium	2.2E+01	1.00	1.3E-05	3.8E-05	3.0E-03	4E-03	1E-02	9E-06	3E-05	5E-01	5E-06	1E-05
		Cobalt	3.8E+00	1.00	2.2E-06	6.7E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06			
		Iron	1.2E+04	1.00	7.0E-03	2.1E-02	7.0E-01	1E-02	3E-02	5E-03	2E-02			
		Manganese	4.4E+02	1.00	2.6E-04	7.7E-04	2.4E-02	1E-02	3E-02	2E-04	6E-04			
		Mercury	4.3E+00	1.00	2.5E-06	7.5E-06	3.0E-04	8E-03	3E-02	2E-06	6E-06			
		Thallium	1.5E-01	1.00	8.8E-08	2.6E-07	1.0E-05	9E-03	3E-02	6E-08	2E-07			
		Vanadium	1.4E+01	1.00	8.1E-06	2.4E-05	5.0E-03	2E-03	5E-03	6E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	8.4E-12	2.5E-11	7.0E-10	1E-02	4E-02	6E-12	2E-11	1E+05	8E-07	2E-06
		Aluminum	1.1E+04	1.00	6.3E-03	1.9E-02	1.0E+00	6E-03	2E-02	5E-03	1E-02			
		Antimony	1.9E+00	1.00	1.1E-06	3.3E-06	4.0E-04	3E-03	8E-03	8E-07	2E-06			
		Arsenic	1.1E+01	0.60	3.8E-06	1.1E-05	3.0E-04	1E-02	4E-02	3E-06	8E-06	2E+00	4E-06	1E-05
		Barium	7.1E+02	1.00	4.1E-04	1.2E-03	2.0E-01	2E-03	6E-03	3E-04	9E-04			
		Cadmium	4.7E+00	1.00	2.7E-06	8.2E-06	1.0E-03	3E-03	8E-03	2E-06	6E-06			
Upland	54	Chromium	2.4E+01	1.00	1.4E-05	4.1E-05	3.0E-03	5E-03	1E-02	1E-05	3E-05	5E-01	5E-06	2E-05
		Cobalt	2.3E+00	1.00	1.3E-06	4.0E-06	3.0E-04	4E-03	1E-02	1E-06	3E-06			
		Iron	3.7E+03	1.00	2.1E-03	6.4E-03	7.0E-01	3E-03	9E-03	2E-03	5E-03			
		Manganese	2.0E+03	1.00	1.2E-03	3.5E-03	2.4E-02	5E-02	1E-01	9E-04	3E-03			
		Mercury	7.2E-01	1.00	4.2E-07	1.3E-06	3.0E-04	1E-03	4E-03	3E-07	9E-07			
		Thallium	1.9E-01	1.00	1.1E-07	3.3E-07	1.0E-05	1E-02	3E-02	8E-08	2E-07			
		Vanadium	1.4E+01	1.00	8.1E-06	2.4E-05	5.0E-03	2E-03	5E-03	6E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	3.2E-11	9.7E-11	7.0E-10	5E-02	1E-01	2E-11	7E-11	1E+05	3E-06	9E-06
		Aluminum	1.5E+04	1.00	9.0E-03	2.7E-02	1.0E+00	9E-03	3E-02	7E-03	2E-02			
		Antimony	1.2E+00	1.00	7.0E-07	2.1E-06	4.0E-04	2E-03	5E-03	5E-07	2E-06			
		Arsenic	1.4E+01	0.60	4.7E-06	1.4E-05	3.0E-04	2E-02	5E-02	3E-06	1E-05	2E+00	5E-06	2E-05
		Barium	1.1E+03	1.00	6.5E-04	2.0E-03	2.0E-01	3E-03	1E-02	5E-04	1E-03			
		Cadmium	5.6E+00	1.00	3.3E-06	9.8E-06	1.0E-03	3E-03	1E-02	2E-06	7E-06			
Upland	55	Chromium	4.2E+01	1.00	2.4E-05	7.3E-05	3.0E-03	8E-03	2E-02	2E-05	5E-05	5E-01	9E-06	3E-05
		Cobalt	1.6E+00	1.00	9.4E-07	2.8E-06	3.0E-04	3E-03	9E-03	7E-07	2E-06			
		Iron	2.7E+03	1.00	1.6E-03	4.8E-03	7.0E-01	2E-03	7E-03	1E-03	4E-03			
		Manganese	2.7E+03	1.00	1.6E-03	4.7E-03	2.4E-02	7E-02	2E-01	1E-03	3E-03			
		Mercury	1.1E+00	1.00	6.4E-07	1.9E-06	3.0E-04	2E-03	6E-03	5E-07	1E-06			
		Thallium	2.7E-01	1.00	1.6E-07	4.7E-07	1.0E-05	2E-02	5E-02	1E-07	3E-07			
		Vanadium	4.9E+01	1.00	2.9E-05	8.6E-05	5.0E-03	6E-03	2E-02	2E-05	6E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	5.9E-05	1.00	3.4E-11	1.0E-10	7.0E-10	5E-02	1E-01	3E-11	8E-11	1E+05	3E-06	1E-05
		Aluminum	1.6E+04	1.00	9.3E-03	2.8E-02	1.0E+00	9E-03	3E-02	7E-03	2E-02			
		Antimony	1.7E+00	1.00	1.0E-06	3.0E-06	4.0E-04	3E-03	8E-03	7E-07	2E-06			
		Arsenic	1.2E+01	0.60	4.3E-06	1.3E-05	3.0E-04	1E-02	4E-02	3E-06	1E-05	2E+00	5E-06	1E-05
		Barium	7.8E+02	1.00	4.5E-04	1.4E-03	2.0E-01	2E-03	7E-03	3E-04	1E-03			
		Cadmium	6.7E+00	1.00	3.9E-06	1.2E-05	1.0E-03	4E-03	1E-02	3E-06	9E-06			
Upland	56	Chromium	4.9E+01	1.00	2.8E-05	8.5E-05	3.0E-03	9E-03	3E-02	2E-05	6E-05	5E-01	1E-05	3E-05
		Cobalt	2.4E+00	1.00	1.4E-06	4.2E-06	3.0E-04	5E-03	1E-02	1E-06	3E-06			
		Iron	5.2E+03	1.00	3.0E-03	9.1E-03	7.0E-01	4E-03	1E-02	2E-03	7E-03			
		Manganese	1.8E+03	1.00	1.1E-03	3.2E-03	2.4E-02	4E-02	1E-01	8E-04	2E-03			
		Mercury	1.3E+00	1.00	7.5E-07	2.3E-06	3.0E-04	3E-03	8E-03	6E-07	2E-06			
		Thallium	3.5E-01	1.00	2.1E-07	6.2E-07	1.0E-05	2E-02	6E-02	2E-07	5E-07			
		Vanadium	5.8E+01	1.00	3.4E-05	1.0E-04	5.0E-03	7E-03	2E-02	2E-05	7E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	4.9E-11	1.5E-10	7.0E-10	7E-02	2E-01	4E-11	1E-10	1E+05	5E-06	1E-05
		Aluminum	1.6E+04	1.00	9.4E-03	2.8E-02	1.0E+00	9E-03	3E-02	7E-03	2E-02			
		Antimony	2.3E+00	1.00	1.3E-06	4.0E-06	4.0E-04	3E-03	1E-02	1E-06	3E-06			
		Arsenic	1.2E+01	0.60	4.2E-06	1.3E-05	3.0E-04	1E-02	4E-02	3E-06	9E-06	2E+00	5E-06	1E-05
		Barium	8.0E+02	1.00	4.7E-04	1.4E-03	2.0E-01	2E-03	7E-03	3E-04	1E-03			
		Cadmium	4.8E+00	1.00	2.8E-06	8.4E-06	1.0E-03	3E-03	8E-03	2E-06	6E-06			
Upland	58	Chromium	4.0E+01	1.00	2.3E-05	7.0E-05	3.0E-03	8E-03	2E-02	2E-05	5E-05	5E-01	9E-06	3E-05
		Cobalt	2.6E+00	1.00	1.5E-06	4.6E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06			
		Iron	8.0E+03	1.00	4.7E-03	1.4E-02	7.0E-01	7E-03	2E-02	3E-03	1E-02			
		Manganese	1.5E+03	1.00	8.9E-04	2.7E-03	2.4E-02	4E-02	1E-01	7E-04	2E-03			
		Mercury	1.2E+00	1.00	7.0E-07	2.1E-06	3.0E-04	2E-03	7E-03	5E-07	2E-06			
		Thallium	2.0E-01	1.00	1.2E-07	3.5E-07	1.0E-05	1E-02	4E-02	9E-08	3E-07			
		Vanadium	4.7E+01	1.00	2.8E-05	8.3E-05	5.0E-03	6E-03	2E-02	2E-05	6E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	9.3E-12	2.8E-11	7.0E-10	1E-02	4E-02	7E-12	2E-11	1E+05	9E-07	3E-06
		Aluminum	8.6E+03	1.00	5.0E-03	1.5E-02	1.0E+00	5E-03	2E-02	4E-03	1E-02			
		Antimony	8.2E-01	1.00	4.8E-07	1.4E-06	4.0E-04	1E-03	4E-03	4E-07	1E-06			
		Arsenic	6.2E+00	0.60	2.2E-06	6.5E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06	2E+00	2E-06	7E-06
		Barium	7.4E+02	1.00	4.4E-04	1.3E-03	2.0E-01	2E-03	7E-03	3E-04	1E-03			
		Cadmium	3.3E+00	1.00	1.9E-06	5.8E-06	1.0E-03	2E-03	6E-03	1E-06	4E-06			
Upland	59	Chromium	2.1E+01	1.00	1.2E-05	3.7E-05	3.0E-03	4E-03	1E-02	9E-06	3E-05	5E-01	5E-06	1E-05
		Cobalt	2.1E+00	1.00	1.2E-06	3.7E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	5.1E+03	1.00	3.0E-03	8.9E-03	7.0E-01	4E-03	1E-02	2E-03	7E-03			
		Manganese	1.6E+03	1.00	9.5E-04	2.8E-03	2.4E-02	4E-02	1E-01	7E-04	2E-03			
		Mercury	1.0E+00	1.00	5.8E-07	1.7E-06	3.0E-04	2E-03	6E-03	4E-07	1E-06			
		Thallium	1.6E-01	1.00	9.4E-08	2.8E-07	1.0E-05	9E-03	3E-02	7E-08	2E-07			
		Vanadium	1.5E+01	1.00	8.6E-06	2.6E-05	5.0E-03	2E-03	5E-03	6E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	8.7E-06	1.00	5.1E-12	1.5E-11	7.0E-10	7E-03	2E-02	4E-12	1E-11	1E+05	5E-07	1E-06
		Aluminum	8.0E+03	1.00	4.7E-03	1.4E-02	1.0E+00	5E-03	1E-02	3E-03	1E-02			
		Antimony	3.1E-01	1.00	1.8E-07	5.4E-07	4.0E-04	5E-04	1E-03	1E-07	4E-07			
		Arsenic	4.6E+00	0.60	1.6E-06	4.8E-06	3.0E-04	5E-03	2E-02	1E-06	4E-06	2E+00	2E-06	5E-06
		Barium	2.8E+02	1.00	1.6E-04	4.9E-04	2.0E-01	8E-04	2E-03	1E-04	4E-04			
		Cadmium	1.7E+00	1.00	9.9E-07	3.0E-06	1.0E-03	1E-03	3E-03	7E-07	2E-06			
Upland	60	Chromium	1.5E+01	1.00	8.7E-06	2.6E-05	3.0E-03	3E-03	9E-03	6E-06	2E-05	5E-01	3E-06	1E-05
		Cobalt	3.4E+00	1.00	2.0E-06	6.0E-06	3.0E-04	7E-03	2E-02	1E-06	4E-06			
		Iron	8.4E+03	1.00	4.9E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	8.5E+02	1.00	5.0E-04	1.5E-03	2.4E-02	2E-02	6E-02	4E-04	1E-03			
		Mercury	1.9E-01	1.00	1.1E-07	3.3E-07	3.0E-04	4E-04	1E-03	8E-08	2E-07			
		Thallium	1.1E-01	1.00	6.4E-08	1.9E-07	1.0E-05	6E-03	2E-02	5E-08	1E-07			
		Vanadium	1.4E+01	1.00	8.1E-06	2.4E-05	5.0E-03	2E-03	5E-03	6E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	1.00	3.4E-12	1.0E-11	7.0E-10	5E-03	1E-02	3E-12	8E-12	1E+05	3E-07	1E-06
		Aluminum	8.2E+03	1.00	4.8E-03	1.4E-02	1.0E+00	5E-03	1E-02	4E-03	1E-02			
		Antimony	2.0E-01	1.00	1.2E-07	3.5E-07	4.0E-04	3E-04	9E-04	9E-08	3E-07			
		Arsenic	3.7E+00	0.60	1.3E-06	3.9E-06	3.0E-04	4E-03	1E-02	1E-06	3E-06	2E+00	1E-06	4E-06
		Barium	2.0E+02	1.00	1.1E-04	3.4E-04	2.0E-01	6E-04	2E-03	8E-05	3E-04			
		Cadmium	1.1E+00	1.00	6.4E-07	1.9E-06	1.0E-03	6E-04	2E-03	5E-07	1E-06			
Upland	61	Chromium	1.2E+01	1.00	7.2E-06	2.2E-05	3.0E-03	2E-03	7E-03	5E-06	2E-05	5E-01	3E-06	8E-06
		Cobalt	3.8E+00	1.00	2.2E-06	6.7E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06			
		Iron	9.9E+03	1.00	5.8E-03	1.7E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	4.8E+02	1.00	2.8E-04	8.3E-04	2.4E-02	1E-02	3E-02	2E-04	6E-04			
		Mercury	1.1E-01	1.00	6.4E-08	1.9E-07	3.0E-04	2E-04	6E-04	5E-08	1E-07			
		Thallium	1.1E-01	1.00	6.4E-08	1.9E-07	1.0E-05	6E-03	2E-02	5E-08	1E-07			
		Vanadium	1.3E+01	1.00	7.8E-06	2.3E-05	5.0E-03	2E-03	5E-03	6E-06	2E-05			

Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	1.00	6.4E-13	1.9E-12	7.0E-10	9E-04	3E-03	5E-13	1E-12	1E+05	6E-08	2E-07
		Aluminum	7.7E+03	1.00	4.5E-03	1.4E-02	1.0E+00	5E-03	1E-02	3E-03	1E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	2.6E+00	0.60	9.1E-07	2.7E-06	3.0E-04	3E-03	9E-03	7E-07	2E-06	2E+00	1E-06	3E-06
		Barium	1.6E+02	1.00	9.5E-05	2.9E-04	2.0E-01	5E-04	1E-03	7E-05	2E-04			
		Cadmium	3.7E-01	1.00	2.2E-07	6.5E-07	1.0E-03	2E-04	6E-04	2E-07	5E-07			
		Chromium	1.1E+01	1.00	6.3E-06	1.9E-05	3.0E-03	2E-03	6E-03	5E-06	1E-05	5E-01	2E-06	7E-06
		Cobalt	4.0E+00	1.00	2.3E-06	7.0E-06	3.0E-04	8E-03	2E-02	2E-06	5E-06			
		Iron	1.1E+04	1.00	6.2E-03	1.9E-02	7.0E-01	9E-03	3E-02	5E-03	1E-02			
		Manganese	2.7E+02	1.00	1.6E-04	4.8E-04	2.4E-02	7E-03	2E-02	1E-04	4E-04			
		Mercury	9.6E-02	1.00	5.6E-08	1.7E-07	3.0E-04	2E-04	6E-04	4E-08	1E-07			
		Thallium	1.2E-01	1.00	7.0E-08	2.1E-07	1.0E-05	7E-03	2E-02	5E-08	2E-07			
		Vanadium	1.1E+01	1.00	6.6E-06	2.0E-05	5.0E-03	1E-03	4E-03	5E-06	1E-05			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	1.00	9.6E-12	2.9E-11	7.0E-10	1E-02	4E-02	7E-12	2E-11	1E+05	9E-07	3E-06
		Aluminum	7.6E+03	1.00	4.4E-03	1.3E-02	1.0E+00	4E-03	1E-02	3E-03	1E-02			
		Antimony	1.1E-01	1.00	6.1E-08	1.8E-07	4.0E-04	2E-04	5E-04	5E-08	1E-07			
		Arsenic	3.0E+00	0.60	1.1E-06	3.2E-06	3.0E-04	4E-03	1E-02	8E-07	2E-06	2E+00	1E-06	3E-06
		Barium	2.7E+02	1.00	1.6E-04	4.7E-04	2.0E-01	8E-04	2E-03	1E-04	3E-04			
		Cadmium	7.9E-01	1.00	4.6E-07	1.4E-06	1.0E-03	5E-04	1E-03	3E-07	1E-06			
		Chromium	1.2E+01	1.00	6.9E-06	2.1E-05	3.0E-03	2E-03	7E-03	5E-06	2E-05	5E-01	3E-06	8E-06
		Cobalt	3.4E+00	1.00	2.0E-06	6.0E-06	3.0E-04	7E-03	2E-02	1E-06	4E-06			
		Iron	9.9E+03	1.00	5.8E-03	1.7E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	5.2E+02	1.00	3.1E-04	9.2E-04	2.4E-02	1E-02	4E-02	2E-04	7E-04			
		Mercury	3.6E+00	1.00	2.1E-06	6.3E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06			
		Thallium	1.0E-01	1.00	5.8E-08	1.8E-07	1.0E-05	6E-03	2E-02	4E-08	1E-07			
		Vanadium	1.2E+01	1.00	6.8E-06	2.0E-05	5.0E-03	1E-03	4E-03	5E-06	2E-05			
Upland	65[a]	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	1.00	7.6E-12	2.3E-11	7.0E-10	1E-02	3E-02	6E-12	2E-11	1E+05	7E-07	2E-06
		Aluminum	8.7E+03	1.00	5.1E-03	1.5E-02	1.0E+00	5E-03	2E-02	4E-03	1E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.3E+00	0.60	1.5E-06	4.5E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06	2E+00	2E-06	5E-06
		Barium	4.5E+02	1.00	2.6E-04	7.9E-04	2.0E-01	1E-03	4E-03	2E-04	6E-04			
		Cadmium	2.5E+00	1.00	1.5E-06	4.4E-06	1.0E-03	1E-03	4E-03	1E-06	3E-06			
		Chromium	2.7E+01	1.00	1.6E-05	4.7E-05	3.0E-03	5E-03	2E-02	1E-05	3E-05	5E-01	6E-06	2E-05
		Cobalt	3.1E+00	1.00	1.8E-06	5.4E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	9.6E+03	1.00	5.6E-03	1.7E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	1.4E+03	1.00	7.9E-04	2.4E-03	2.4E-02	3E-02	1E-01	6E-04	2E-03			
		Mercury	3.0E-01	1.00	1.8E-07	5.3E-07	3.0E-04	6E-04	2E-03	1E-07	4E-07			
		Thallium	1.2E-01	1.00	7.0E-08	2.1E-07	1.0E-05	7E-03	2E-02	5E-08	2E-07			
		Vanadium	1.3E+01	1.00	7.7E-06	2.3E-05	5.0E-03	2E-03	5E-03	6E-06	2E-05			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	1.00	9.0E-13	2.7E-12	7.0E-10	1E-03	4E-03	7E-13	2E-12	1E+05	9E-08	3E-07
		Aluminum	4.6E+03	1.00	2.7E-03	8.1E-03	1.0E+00	3E-03	8E-03	2E-03	6E-03			
		Antimony	2.2E-01	1.00	1.3E-07	3.8E-07	4.0E-04	3E-04	1E-03	9E-08	3E-07			
		Arsenic	3.2E+00	0.60	1.1E-06	3.4E-06	3.0E-04	4E-03	1E-02	8E-07	2E-06	2E+00	1E-06	4E-06
		Barium	2.6E+02	1.00	1.5E-04	4.6E-04	2.0E-01	8E-04	2E-03	1E-04	3E-04			
		Cadmium	9.0E-01	1.00	5.3E-07	1.6E-06	1.0E-03	5E-04	2E-03	4E-07	1E-06			
		Chromium	1.2E+01	1.00	7.0E-06	2.1E-05	3.0E-03	2E-03	7E-03	5E-06	2E-05	5E-01	3E-06	8E-06
		Cobalt	2.4E+00	1.00	1.4E-06	4.3E-06	3.0E-04	5E-03	1E-02	1E-06	3E-06			
		Iron	6.3E+03	1.00	3.7E-03	1.1E-02	7.0E-01	5E-03	2E-02	3E-03	8E-03			
		Manganese	5.1E+02	1.00	3.0E-04	9.0E-04	2.4E-02	1E-02	4E-02	2E-04	7E-04			
		Mercury	6.6E-02	1.00	3.9E-08	1.2E-07	3.0E-04	1E-04	4E-04	3E-08	9E-08			
		Thallium	7.1E-02	1.00	4.1E-08	1.2E-07	1.0E-05	4E-03	1E-02	3E-08	9E-08			
		Vanadium	7.5E+00	1.00	4.4E-06	1.3E-05	5.0E-03	9E-04	3E-03	3E-06	1E-05			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	4.8E-11	1.4E-10	7.0E-10	7E-02	2E-01	4E-11	1E-10	1E+05	5E-06	1E-05
		Aluminum	6.0E+03	1.00	3.5E-03	1.1E-02	1.0E+00	4E-03	1E-02	3E-03	8E-03			
		Antimony	1.6E+00	1.00	9.4E-07	2.8E-06	4.0E-04	2E-03	7E-03	7E-07	2E-06			
		Arsenic	1.5E+01	0.60	5.3E-06	1.6E-05	3.0E-04	2E-02	5E-02	4E-06	1E-05	2E+00	6E-06	2E-05
		Barium	6.1E+02	1.00	3.6E-04	1.1E-03	2.0E-01	2E-03	5E-03	3E-04	8E-04			
		Cadmium	4.8E+00	1.00	2.8E-06	8.4E-06	1.0E-03	3E-03	8E-03	2E-06	6E-06			
		Chromium	1.9E+01	1.00	1.1E-05	3.3E-05	3.0E-03	4E-03	1E-02	8E-06	2E-05	5E-01	4E-06	1E-05
		Cobalt	2.2E+00	1.00	1.3E-06	3.9E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	3.5E+03	1.00	2.1E-03	6.2E-03	7.0E-01	3E-03	9E-03	2E-03	5E-03			
		Manganese	2.0E+03	1.00	1.2E-03	3.6E-03	2.4E-02	5E-02	1E-01	9E-04	3E-03			
		Mercury	1.0E-02	1.00	5.8E-09	1.8E-08	3.0E-04	2E-05	6E-05	4E-09	1E-08			
		Thallium	3.8E-01	1.00	2.2E-07	6.7E-07	1.0E-05	2E-02	7E-02	2E-07	5E-07			
		Vanadium	5.6E+00	1.00	3.3E-06	9.8E-06	5.0E-03	7E-04	2E-03	2E-06	7E-06			

Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	1.00	4.8E-11	1.4E-10	7.0E-10	7E-02	2E-01	4E-11	1E-10	1E+05	5E-06	1E-05
		Aluminum	6.0E+03	1.00	3.5E-03	1.1E-02	1.0E+00	4E-03	1E-02	3E-03	8E-03			
		Antimony	1.6E+00	1.00	9.4E-07	2.8E-06	4.0E-04	2E-03	7E-03	7E-07	2E-06			
		Arsenic	1.5E+01	0.60	5.3E-06	1.6E-05	3.0E-04	2E-02	5E-02	4E-06	1E-05	2E+00	6E-06	2E-05
		Barium	6.1E+02	1.00	3.6E-04	1.1E-03	2.0E-01	2E-03	5E-03	3E-04	8E-04			
		Cadmium	4.8E+00	1.00	2.8E-06	8.4E-06	1.0E-03	3E-03	8E-03	2E-06	6E-06			
		Chromium	1.9E+01	1.00	1.1E-05	3.3E-05	3.0E-03	4E-03	1E-02	8E-06	2E-05	5E-01	4E-06	1E-05
		Cobalt	2.2E+00	1.00	1.3E-06	3.9E-06	3.0E-04	4E-03	1E-02	9E-07	3E-06			
		Iron	3.5E+03	1.00	2.1E-03	6.2E-03	7.0E-01	3E-03	9E-03	2E-03	5E-03			
		Manganese	2.0E+03	1.00	1.2E-03	3.6E-03	2.4E-02	5E-02	1E-01	9E-04	3E-03			
		Mercury	1.0E-02	1.00	5.8E-09	1.8E-08	3.0E-04	2E-05	6E-05	4E-09	1E-08			
		Thallium	3.8E-01	1.00	2.2E-07	6.7E-07	1.0E-05	2E-02	7E-02	2E-07	5E-07			
		Vanadium	5.6E+00	1.00	3.3E-06	9.8E-06	5.0E-03	7E-04	2E-03	2E-06	7E-06			
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.1E-06	1.00	2.4E-12	7.2E-12	7.0E-10	3E-03	1E-02	2E-12	5E-12	1E+05	2E-07	7E-07
		Aluminum	3.4E+03	1.00	2.0E-03	5.9E-03	1.0E+00	2E-03	6E-03	1E-03	4E-03			
		Antimony	4.7E-01	1.00	2.7E-07	8.2E-07	4.0E-04	7E-04	2E-03	2E-07	6E-07			
		Arsenic	6.0E+00	0.60	2.1E-06	6.3E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06	2E+00	2E-06	7E-06
		Barium	4.5E+02	1.00	2.6E-04	7.9E-04	2.0E-01	1E-03	4E-03	2E-04	6E-04			
		Cadmium	1.8E+00	1.00	1.1E-06	3.2E-06	1.0E-03	1E-03	3E-03	8E-07	2E-06			
		Chromium	1.4E+01	1.00	8.2E-06	2.5E-05	3.0E-03	3E-03	8E-03	6E-06	2E-05	5E-01	3E-06	9E-06
		Cobalt	1.7E+00	1.00	9.9E-07	3.0E-06	3.0E-04	3E-03	1E-02	7E-07	2E-06			
		Iron	3.8E+03	1.00	2.2E-03	6.6E-03	7.0E-01	3E-03	9E-03	2E-03	5E-03			
		Manganese	1.0E+03	1.00	5.8E-04	1.7E-03	2.4E-02	2E-02	7E-02	4E-04	1E-03			
		Mercury	1.1E-01	1.00	6.4E-08	1.9E-07	3.0E-04	2E-04	6E-04	5E-08	1E-07			
		Thallium	1.4E-01	1.00	8.2E-08	2.5E-07	1.0E-05	8E-03	2E-02	6E-08	2E-07			
		Vanadium	1.2E+01	1.00	6.7E-06	2.0E-05	5.0E-03	1E-03	4E-03	5E-06	1E-05			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	1.00	1.4E-12	4.2E-12	7.0E-10	2E-03	6E-03	1E-12	3E-12	1E+05	1E-07	4E-07
		Aluminum	1.1E+03	1.00	6.4E-04	1.9E-03	1.0E+00	6E-04	2E-03	5E-04	1E-03			
		Antimony	7.5E-02	1.00	4.4E-08	1.3E-07	4.0E-04	1E-04	3E-04	3E-08	1E-07			
		Arsenic	5.8E+00	0.60	2.0E-06	6.1E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06	2E+00	2E-06	7E-06
		Barium	5.0E+02	1.00	2.9E-04	8.7E-04	2.0E-01	1E-03	4E-03	2E-04	6E-04			
		Cadmium	1.3E+00	1.00	7.6E-07	2.3E-06	1.0E-03	8E-04	2E-03	6E-07	2E-06			
		Chromium	3.4E+01	1.00	2.0E-05	6.0E-05	3.0E-03	7E-03	2E-02	1E-05	4E-05	5E-01	7E-06	2E-05
		Cobalt	2.5E+00	1.00	1.5E-06	4.4E-06	3.0E-04	5E-03	1E-02	1E-06	3E-06			
		Iron	3.0E+03	1.00	1.7E-03	5.2E-03	7.0E-01	2E-03	7E-03	1E-03	4E-03			
		Manganese	7.2E+02	1.00	4.2E-04	1.3E-03	2.4E-02	2E-02	5E-02	3E-04	9E-04			
		Mercury	5.0E-03	1.00	2.9E-09	8.8E-09	3.0E-04	1E-05	3E-05	2E-09	6E-09			
		Thallium	8.3E-02	1.00	4.9E-08	1.5E-07	1.0E-05	5E-03	1E-02	4E-08	1E-07			
		Vanadium	3.5E+00	1.00	2.0E-06	6.1E-06	5.0E-03	4E-04	1E-03	2E-06	5E-06			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.4E-11	4.1E-11	7.0E-10	2E-02	6E-02	1E-11	3E-11	1E+05	1E-06	4E-06
		Aluminum	2.3E+03	1.00	1.3E-03	4.0E-03	1.0E+00	1E-03	4E-03	1E-03	3E-03			
		Antimony	2.4E-01	1.00	1.4E-07	4.2E-07	4.0E-04	4E-04	1E-03	1E-07	3E-07			
		Arsenic	7.0E+00	0.60	2.5E-06	7.4E-06	3.0E-04	8E-03	2E-02	2E-06	5E-06	2E+00	3E-06	8E-06
		Barium	5.4E+02	1.00	3.1E-04	9.4E-04	2.0E-01	2E-03	5E-03	2E-04	7E-04			
		Cadmium	2.2E+00	1.00	1.3E-06	3.9E-06	1.0E-03	1E-03	4E-03	9E-07	3E-06			
		Chromium	1.9E+01	1.00	1.1E-05	3.3E-05	3.0E-03	4E-03	1E-02	8E-06	2E-05	5E-01	4E-06	1E-05
		Cobalt	1.3E+00	1.00	7.6E-07	2.3E-06	3.0E-04	3E-03	8E-03	6E-07	2E-06			
		Iron	1.3E+03	1.00	7.4E-04	2.2E-03	7.0E-01	1E-03	3E-03	5E-04	2E-03			
		Manganese	2.3E+03	1.00	1.3E-03	3.9E-03	2.4E-02	5E-02	2E-01	1E-03	3E-03			
		Mercury	4.9E-03	1.00	2.8E-09	8.5E-09	3.0E-04	9E-06	3E-05	2E-09	6E-09			
		Thallium	6.6E-02	1.00	3.9E-08	1.2E-07	1.0E-05	4E-03	1E-02	3E-08	9E-08			
		Vanadium	4.7E+00	1.00	2.7E-06	8.2E-06	5.0E-03	5E-04	2E-03	2E-06	6E-06			
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-04	1.00	1.8E-10	5.4E-10	7.0E-10	3E-01	8E-01	1E-10	4E-10	1E+05	2E-05	5E-05
		Aluminum	1.8E+04	1.00	1.1E-02	3.2E-02	1.0E+00	1E-02	3E-02	8E-03	2E-02			
		Antimony	2.4E+00	1.00	1.4E-06	4.2E-06	4.0E-04	3E-03	1E-02	1E-06	3E-06			
		Arsenic	4.1E+01	0.60	1.4E-05	4.3E-05	3.0E-04	5E-02	1E-01	1E-05	3E-05	2E+00	2E-05	5E-05
		Barium	8.3E+02	1.00	4.9E-04	1.5E-03	2.0E-01	2E-03	7E-03	4E-04	1E-03			
		Cadmium	6.4E+00	1.00	3.8E-06	1.1E-05	1.0E-03	4E-03	1E-02	3E-06	8E-06			
		Chromium	3.0E+01	1.00	1.7E-05	5.2E-05	3.0E-03	6E-03	2E-02	1E-05	4E-05	5E-01	6E-06	2E-05
		Cobalt	7.3E+00	1.00	4.2E-06	1.3E-05	3.0E-04	1E-02	4E-02	3E-06	9E-06			
		Iron	1.3E+04	1.00	7.8E-03	2.4E-02	7.0E-01	1E-02	3E-02	6E-03	2E-02			
		Manganese	2.3E+03	1.00	1.4E-03	4.1E-03	2.4E-02	6E-02	2E-01	1E-03	3E-03			
		Mercury	2.2E-01	1.00	1.3E-07	3.9E-07	3.0E-04	4E-04	1E-03	1E-07	3E-07			
		Thallium	7.7E-01	1.00	4.5E-07	1.3E-06	1.0E-05	4E-02	1E-01	3E-07	1E-06			
		Vanadium	2.2E+01	1.00	1.3E-05	3.9E-05	5.0E-03	3E-03	8E-03	1E-05	3E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	2.0E-13	6.0E-13	7.0E-10	3E-04	9E-04	1E-13	4E-13	1E+05	2E-08	6E-08
		Aluminum	1.2E+04	1.00	7.2E-03	2.2E-02	1.0E+00	7E-03	2E-02	5E-03	2E-02			
		Antimony	9.5E-02	1.00	5.6E-08	1.7E-07	4.0E-04	1E-04	4E-04	4E-08	1E-07			
		Arsenic	4.3E+00	0.60	1.5E-06	4.5E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06	2E+00	2E-06	5E-06
		Barium	2.1E+02	1.00	1.2E-04	3.6E-04	2.0E-01	6E-04	2E-03	9E-05	3E-04			
		Cadmium	1.5E-01	1.00	8.8E-08	2.6E-07	1.0E-03	9E-05	3E-04	6E-08	2E-07			
Upland	75	Chromium	1.3E+01	1.00	7.8E-06	2.3E-05	3.0E-03	3E-03	8E-03	6E-06	2E-05	5E-01	3E-06	9E-06
		Cobalt	6.4E+00	1.00	3.7E-06	1.1E-05	3.0E-04	1E-02	4E-02	3E-06	8E-06			
		Iron	1.6E+04	1.00	9.2E-03	2.8E-02	7.0E-01	1E-02	4E-02	7E-03	2E-02			
		Manganese	3.7E+02	1.00	2.2E-04	6.5E-04	2.4E-02	9E-03	3E-02	2E-04	5E-04			
		Mercury	1.4E-02	1.00	8.2E-09	2.5E-08	3.0E-04	3E-05	8E-05	6E-09	2E-08			
		Thallium	1.8E-01	1.00	1.1E-07	3.2E-07	1.0E-05	1E-02	3E-02	8E-08	2E-07			
		Vanadium	1.7E+01	1.00	1.0E-05	3.0E-05	5.0E-03	2E-03	6E-03	7E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	1.2E-12	3.6E-12	7.0E-10	2E-03	5E-03	9E-13	3E-12	1E+05	1E-07	3E-07
		Aluminum	6.8E+03	1.00	4.0E-03	1.2E-02	1.0E+00	4E-03	1E-02	3E-03	9E-03			
		Antimony	1.2E-01	1.00	7.0E-08	2.1E-07	4.0E-04	2E-04	5E-04	5E-08	2E-07			
		Arsenic	2.9E+00	0.60	1.0E-06	3.0E-06	3.0E-04	3E-03	1E-02	7E-07	2E-06	2E+00	1E-06	3E-06
		Barium	1.5E+02	1.00	8.6E-05	2.6E-04	2.0E-01	4E-04	1E-03	6E-05	2E-04			
		Cadmium	1.2E-01	1.00	7.1E-08	2.1E-07	1.0E-03	7E-05	2E-04	5E-08	2E-07			
Upland	76	Chromium	9.3E+00	1.00	5.4E-06	1.6E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	3.3E+00	1.00	1.9E-06	5.8E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	8.8E+03	1.00	5.1E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	1.7E+02	1.00	1.0E-04	3.1E-04	2.4E-02	4E-03	1E-02	8E-05	2E-04			
		Mercury	2.2E-02	1.00	1.3E-08	3.8E-08	3.0E-04	4E-05	1E-04	9E-09	3E-08			
		Thallium	8.5E-02	1.00	5.0E-08	1.5E-07	1.0E-05	5E-03	1E-02	4E-08	1E-07			
		Vanadium	1.0E+01	1.00	6.1E-06	1.8E-05	5.0E-03	1E-03	4E-03	5E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	1.2E-12	3.6E-12	7.0E-10	2E-03	5E-03	9E-13	3E-12	1E+05	1E-07	3E-07
		Aluminum	6.8E+03	1.00	4.0E-03	1.2E-02	1.0E+00	4E-03	1E-02	3E-03	9E-03			
		Antimony	1.2E-01	1.00	7.0E-08	2.1E-07	4.0E-04	2E-04	5E-04	5E-08	2E-07			
		Arsenic	2.9E+00	0.60	1.0E-06	3.0E-06	3.0E-04	3E-03	1E-02	7E-07	2E-06	2E+00	1E-06	3E-06
		Barium	1.5E+02	1.00	8.6E-05	2.6E-04	2.0E-01	4E-04	1E-03	6E-05	2E-04			
		Cadmium	1.2E-01	1.00	7.1E-08	2.1E-07	1.0E-03	7E-05	2E-04	5E-08	2E-07			
Upland	77	Chromium	9.3E+00	1.00	5.4E-06	1.6E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	3.3E+00	1.00	1.9E-06	5.8E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	8.8E+03	1.00	5.1E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	1.7E+02	1.00	1.0E-04	3.1E-04	2.4E-02	4E-03	1E-02	8E-05	2E-04			
		Mercury	2.2E-02	1.00	1.3E-08	3.8E-08	3.0E-04	4E-05	1E-04	9E-09	3E-08			
		Thallium	8.5E-02	1.00	5.0E-08	1.5E-07	1.0E-05	5E-03	1E-02	4E-08	1E-07			
		Vanadium	1.0E+01	1.00	6.1E-06	1.8E-05	5.0E-03	1E-03	4E-03	5E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	1.00	2.0E-13	6.0E-13	7.0E-10	3E-04	9E-04	1E-13	4E-13	1E+05	2E-08	6E-08
		Aluminum	1.2E+04	1.00	7.2E-03	2.2E-02	1.0E+00	7E-03	2E-02	5E-03	2E-02			
		Antimony	9.5E-02	1.00	5.6E-08	1.7E-07	4.0E-04	1E-04	4E-04	4E-08	1E-07			
		Arsenic	4.3E+00	0.60	1.5E-06	4.5E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06	2E+00	2E-06	5E-06
		Barium	2.1E+02	1.00	1.2E-04	3.6E-04	2.0E-01	6E-04	2E-03	9E-05	3E-04			
		Cadmium	1.5E-01	1.00	8.8E-08	2.6E-07	1.0E-03	9E-05	3E-04	6E-08	2E-07			
Upland	78	Chromium	1.3E+01	1.00	7.8E-06	2.3E-05	3.0E-03	3E-03	8E-03	6E-06	2E-05	5E-01	3E-06	9E-06
		Cobalt	6.4E+00	1.00	3.7E-06	1.1E-05	3.0E-04	1E-02	4E-02	3E-06	8E-06			
		Iron	1.6E+04	1.00	9.2E-03	2.8E-02	7.0E-01	1E-02	4E-02	7E-03	2E-02			
		Manganese	3.7E+02	1.00	2.2E-04	6.5E-04	2.4E-02	9E-03	3E-02	2E-04	5E-04			
		Mercury	1.4E-02	1.00	8.2E-09	2.5E-08	3.0E-04	3E-05	8E-05	6E-09	2E-08			
		Thallium	1.8E-01	1.00	1.1E-07	3.2E-07	1.0E-05	1E-02	3E-02	8E-08	2E-07			
		Vanadium	1.7E+01	1.00	1.0E-05	3.0E-05	5.0E-03	2E-03	6E-03	7E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	1.2E-12	3.6E-12	7.0E-10	2E-03	5E-03	9E-13	3E-12	1E+05	1E-07	3E-07
		Aluminum	6.8E+03	1.00	4.0E-03	1.2E-02	1.0E+00	4E-03	1E-02	3E-03	9E-03			
		Antimony	1.2E-01	1.00	7.0E-08	2.1E-07	4.0E-04	2E-04	5E-04	5E-08	2E-07			
		Arsenic	2.9E+00	0.60	1.0E-06	3.0E-06	3.0E-04	3E-03	1E-02	7E-07	2E-06	2E+00	1E-06	3E-06
		Barium	1.5E+02	1.00	8.6E-05	2.6E-04	2.0E-01	4E-04	1E-03	6E-05	2E-04			
		Cadmium	1.2E-01	1.00	7.1E-08	2.1E-07	1.0E-03	7E-05	2E-04	5E-08	2E-07			
Upland	79	Chromium	9.3E+00	1.00	5.4E-06	1.6E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	3.3E+00	1.00	1.9E-06	5.8E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	8.8E+03	1.00	5.1E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	1.7E+02	1.00	1.0E-04	3.1E-04	2.4E-02	4E-03	1E-02	8E-05	2E-04			
		Mercury	2.2E-02	1.00	1.3E-08	3.8E-08	3.0E-04	4E-05	1E-04	9E-09	3E-08			
		Thallium	8.5E-02	1.00	5.0E-08	1.5E-07	1.0E-05	5E-03	1E-02	4E-08	1E-07			
		Vanadium	1.0E+01	1.00	6.1E-06	1.8E-05	5.0E-03	1E-03	4E-03	5E-06	1E-05			

Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	1.00	1.2E-12	3.6E-12	7.0E-10	2E-03	5E-03	9E-13	3E-12	1E+05	1E-07	3E-07
		Aluminum	6.8E+03	1.00	4.0E-03	1.2E-02	1.0E+00	4E-03	1E-02	3E-03	9E-03			
		Antimony	1.2E-01	1.00	7.0E-08	2.1E-07	4.0E-04	2E-04	5E-04	5E-08	2E-07			
		Arsenic	2.9E+00	0.60	1.0E-06	3.0E-06	3.0E-04	3E-03	1E-02	7E-07	2E-06	2E+00	1E-06	3E-06
		Barium	1.5E+02	1.00	8.6E-05	2.6E-04	2.0E-01	4E-04	1E-03	6E-05	2E-04			
		Cadmium	1.2E-01	1.00	7.1E-08	2.1E-07	1.0E-03	7E-05	2E-04	5E-08	2E-07			
		Chromium	9.3E+00	1.00	5.4E-06	1.6E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	3.3E+00	1.00	1.9E-06	5.8E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	8.8E+03	1.00	5.1E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	1.7E+02	1.00	1.0E-04	3.1E-04	2.4E-02	4E-03	1E-02	8E-05	2E-04			
		Mercury	2.2E-02	1.00	1.3E-08	3.8E-08	3.0E-04	4E-05	1E-04	9E-09	3E-08			
		Thallium	8.5E-02	1.00	5.0E-08	1.5E-07	1.0E-05	5E-03	1E-02	4E-08	1E-07			
		Vanadium	1.0E+01	1.00	6.1E-06	1.8E-05	5.0E-03	1E-03	4E-03	5E-06	1E-05			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	1.00	3.5E-13	1.1E-12	7.0E-10	5E-04	2E-03	3E-13	8E-13	1E+05	3E-08	1E-07
		Aluminum	7.0E+03	1.00	4.1E-03	1.2E-02	1.0E+00	4E-03	1E-02	3E-03	9E-03			
		Antimony	1.0E-01	1.00	5.8E-08	1.8E-07	4.0E-04	1E-04	4E-04	4E-08	1E-07			
		Arsenic	4.5E+00	0.60	1.6E-06	4.7E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06	2E+00	2E-06	5E-06
		Barium	1.9E+02	1.00	1.1E-04	3.3E-04	2.0E-01	5E-04	2E-03	8E-05	2E-04			
		Cadmium	3.2E-01	1.00	1.9E-07	5.6E-07	1.0E-03	2E-04	6E-04	1E-07	4E-07			
		Chromium	8.4E+00	1.00	4.9E-06	1.5E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	5E-06
		Cobalt	3.9E+00	1.00	2.3E-06	6.8E-06	3.0E-04	8E-03	2E-02	2E-06	5E-06			
		Iron	9.6E+03	1.00	5.6E-03	1.7E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	2.8E+02	1.00	1.7E-04	5.0E-04	2.4E-02	7E-03	2E-02	1E-04	4E-04			
		Mercury	3.3E-02	1.00	1.9E-08	5.8E-08	3.0E-04	6E-05	2E-04	1E-08	4E-08			
		Thallium	1.1E-01	1.00	6.4E-08	1.9E-07	1.0E-05	6E-03	2E-02	5E-08	1E-07			
		Vanadium	1.3E+01	1.00	7.3E-06	2.2E-05	5.0E-03	1E-03	4E-03	5E-06	2E-05			
Floodplain	85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	1.00	2.3E-13	7.0E-13	7.0E-10	3E-04	1E-03	2E-13	5E-13	1E+05	2E-08	7E-08
		Aluminum	2.9E+03	1.00	1.7E-03	5.2E-03	1.0E+00	2E-03	5E-03	1E-03	4E-03			
		Antimony	8.5E-02	1.00	5.0E-08	1.5E-07	4.0E-04	1E-04	4E-04	4E-08	1E-07			
		Arsenic	1.9E+00	0.60	6.7E-07	2.0E-06	3.0E-04	2E-03	7E-03	5E-07	1E-06	2E+00	7E-07	2E-06
		Barium	2.9E+01	1.00	1.7E-05	5.1E-05	2.0E-01	9E-05	3E-04	1E-05	4E-05			
		Cadmium	1.6E-02	1.00	9.4E-09	2.8E-08	1.0E-03	9E-06	3E-05	7E-09	2E-08			
		Chromium	3.9E+00	1.00	2.3E-06	6.8E-06	3.0E-03	8E-04	2E-03	2E-06	5E-06	5E-01	8E-07	3E-06
		Cobalt	1.8E+00	1.00	1.1E-06	3.2E-06	3.0E-04	4E-03	1E-02	8E-07	2E-06			
		Iron	5.2E+03	1.00	3.0E-03	9.0E-03	7.0E-01	4E-03	1E-02	2E-03	7E-03			
		Manganese	6.4E+01	1.00	3.7E-05	1.1E-04	2.4E-02	2E-03	5E-03	3E-05	8E-05			
		Mercury	4.4E-03	1.00	2.5E-09	7.6E-09	3.0E-04	8E-06	3E-05	2E-09	6E-09			
		Thallium	4.4E-02	1.00	2.6E-08	7.7E-08	1.0E-05	3E-03	8E-03	2E-08	6E-08			
		Vanadium	5.1E+00	1.00	3.0E-06	8.9E-06	5.0E-03	6E-04	2E-03	2E-06	7E-06			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	1.00	1.1E-11	3.2E-11	7.0E-10	2E-02	5E-02	8E-12	2E-11	1E+05	1E-06	3E-06
		Aluminum	2.0E+04	1.00	1.1E-02	3.4E-02	1.0E+00	1E-02	3E-02	8E-03	3E-02			
		Antimony	4.5E-01	1.00	2.6E-07	7.9E-07	4.0E-04	7E-04	2E-03	2E-07	6E-07			
		Arsenic	4.6E+00	0.60	1.6E-06	4.8E-06	3.0E-04	5E-03	2E-02	1E-06	4E-06	2E+00	2E-06	5E-06
		Barium	4.6E+02	1.00	2.7E-04	8.0E-04	2.0E-01	1E-03	4E-03	2E-04	6E-04			
		Cadmium	5.4E-01	1.00	3.2E-07	9.5E-07	1.0E-03	3E-04	9E-04	2E-07	7E-07			
		Chromium	2.0E+01	1.00	1.1E-05	3.4E-05	3.0E-03	4E-03	1E-02	8E-06	3E-05	5E-01	4E-06	1E-05
		Cobalt	5.6E+00	1.00	3.3E-06	9.8E-06	3.0E-04	1E-02	3E-02	2E-06	7E-06			
		Iron	2.3E+04	1.00	1.3E-02	4.0E-02	7.0E-01	2E-02	6E-02	1E-02	3E-02			
		Manganese	5.6E+02	1.00	3.3E-04	9.8E-04	2.4E-02	1E-02	4E-02	2E-04	7E-04			
		Mercury	5.3E-01	1.00	3.1E-07	9.3E-07	3.0E-04	1E-03	3E-03	2E-07	7E-07			
		Thallium	2.0E-01	1.00	1.2E-07	3.5E-07	1.0E-05	1E-02	4E-02	9E-08	3E-07			
		Vanadium	2.1E+01	1.00	1.3E-05	3.8E-05	5.0E-03	3E-03	8E-03	9E-06	3E-05			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	1.00	4.0E-12	1.2E-11	7.0E-10	6E-03	2E-02	3E-12	9E-12	1E+05	4E-07	1E-06
		Aluminum	1.1E+04	1.00	6.3E-03	1.9E-02	1.0E+00	6E-03	2E-02	5E-03	1E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.7E+00	0.60	1.6E-06	4.9E-06	3.0E-04	5E-03	2E-02	1E-06	4E-06	2E+00	2E-06	5E-06
		Barium	7.7E+02	1.00	4.5E-04	1.4E-03	2.0E-01	2E-03	7E-03	3E-04	1E-03			
		Cadmium	7.9E-01	1.00	4.6E-07	1.4E-06	1.0E-03	5E-04	1E-03	3E-07	1E-06			
		Chromium	1.6E+01	1.00	9.1E-06	2.7E-05	3.0E-03	3E-03	9E-03	7E-06	2E-05	5E-01	3E-06	1E-05
		Cobalt	4.0E+00	1.00	2.3E-06	7.0E-06	3.0E-04	8E-03	2E-02	2E-06	5E-06			
		Iron	1.2E+04	1.00	7.1E-03	2.1E-02	7.0E-01	1E-02	3E-02	5E-03	2E-02			
		Manganese	2.7E+02	1.00	1.6E-04	4.8E-04	2.4E-02	7E-03	2E-02	1E-04	4E-04			
		Mercury	1.0E-01	1.00	5.8E-08	1.8E-07	3.0E-04	2E-04	6E-04	4E-08	1E-07			
		Thallium	2.0E-01	1.00	1.2E-07	3.5E-07	1.0E-05	1E-02	4E-02	9E-08	3E-07			
		Vanadium	2.1E+01	1.00	1.2E-05	3.6E-05	5.0E-03	2E-03	7E-03	9E-06	3E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	1.00	3.3E-11	9.8E-11	7.0E-10	5E-02	1E-01	2E-11	7E-11	1E+05	3E-06	9E-06
		Aluminum	1.2E+04	1.00	6.9E-03	2.1E-02	1.0E+00	7E-03	2E-02	5E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.5E+00	0.60	1.9E-06	5.8E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06	2E+00	2E-06	6E-06
		Barium	1.5E+03	1.00	8.5E-04	2.5E-03	2.0E-01	4E-03	1E-02	6E-04	2E-03			
		Cadmium	1.8E+00	1.00	1.1E-06	3.2E-06	1.0E-03	1E-03	3E-03	8E-07	2E-06			
Floodplain	88	Chromium	2.6E+01	1.00	1.5E-05	4.6E-05	3.0E-03	5E-03	2E-02	1E-05	3E-05	5E-01	6E-06	2E-05
		Cobalt	2.6E+00	1.00	1.5E-06	4.6E-06	3.0E-04	5E-03	2E-02	1E-06	3E-06			
		Iron	8.7E+03	1.00	5.1E-03	1.5E-02	7.0E-01	7E-03	2E-02	4E-03	1E-02			
		Manganese	5.3E+02	1.00	3.1E-04	9.2E-04	2.4E-02	1E-02	4E-02	2E-04	7E-04			
		Mercury	6.9E-01	1.00	4.0E-07	1.2E-06	3.0E-04	1E-03	4E-03	3E-07	9E-07			
		Thallium	1.5E-01	1.00	8.8E-08	2.6E-07	1.0E-05	9E-03	3E-02	6E-08	2E-07			
		Vanadium	1.4E+01	1.00	8.0E-06	2.4E-05	5.0E-03	2E-03	5E-03	6E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	1.00	5.7E-12	1.7E-11	7.0E-10	8E-03	2E-02	4E-12	1E-11	1E+05	5E-07	2E-06
		Aluminum	1.1E+04	1.00	6.6E-03	2.0E-02	1.0E+00	7E-03	2E-02	5E-03	1E-02			
		Antimony	3.7E-01	1.00	2.2E-07	6.5E-07	4.0E-04	5E-04	2E-03	2E-07	5E-07			
		Arsenic	4.8E+00	0.60	1.7E-06	5.0E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06	2E+00	2E-06	6E-06
		Barium	5.0E+02	1.00	2.9E-04	8.8E-04	2.0E-01	1E-03	4E-03	2E-04	7E-04			
		Cadmium	5.5E-01	1.00	3.2E-07	9.6E-07	1.0E-03	3E-04	1E-03	2E-07	7E-07			
Floodplain	89	Chromium	1.7E+01	1.00	1.0E-05	3.0E-05	3.0E-03	3E-03	1E-02	7E-06	2E-05	5E-01	4E-06	1E-05
		Cobalt	4.5E+00	1.00	2.6E-06	7.8E-06	3.0E-04	9E-03	3E-02	2E-06	6E-06			
		Iron	1.3E+04	1.00	7.4E-03	2.2E-02	7.0E-01	1E-02	3E-02	5E-03	2E-02			
		Manganese	3.7E+02	1.00	2.1E-04	6.4E-04	2.4E-02	9E-03	3E-02	2E-04	5E-04			
		Mercury	1.8E-01	1.00	1.0E-07	3.1E-07	3.0E-04	3E-04	1E-03	8E-08	2E-07			
		Thallium	1.6E-01	1.00	9.1E-08	2.7E-07	1.0E-05	9E-03	3E-02	7E-08	2E-07			
		Vanadium	1.9E+01	1.00	1.1E-05	3.3E-05	5.0E-03	2E-03	7E-03	8E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	3.2E-11	9.7E-11	7.0E-10	5E-02	1E-01	2E-11	7E-11	1E+05	3E-06	9E-06
		Aluminum	1.1E+04	1.00	6.5E-03	2.0E-02	1.0E+00	7E-03	2E-02	5E-03	1E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	1.0E+01	0.60	3.5E-06	1.1E-05	3.0E-04	1E-02	4E-02	3E-06	8E-06	2E+00	4E-06	1E-05
		Barium	7.6E+02	1.00	4.5E-04	1.3E-03	2.0E-01	2E-03	7E-03	3E-04	1E-03			
		Cadmium	2.8E+00	1.00	1.6E-06	4.9E-06	1.0E-03	2E-03	5E-03	1E-06	4E-06			
Floodplain	90	Chromium	2.8E+01	1.00	1.6E-05	4.9E-05	3.0E-03	5E-03	2E-02	1E-05	4E-05	5E-01	6E-06	2E-05
		Cobalt	3.1E+00	1.00	1.8E-06	5.4E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	9.3E+03	1.00	5.4E-03	1.6E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	1.1E+03	1.00	6.5E-04	2.0E-03	2.4E-02	3E-02	8E-02	5E-04	1E-03			
		Mercury	1.5E+00	1.00	8.7E-07	2.6E-06	3.0E-04	3E-03	9E-03	6E-07	2E-06			
		Thallium	1.6E-01	1.00	9.1E-08	2.7E-07	1.0E-05	9E-03	3E-02	7E-08	2E-07			
		Vanadium	3.1E+01	1.00	1.8E-05	5.5E-05	5.0E-03	4E-03	1E-02	1E-05	4E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	1.3E-11	4.0E-11	7.0E-10	2E-02	6E-02	1E-11	3E-11	1E+05	1E-06	4E-06
		Aluminum	1.5E+04	1.00	8.6E-03	2.6E-02	1.0E+00	9E-03	3E-02	6E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	6.3E+00	0.60	2.2E-06	6.6E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06	2E+00	2E-06	7E-06
		Barium	9.2E+02	1.00	5.4E-04	1.6E-03	2.0E-01	3E-03	8E-03	4E-04	1E-03			
		Cadmium	1.7E+00	1.00	9.9E-07	3.0E-06	1.0E-03	1E-03	3E-03	7E-07	2E-06			
Floodplain	91	Chromium	2.6E+01	1.00	1.5E-05	4.6E-05	3.0E-03	5E-03	2E-02	1E-05	3E-05	5E-01	6E-06	2E-05
		Cobalt	5.3E+00	1.00	3.1E-06	9.3E-06	3.0E-04	1E-02	3E-02	2E-06	7E-06			
		Iron	1.4E+04	1.00	8.3E-03	2.5E-02	7.0E-01	1E-02	4E-02	6E-03	2E-02			
		Manganese	4.0E+02	1.00	2.3E-04	7.0E-04	2.4E-02	1E-02	3E-02	2E-04	5E-04			
		Mercury	8.3E-01	1.00	4.9E-07	1.5E-06	3.0E-04	2E-03	5E-03	4E-07	1E-06			
		Thallium	1.9E-01	1.00	1.1E-07	3.3E-07	1.0E-05	1E-02	3E-02	8E-08	2E-07			
		Vanadium	2.6E+01	1.00	1.5E-05	4.6E-05	5.0E-03	3E-03	9E-03	1E-05	3E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	1.00	2.7E-11	8.1E-11	7.0E-10	4E-02	1E-01	2E-11	6E-11	1E+05	3E-06	8E-06
		Aluminum	1.5E+04	1.00	8.8E-03	2.7E-02	1.0E+00	9E-03	3E-02	7E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	7.8E+00	0.60	2.7E-06	8.2E-06	3.0E-04	9E-03	3E-02	2E-06	6E-06	2E+00	3E-06	9E-06
		Barium	4.3E+02	1.00	2.5E-04	7.5E-04	2.0E-01	1E-03	4E-03	2E-04	6E-04			
		Cadmium	2.1E+00	1.00	1.2E-06	3.7E-06	1.0E-03	1E-03	4E-03	9E-07	3E-06			
Floodplain	93	Chromium	2.5E+01	1.00	1.5E-05	4.4E-05	3.0E-03	5E-03	1E-02	1E-05	3E-05	5E-01	5E-06	2E-05
		Cobalt	3.2E+00	1.00	1.9E-06	5.6E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	7.9E+03	1.00	4.6E-03	1.4E-02	7.0E-01	7E-03	2E-02	3E-03	1E-02			
		Manganese	8.8E+02	1.00	5.1E-04	1.5E-03	2.4E-02	2E-02	6E-02	4E-04	1E-03			
		Mercury	3.2E+00	1.00	1.8E-06	5.5E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Thallium	1.2E-01	1.00	7.2E-08	2.1E-07	1.0E-05	7E-03	2E-02	5E-08	2E-07			
		Vanadium	2.9E+01	1.00	1.7E-05	5.0E-05	5.0E-03	3E-03	1E-02	1E-05	4E-05			

		$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	1.00	1.3E-11	3.9E-11	7.0E-10	2E-02	6E-02	1E-11	3E-11	1E+05	1E-06	4E-06
		Aluminum	1.0E+04	1.00	6.1E-03	1.8E-02	1.0E+00	6E-03	2E-02	4E-03	1E-02			
		Antimony	4.7E-01	1.00	2.7E-07	8.2E-07	4.0E-04	7E-04	2E-03	2E-07	6E-07			
		Arsenic	4.0E+00	0.60	1.4E-06	4.2E-06	3.0E-04	5E-03	1E-02	1E-06	3E-06	2E+00	2E-06	5E-06
		Barium	4.1E+02	1.00	2.4E-04	7.3E-04	2.0E-01	1E-03	4E-03	2E-04	5E-04			
		Cadmium	1.2E+00	1.00	6.8E-07	2.0E-06	1.0E-03	7E-04	2E-03	5E-07	1E-06			
Floodplain	94	Chromium	2.0E+01	1.00	1.2E-05	3.5E-05	3.0E-03	4E-03	1E-02	9E-06	3E-05	5E-01	4E-06	1E-05
		Cobalt	3.2E+00	1.00	1.9E-06	5.6E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06			
		Iron	9.5E+03	1.00	5.5E-03	1.7E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	4.0E+02	1.00	2.4E-04	7.1E-04	2.4E-02	1E-02	3E-02	2E-04	5E-04			
		Mercury	9.4E-01	1.00	5.5E-07	1.6E-06	3.0E-04	2E-03	5E-03	4E-07	1E-06			
		Thallium	1.5E-01	1.00	8.9E-08	2.7E-07	1.0E-05	9E-03	3E-02	7E-08	2E-07			
		Vanadium	1.8E+01	1.00	1.0E-05	3.1E-05	5.0E-03	2E-03	6E-03	8E-06	2E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	1.00	1.2E-11	3.7E-11	7.0E-10	2E-02	5E-02	9E-12	3E-11	1E+05	1E-06	4E-06
		Aluminum	9.8E+03	1.00	5.7E-03	1.7E-02	1.0E+00	6E-03	2E-02	4E-03	1E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	5.6E+00	0.60	2.0E-06	5.9E-06	3.0E-04	7E-03	2E-02	1E-06	4E-06	2E+00	2E-06	7E-06
		Barium	3.9E+02	1.00	2.3E-04	6.9E-04	2.0E-01	1E-03	3E-03	2E-04	5E-04			
		Cadmium	1.2E+00	1.00	7.2E-07	2.2E-06	1.0E-03	7E-04	2E-03	5E-07	2E-06			
Floodplain	95	Chromium	1.8E+01	1.00	1.0E-05	3.1E-05	3.0E-03	3E-03	1E-02	8E-06	2E-05	5E-01	4E-06	1E-05
		Cobalt	3.5E+00	1.00	2.0E-06	6.1E-06	3.0E-04	7E-03	2E-02	2E-06	5E-06			
		Iron	9.7E+03	1.00	5.7E-03	1.7E-02	7.0E-01	8E-03	2E-02	4E-03	1E-02			
		Manganese	7.4E+02	1.00	4.3E-04	1.3E-03	2.4E-02	2E-02	5E-02	3E-04	1E-03			
		Mercury	1.0E+00	1.00	6.1E-07	1.8E-06	3.0E-04	2E-03	6E-03	5E-07	1E-06			
		Thallium	1.2E-01	1.00	7.1E-08	2.1E-07	1.0E-05	7E-03	2E-02	5E-08	2E-07			
		Vanadium	2.3E+01	1.00	1.4E-05	4.1E-05	5.0E-03	3E-03	8E-03	1E-05	3E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	1.6E-12	4.9E-12	7.0E-10	2E-03	7E-03	1E-12	4E-12	1E+05	2E-07	5E-07
		Aluminum	6.9E+03	1.00	4.1E-03	1.2E-02	1.0E+00	4E-03	1E-02	3E-03	9E-03			
		Antimony	4.8E-02	1.00	2.8E-08	8.3E-08	4.0E-04	7E-05	2E-04	2E-08	6E-08			
		Arsenic	1.7E+00	0.60	6.0E-07	1.8E-06	3.0E-04	2E-03	6E-03	4E-07	1E-06	2E+00	7E-07	2E-06
		Barium	2.4E+02	1.00	1.4E-04	4.2E-04	2.0E-01	7E-04	2E-03	1E-04	3E-04			
		Cadmium	2.6E-01	1.00	1.5E-07	4.6E-07	1.0E-03	2E-04	5E-04	1E-07	3E-07			
Floodplain	97	Chromium	9.3E+00	1.00	5.4E-06	1.6E-05	3.0E-03	2E-03	5E-03	4E-06	1E-05	5E-01	2E-06	6E-06
		Cobalt	1.7E+00	1.00	9.9E-07	3.0E-06	3.0E-04	3E-03	1E-02	7E-07	2E-06			
		Iron	5.5E+03	1.00	3.2E-03	9.7E-03	7.0E-01	5E-03	1E-02	2E-03	7E-03			
		Manganese	9.3E+01	1.00	5.4E-05	1.6E-04	2.4E-02	2E-03	7E-03	4E-05	1E-04			
		Mercury	4.1E-02	1.00	2.4E-08	7.2E-08	3.0E-04	8E-05	2E-04	2E-08	5E-08			
		Thallium	7.5E-03	1.00	4.4E-09	1.3E-08	1.0E-05	4E-04	1E-03	3E-09	1E-08			
		Vanadium	8.7E+00	1.00	5.1E-06	1.5E-05	5.0E-03	1E-03	3E-03	4E-06	1E-05			
		$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	8.5E-12	2.5E-11	7.0E-10	1E-02	4E-02	6E-12	2E-11	1E+05	8E-07	2E-06
		Aluminum	1.5E+04	1.00	8.9E-03	2.7E-02	1.0E+00	9E-03	3E-02	7E-03	2E-02			
		Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
		Arsenic	4.9E+00	0.60	1.7E-06	5.1E-06	3.0E-04	6E-03	2E-02	1E-06	4E-06	2E+00	2E-06	6E-06
		Barium	2.2E+03	1.00	1.3E-03	3.8E-03	2.0E-01	6E-03	2E-02	9E-04	3E-03			
		Cadmium	1.2E+00	1.00	7.1E-07	2.1E-06	1.0E-03	7E-04	2E-03	5E-07	2E-06			
Floodplain	98	Chromium	1.9E+01	1.00	1.1E-05	3.4E-05	3.0E-03	4E-03	1E-02	8E-06	3E-05	5E-01	4E-06	1E-05
		Cobalt	3.2E+00	1.00	1.8E-06	5.5E-06	3.0E-04	6E-03	2E-02	1E-07	6E-07			
		Iron	1.1E+04	1.00	6.1E-03	1.8E-02	7.0E-01	9E-03	3E-02	3E-04	2E-03			
		Manganese	2.9E+02	1.00	1.7E-04	5.1E-04	2.4E-02	7E-03	2E-02	9E-06	6E-05			
		Mercury	3.1E-01	1.00	1.8E-07	5.3E-07	3.0E-04	6E-04	2E-03	1E-08	6E-08			
		Thallium	1.3E-01	1.00	7.3E-08	2.2E-07	1.0E-05	7E-03	2E-02	4E-09	2E-08			
		Vanadium	2.1E+01	1.00	1.2E-05	3.7E-05	5.0E-03	2E-03	7E-03	7E-07	4E-06			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Campers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME	
Noncancer	5.55E-07	4.16E-06	*Based on Child HIFs*
Cancer	2.38E-08	3.57E-07	*Based on TWA HIFs*

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	26	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-06	0.03	6.2E-14	4.6E-13	7.0E-10	9E-05	7E-04	3E-15	4E-14	1E+05	3E-10	5E-09
		Arsenic	9.3E+00	0.03	1.5E-07	1.2E-06	3.0E-04	5E-04	4E-03	7E-09	1E-07	2E+00	1E-08	1E-07
		Cadmium	7.0E-01	0.001	3.9E-10	2.9E-09	2.5E-05	2E-05	1E-04	2E-11	2E-10			
Upland	27	$TEQ_{D/F}$ (ND=1/2 DL)	2.5E-06	0.03	4.2E-14	3.1E-13	7.0E-10	6E-05	4E-04	2E-15	3E-14	1E+05	2E-10	4E-09
		Arsenic	1.0E+00	0.03	1.7E-08	1.2E-07	3.0E-04	6E-05	4E-04	7E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	6.4E-02	0.001	3.6E-11	2.7E-10	2.5E-05	1E-06	1E-05	2E-12	2E-11			
Upland	28	$TEQ_{D/F}$ (ND=1/2 DL)	6.6E-07	0.03	1.1E-14	8.2E-14	7.0E-10	2E-05	1E-04	5E-16	7E-15	1E+05	6E-11	9E-10
		Arsenic	9.5E-01	0.03	1.6E-08	1.2E-07	3.0E-04	5E-05	4E-04	7E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	7.3E-02	0.001	4.0E-11	3.0E-10	2.5E-05	2E-06	1E-05	2E-12	3E-11			
Upland	29	$TEQ_{D/F}$ (ND=1/2 DL)	2.9E-06	0.03	4.9E-14	3.7E-13	7.0E-10	7E-05	5E-04	2E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	1.7E+00	0.03	2.8E-08	2.1E-07	3.0E-04	9E-05	7E-04	1E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	1.4E-01	0.001	7.8E-11	5.8E-10	2.5E-05	3E-06	2E-05	3E-12	5E-11			
Upland	30	$TEQ_{D/F}$ (ND=1/2 DL)	1.7E-06	0.03	2.8E-14	2.1E-13	7.0E-10	4E-05	3E-04	1E-15	2E-14	1E+05	2E-10	2E-09
		Arsenic	1.2E+00	0.03	2.0E-08	1.5E-07	3.0E-04	7E-05	5E-04	9E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	1.3E-01	0.001	7.2E-11	5.4E-10	2.5E-05	3E-06	2E-05	3E-12	5E-11			
Upland	31	$TEQ_{D/F}$ (ND=1/2 DL)	7.1E-07	0.03	1.2E-14	8.9E-14	7.0E-10	2E-05	1E-04	5E-16	8E-15	1E+05	7E-11	1E-09
		Arsenic	1.9E+00	0.03	3.1E-08	2.3E-07	3.0E-04	1E-04	8E-04	1E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	4.4E-02	0.001	2.4E-11	1.8E-10	2.5E-05	1E-06	7E-06	1E-12	2E-11			
Upland	32	$TEQ_{D/F}$ (ND=1/2 DL)	5.3E-07	0.03	8.8E-15	6.6E-14	7.0E-10	1E-05	9E-05	4E-16	6E-15	1E+05	5E-11	7E-10
		Arsenic	1.1E+00	0.03	1.8E-08	1.4E-07	3.0E-04	6E-05	5E-04	8E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	4.6E-02	0.001	2.6E-11	1.9E-10	2.5E-05	1E-06	8E-06	1E-12	2E-11			
Upland	33	$TEQ_{D/F}$ (ND=1/2 DL)	1.0E-06	0.03	1.7E-14	1.3E-13	7.0E-10	2E-05	2E-04	7E-16	1E-14	1E+05	9E-11	1E-09
		Arsenic	4.0E+00	0.03	6.7E-08	5.0E-07	3.0E-04	2E-04	2E-03	3E-09	4E-08	2E+00	4E-09	6E-08
		Cadmium	1.3E-01	0.001	7.2E-11	5.4E-10	2.5E-05	3E-06	2E-05	3E-12	5E-11			
Upland	34	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-07	0.03	1.4E-14	1.0E-13	7.0E-10	2E-05	1E-04	6E-16	9E-15	1E+05	8E-11	1E-09
		Arsenic	1.6E+00	0.03	2.7E-08	2.0E-07	3.0E-04	9E-05	7E-04	1E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	9.3E-02	0.001	5.2E-11	3.9E-10	2.5E-05	2E-06	2E-05	2E-12	3E-11			
Upland	35	$TEQ_{D/F}$ (ND=1/2 DL)	7.3E-07	0.03	1.2E-14	9.1E-14	7.0E-10	2E-05	1E-04	5E-16	8E-15	1E+05	7E-11	1E-09
		Arsenic	2.1E+00	0.03	3.5E-08	2.6E-07	3.0E-04	1E-04	9E-04	1E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	1.9E-01	0.001	1.1E-10	7.9E-10	2.5E-05	4E-06	3E-05	5E-12	7E-11			
Upland	36	$TEQ_{D/F}$ (ND=1/2 DL)	9.2E-06	0.03	1.5E-13	1.1E-12	7.0E-10	2E-04	2E-03	7E-15	1E-13	1E+05	8E-10	1E-08
		Arsenic	5.1E+00	0.03	8.5E-08	6.4E-07	3.0E-04	3E-04	2E-03	4E-09	5E-08	2E+00	5E-09	8E-08
		Cadmium	8.5E-01	0.001	4.7E-10	3.5E-09	2.5E-05	2E-05	1E-04	2E-11	3E-10			
Upland	37	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	2.5E-14	1.9E-13	7.0E-10	4E-05	3E-04	1E-15	2E-14	1E+05	1E-10	2E-09
		Arsenic	2.5E+00	0.03	4.2E-08	3.1E-07	3.0E-04	1E-04	1E-03	2E-09	3E-08	2E+00	3E-09	4E-08
		Cadmium	2.6E-01	0.001	1.4E-10	1.1E-09	2.5E-05	6E-06	4E-05	6E-12	9E-11			
Upland	38[a]	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-06	0.03	3.5E-14	2.6E-13	7.0E-10	5E-05	4E-04	1E-15	2E-14	1E+05	2E-10	3E-09
		Arsenic	1.0E+00	0.03	1.7E-08	1.2E-07	3.0E-04	6E-05	4E-04	7E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	1.6E-02	0.001	8.9E-12	6.7E-11	2.5E-05	4E-07	3E-06	4E-13	6E-12			
Upland	39	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	4.6E-14	3.5E-13	7.0E-10	7E-05	5E-04	2E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	2.2E+00	0.03	3.6E-08	2.7E-07	3.0E-04	1E-04	9E-04	2E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	3.3E-01	0.001	1.8E-10	1.4E-09	2.5E-05	7E-06	6E-05	8E-12	1E-10			
Upland	40	$TEQ_{D/F}$ (ND=1/2 DL)	3.5E-06	0.03	5.9E-14	4.4E-13	7.0E-10	8E-05	6E-04	3E-15	4E-14	1E+05	3E-10	5E-09
		Arsenic	1.4E+00	0.03	2.3E-08	1.7E-07	3.0E-04	8E-05	6E-04	1E-09	1E-08	2E+00	1E-09	2E-08
		Cadmium	2.8E-01	0.001	1.6E-10	1.2E-09	2.5E-05	6E-06	5E-05	7E-12	1E-10			
Upland	41	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	6.6E-14	4.9E-13	7.0E-10	9E-05	7E-04	3E-15	4E-14	1E+05	4E-10	5E-09
		Arsenic	1.3E+00	0.03	2.2E-08	1.6E-07	3.0E-04	7E-05	5E-04	9E-10	1E-08	2E+00	1E-09	2E-08
		Cadmium	2.8E-01	0.001	1.6E-10	1.2E-09	2.5E-05	6E-06	5E-05	7E-12	1E-10			
Upland	42	$TEQ_{D/F}$ (ND=1/2 DL)	7.5E-06	0.03	1.2E-13	9.3E-13	7.0E-10	2E-04	1E-03	5E-15	8E-14	1E+05	7E-10	1E-08
		Arsenic	3.1E+00	0.03	5.2E-08	3.9E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	5E-08
		Cadmium	3.2E-01	0.001	1.8E-10	1.3E-09	2.5E-05	7E-06	5E-05	8E-12	1E-10			
Upland	43	$TEQ_{D/F}$ (ND=1/2 DL)	3.9E-06	0.03	6.5E-14	4.9E-13	7.0E-10	9E-05	7E-04	3E-15	4E-14	1E+05	4E-10	5E-09
		Arsenic	2.8E+00	0.03	4.7E-08	3.5E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	4E-08
		Cadmium	4.7E-01	0.001	2.6E-10	2.0E-09	2.5E-05	1E-05	8E-05	1E-11	2E-10			
Upland	44	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	3.6E-14	2.7E-13	7.0E-10	5E-05	4E-04	2E-15	2E-14	1E+05	2E-10	3E-09
		Arsenic	4.4E+00	0.03	7.3E-08	5.5E-07	3.0E-04	2E-04	2E-03	3E-09	5E-08	2E+00	5E-09	7E-08
		Cadmium	8.0E-01	0.001	4.4E-10	3.3E-09	2.5E-05	2E-05	1E-04	2E-11	3E-10			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Campers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME	
Noncancer	5.55E-07	4.16E-06	*Based on Child HIFs*
Cancer	2.38E-08	3.57E-07	*Based on TWA HIFs*

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	45[a]	$TEQ_{D/F}$ (ND=1/2 DL)	3.7E-07	0.03	6.1E-15	4.6E-14	7.0E-10	9E-06	7E-05	3E-16	4E-15	1E+05	3E-11	5E-10
		Arsenic	3.1E+00	0.03	5.2E-08	3.9E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	5E-08
		Cadmium	8.0E-02	0.001	4.4E-11	3.3E-10	2.5E-05	2E-06	1E-05	2E-12	3E-11			
Upland	46	$TEQ_{D/F}$ (ND=1/2 DL)	3.0E-06	0.03	5.0E-14	3.8E-13	7.0E-10	7E-05	5E-04	2E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	2.3E+00	0.03	3.8E-08	2.9E-07	3.0E-04	1E-04	1E-03	2E-09	2E-08	2E+00	2E-09	4E-08
		Cadmium	2.4E-01	0.001	1.3E-10	1.0E-09	2.5E-05	5E-06	4E-05	6E-12	9E-11			
Upland	47	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	2.7E-13	2.0E-12	7.0E-10	4E-04	3E-03	1E-14	2E-13	1E+05	2E-09	2E-08
		Arsenic	1.3E+01	0.03	2.1E-07	1.6E-06	3.0E-04	7E-04	5E-03	9E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	5.2E+00	0.001	2.9E-09	2.2E-08	2.5E-05	1E-04	9E-04	1E-10	2E-09			
Upland	48	$TEQ_{D/F}$ (ND=1/2 DL)	4.9E-05	0.03	8.2E-13	6.1E-12	7.0E-10	1E-03	9E-03	4E-14	5E-13	1E+05	5E-09	7E-08
		Arsenic	1.4E+01	0.03	2.4E-07	1.8E-06	3.0E-04	8E-04	6E-03	1E-08	2E-07	2E+00	2E-08	2E-07
		Cadmium	8.3E+00	0.001	4.6E-09	3.5E-08	2.5E-05	2E-04	1E-03	2E-10	3E-09			
Upland	49	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-05	0.03	6.6E-13	5.0E-12	7.0E-10	9E-04	7E-03	3E-14	4E-13	1E+05	4E-09	6E-08
		Arsenic	3.6E+00	0.03	6.0E-08	4.5E-07	3.0E-04	2E-04	1E-03	3E-09	4E-08	2E+00	4E-09	6E-08
		Cadmium	2.0E+00	0.001	1.1E-09	8.3E-09	2.5E-05	4E-05	3E-04	5E-11	7E-10			
Upland	50	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-05	0.03	4.0E-13	3.0E-12	7.0E-10	6E-04	4E-03	2E-14	3E-13	1E+05	2E-09	3E-08
		Arsenic	7.9E+00	0.03	1.3E-07	9.8E-07	3.0E-04	4E-04	3E-03	6E-09	8E-08	2E+00	8E-09	1E-07
		Cadmium	3.9E+00	0.001	2.2E-09	1.6E-08	2.5E-05	9E-05	6E-04	9E-11	1E-09			
Upland	51	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-06	0.03	5.2E-14	3.9E-13	7.0E-10	7E-05	6E-04	2E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	2.2E+00	0.03	3.7E-08	2.7E-07	3.0E-04	1E-04	9E-04	2E-09	2E-08	2E+00	2E-09	4E-08
		Cadmium	5.2E-01	0.001	2.9E-10	2.2E-09	2.5E-05	1E-05	9E-05	1E-11	2E-10			
Upland	52	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-06	0.03	3.6E-14	2.7E-13	7.0E-10	5E-05	4E-04	2E-15	2E-14	1E+05	2E-10	3E-09
		Arsenic	1.8E+00	0.03	2.9E-08	2.2E-07	3.0E-04	1E-04	7E-04	1E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	1.6E-01	0.001	8.8E-11	6.6E-10	2.5E-05	4E-06	3E-05	4E-12	6E-11			
Upland	53	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	3.8E-13	2.8E-12	7.0E-10	5E-04	4E-03	2E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	2.6E+00	0.03	4.3E-08	3.2E-07	3.0E-04	1E-04	1E-03	2E-09	3E-08	2E+00	3E-09	4E-08
		Cadmium	1.2E+00	0.001	6.7E-10	5.0E-09	2.5E-05	3E-05	2E-04	3E-11	4E-10			
Upland	54	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	2.4E-13	1.8E-12	7.0E-10	3E-04	3E-03	1E-14	2E-13	1E+05	1E-09	2E-08
		Arsenic	1.1E+01	0.03	1.8E-07	1.3E-06	3.0E-04	6E-04	4E-03	8E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	4.7E+00	0.001	2.6E-09	2.0E-08	2.5E-05	1E-04	8E-04	1E-10	2E-09			
Upland	55	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	9.2E-13	6.9E-12	7.0E-10	1E-03	1E-02	4E-14	6E-13	1E+05	5E-09	8E-08
		Arsenic	1.4E+01	0.03	2.2E-07	1.7E-06	3.0E-04	7E-04	6E-03	1E-08	1E-07	2E+00	1E-08	2E-07
		Cadmium	5.6E+00	0.001	3.1E-09	2.3E-08	2.5E-05	1E-04	9E-04	1E-10	2E-09			
Upland	56	$TEQ_{D/F}$ (ND=1/2 DL)	5.9E-05	0.03	9.8E-13	7.3E-12	7.0E-10	1E-03	1E-02	4E-14	6E-13	1E+05	5E-09	8E-08
		Arsenic	1.2E+01	0.03	2.0E-07	1.5E-06	3.0E-04	7E-04	5E-03	9E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	6.7E+00	0.001	3.7E-09	2.8E-08	2.5E-05	1E-04	1E-03	2E-10	2E-09			
Upland	58	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.4E-12	1.0E-11	7.0E-10	2E-03	1E-02	6E-14	9E-13	1E+05	8E-09	1E-07
		Arsenic	1.2E+01	0.03	2.0E-07	1.5E-06	3.0E-04	7E-04	5E-03	8E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	4.8E+00	0.001	2.7E-09	2.0E-08	2.5E-05	1E-04	8E-04	1E-10	2E-09			
Upland	59	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	2.6E-13	2.0E-12	7.0E-10	4E-04	3E-03	1E-14	2E-13	1E+05	1E-09	2E-08
		Arsenic	6.2E+00	0.03	1.0E-07	7.8E-07	3.0E-04	3E-04	3E-03	4E-09	7E-08	2E+00	7E-09	1E-07
		Cadmium	3.3E+00	0.001	1.8E-09	1.4E-08	2.5E-05	7E-05	6E-04	8E-11	1E-09			
Upland	60	$TEQ_{D/F}$ (ND=1/2 DL)	8.7E-06	0.03	1.4E-13	1.1E-12	7.0E-10	2E-04	2E-03	6E-15	9E-14	1E+05	8E-10	1E-08
		Arsenic	4.6E+00	0.03	7.7E-08	5.7E-07	3.0E-04	3E-04	2E-03	3E-09	5E-08	2E+00	5E-09	7E-08
		Cadmium	1.7E+00	0.001	9.4E-10	7.1E-09	2.5E-05	4E-05	3E-04	4E-11	6E-10			
Upland	61	$TEQ_{D/F}$ (ND=1/2 DL)	5.8E-06	0.03	9.7E-14	7.2E-13	7.0E-10	1E-04	1E-03	4E-15	6E-14	1E+05	5E-10	8E-09
		Arsenic	3.7E+00	0.03	6.2E-08	4.6E-07	3.0E-04	2E-04	2E-03	3E-09	4E-08	2E+00	4E-09	6E-08
		Cadmium	1.1E+00	0.001	6.1E-10	4.6E-09	2.5E-05	2E-05	2E-04	3E-11	4E-10			
Upland	62	$TEQ_{D/F}$ (ND=1/2 DL)	1.1E-06	0.03	1.8E-14	1.4E-13	7.0E-10	3E-05	2E-04	8E-16	1E-14	1E+05	1E-10	2E-09
		Arsenic	2.6E+00	0.03	4.3E-08	3.2E-07	3.0E-04	1E-04	1E-03	2E-09	3E-08	2E+00	3E-09	4E-08
		Cadmium	3.7E-01	0.001	2.1E-10	1.5E-09	2.5E-05	8E-06	6E-05	9E-12	1E-10			
Upland	64	$TEQ_{D/F}$ (ND=1/2 DL)	1.6E-05	0.03	2.7E-13	2.1E-12	7.0E-10	4E-04	3E-03	1E-14	2E-13	1E+05	2E-09	2E-08
		Arsenic	3.0E+00	0.03	5.0E-08	3.7E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	5E-08
		Cadmium	7.9E-01	0.001	4.4E-10	3.3E-09	2.5E-05	2E-05	1E-04	2E-11	3E-10			
Upland	65[a]	$TEQ_{D/F}$ (ND=1/2 DL)	1.3E-05	0.03	2.2E-13	1.6E-12	7.0E-10	3E-04	2E-03	9E-15	1E-13	1E+05	1E-09	2E-08
		Arsenic	4.3E+00	0.03	7.2E-08	5.4E-07	3.0E-04	2E-04	2E-03	3E-09	5E-08	2E+00	5E-09	7E-08
		Cadmium	2.5E+00	0.001	1.4E-09	1.0E-08	2.5E-05	6E-05	4E-04	6E-11	9E-10			
Upland	66	$TEQ_{D/F}$ (ND=1/2 DL)	1.5E-06	0.03	2.6E-14	1.9E-13	7.0E-10	4E-05	3E-04	1E-15	2E-14	1E+05	1E-10	2E-09
		Arsenic	3.2E+00	0.03	5.3E-08	4.0E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	5E-08
		Cadmium	9.0E-01	0.001	5.0E-10	3.7E-09	2.5E-05	2E-05	1E-04	2E-11	3E-10			
Upland	67	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.4E-12	1.0E-11	7.0E-10	2E-03	1E-02	6E-14	9E-13	1E+05	8E-09	1E-07
		Arsenic	1.5E+01	0.03	2.5E-07	1.9E-06	3.0E-04	8E-04	6E-03	1E-08	2E-07	2E+00	2E-08	2E-07
		Cadmium	4.8E+00	0.001	2.7E-09	2.0E-08	2.5E-05	1E-04	8E-04	1E-10	2E-09			
Upland	68	$TEQ_{D/F}$ (ND=1/2 DL)	8.3E-05	0.03	1.4E-12	1.0E-11	7.0E-10	2E-03	1E-02	6E-14	9E-13	1E+05	8E-09	1E-07
		Arsenic	1.5E+01	0.03	2.5E-07	1.9E-06	3.0E-04	8E-04	6E-03	1E-08	2E-07	2E+00	2E-08	2E-07
		Cadmium	4.8E+00	0.001	2.7E-09	2.0E-08	2.5E-05	1E-04	8E-04	1E-10	2E-09			

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Campers**
Exposure Area **Random grids across OU3**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME	
Noncancer	5.55E-07	4.16E-06	*Based on Child HIFs*
Cancer	2.38E-08	3.57E-07	*Based on TWA HIFs*

Area	Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
					DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
			mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Upland	70	$TEQ_{D/F}$ (ND=1/2 DL)	4.1E-06	0.03	6.8E-14	5.1E-13	7.0E-10	1E-04	7E-04	3E-15	4E-14	1E+05	4E-10	6E-09
		Arsenic	6.0E+00	0.03	1.0E-07	7.5E-07	3.0E-04	3E-04	2E-03	4E-09	6E-08	2E+00	6E-09	1E-07
		Cadmium	1.8E+00	0.001	1.0E-09	7.5E-09	2.5E-05	4E-05	3E-04	4E-11	6E-10			
Upland	71	$TEQ_{D/F}$ (ND=1/2 DL)	2.4E-06	0.03	4.0E-14	3.0E-13	7.0E-10	6E-05	4E-04	2E-15	3E-14	1E+05	2E-10	3E-09
		Arsenic	5.8E+00	0.03	9.7E-08	7.2E-07	3.0E-04	3E-04	2E-03	4E-09	6E-08	2E+00	6E-09	9E-08
		Cadmium	1.3E+00	0.001	7.2E-10	5.4E-09	2.5E-05	3E-05	2E-04	3E-11	5E-10			
Upland	72	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	3.9E-13	2.9E-12	7.0E-10	6E-04	4E-03	2E-14	3E-13	1E+05	2E-09	3E-08
		Arsenic	7.0E+00	0.03	1.2E-07	8.7E-07	3.0E-04	4E-04	3E-03	5E-09	7E-08	2E+00	7E-09	1E-07
		Cadmium	2.2E+00	0.001	1.2E-09	9.2E-09	2.5E-05	5E-05	4E-04	5E-11	8E-10			
Upland	74	$TEQ_{D/F}$ (ND=1/2 DL)	3.1E-04	0.03	5.1E-12	3.8E-11	7.0E-10	7E-03	5E-02	2E-13	3E-12	1E+05	3E-08	4E-07
		Arsenic	4.1E+01	0.03	6.7E-07	5.1E-06	3.0E-04	2E-03	2E-02	3E-08	4E-07	2E+00	4E-08	7E-07
		Cadmium	6.4E+00	0.001	3.6E-09	2.7E-08	2.5E-05	1E-04	1E-03	2E-10	2E-09			
Upland	75	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	5.7E-15	4.3E-14	7.0E-10	8E-06	6E-05	2E-16	4E-15	1E+05	3E-11	5E-10
		Arsenic	4.3E+00	0.03	7.2E-08	5.4E-07	3.0E-04	2E-04	2E-03	3E-09	5E-08	2E+00	5E-09	7E-08
		Cadmium	1.5E-01	0.001	8.3E-11	6.2E-10	2.5E-05	3E-06	2E-05	4E-12	5E-11			
Upland	76	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	3.4E-14	2.5E-13	7.0E-10	5E-05	4E-04	1E-15	2E-14	1E+05	2E-10	3E-09
		Arsenic	2.9E+00	0.03	4.7E-08	3.6E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	5E-08
		Cadmium	1.2E-01	0.001	6.7E-11	5.1E-10	2.5E-05	3E-06	2E-05	3E-12	4E-11			
Upland	77	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	3.4E-14	2.5E-13	7.0E-10	5E-05	4E-04	1E-15	2E-14	1E+05	2E-10	3E-09
		Arsenic	2.9E+00	0.03	4.7E-08	3.6E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	5E-08
		Cadmium	1.2E-01	0.001	6.7E-11	5.1E-10	2.5E-05	3E-06	2E-05	3E-12	4E-11			
Upland	78	$TEQ_{D/F}$ (ND=1/2 DL)	3.4E-07	0.03	5.7E-15	4.3E-14	7.0E-10	8E-06	6E-05	2E-16	4E-15	1E+05	3E-11	5E-10
		Arsenic	4.3E+00	0.03	7.2E-08	5.4E-07	3.0E-04	2E-04	2E-03	3E-09	5E-08	2E+00	5E-09	7E-08
		Cadmium	1.5E-01	0.001	8.3E-11	6.2E-10	2.5E-05	3E-06	2E-05	4E-12	5E-11			
Upland	79	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	3.4E-14	2.5E-13	7.0E-10	5E-05	4E-04	1E-15	2E-14	1E+05	2E-10	3E-09
		Arsenic	2.9E+00	0.03	4.7E-08	3.6E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	5E-08
		Cadmium	1.2E-01	0.001	6.7E-11	5.1E-10	2.5E-05	3E-06	2E-05	3E-12	4E-11			
Upland	80	$TEQ_{D/F}$ (ND=1/2 DL)	2.0E-06	0.03	3.4E-14	2.5E-13	7.0E-10	5E-05	4E-04	1E-15	2E-14	1E+05	2E-10	3E-09
		Arsenic	2.9E+00	0.03	4.7E-08	3.6E-07	3.0E-04	2E-04	1E-03	2E-09	3E-08	2E+00	3E-09	5E-08
		Cadmium	1.2E-01	0.001	6.7E-11	5.1E-10	2.5E-05	3E-06	2E-05	3E-12	4E-11			
Floodplain	81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	0.03	1.0E-14	7.5E-14	7.0E-10	1E-05	1E-04	4E-16	6E-15	1E+05	6E-11	8E-10
		Arsenic	4.5E+00	0.03	7.5E-08	5.6E-07	3.0E-04	2E-04	2E-03	3E-09	5E-08	2E+00	5E-09	7E-08
		Cadmium	3.2E-01	0.001	1.8E-10	1.3E-09	2.5E-05	7E-06	5E-05	8E-12	1E-10			
Floodplain	85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	0.03	6.7E-15	5.0E-14	7.0E-10	1E-05	7E-05	3E-16	4E-15	1E+05	4E-11	6E-10
		Arsenic	1.9E+00	0.03	3.2E-08	2.4E-07	3.0E-04	1E-04	8E-04	1E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	1.6E-02	0.001	8.9E-12	6.7E-11	2.5E-05	4E-07	3E-06	4E-13	6E-12			
Floodplain	86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	0.03	3.1E-13	2.3E-12	7.0E-10	4E-04	3E-03	1E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	4.6E+00	0.03	7.7E-08	5.7E-07	3.0E-04	3E-04	2E-03	3E-09	5E-08	2E+00	5E-09	7E-08
		Cadmium	5.4E-01	0.001	3.0E-10	2.2E-09	2.5E-05	1E-05	9E-05	1E-11	2E-10			
Floodplain	87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	0.03	1.1E-13	8.5E-13	7.0E-10	2E-04	1E-03	5E-15	7E-14	1E+05	6E-10	9E-09
		Arsenic	4.7E+00	0.03	7.8E-08	5.9E-07	3.0E-04	3E-04	2E-03	3E-09	5E-08	2E+00	5E-09	8E-08
		Cadmium	7.9E-01	0.001	4.4E-10	3.3E-09	2.5E-05	2E-05	1E-04	2E-11	3E-10			
Floodplain	88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	0.03	9.3E-13	7.0E-12	7.0E-10	1E-03	1E-02	4E-14	6E-13	1E+05	5E-09	8E-08
		Arsenic	5.5E+00	0.03	9.2E-08	6.9E-07	3.0E-04	3E-04	2E-03	4E-09	6E-08	2E+00	6E-09	9E-08
		Cadmium	1.8E+00	0.001	1.0E-09	7.5E-09	2.5E-05	4E-05	3E-04	4E-11	6E-10			
Floodplain	89	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	0.03	1.6E-13	1.2E-12	7.0E-10	2E-04	2E-03	7E-15	1E-13	1E+05	9E-10	1E-08
		Arsenic	4.8E+00	0.03	7.9E-08	5.9E-07	3.0E-04	3E-04	2E-03	3E-09	5E-08	2E+00	5E-09	8E-08
		Cadmium	5.5E-01	0.001	3.0E-10	2.3E-09	2.5E-05	1E-05	9E-05	1E-11	2E-10			
Floodplain	90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	9.2E-13	6.9E-12	7.0E-10	1E-03	1E-02	4E-14	6E-13	1E+05	5E-09	8E-08
		Arsenic	1.0E+01	0.03	1.7E-07	1.2E-06	3.0E-04	6E-04	4E-03	7E-09	1E-07	2E+00	1E-08	2E-07
		Cadmium	2.8E+00	0.001	1.6E-09	1.2E-08	2.5E-05	6E-05	5E-04	7E-11	1E-09			
Floodplain	91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	3.8E-13	2.8E-12	7.0E-10	5E-04	4E-03	2E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	6.3E+00	0.03	1.0E-07	7.9E-07	3.0E-04	3E-04	3E-03	4E-09	7E-08	2E+00	7E-09	1E-07
		Cadmium	1.7E+00	0.001	9.4E-10	7.1E-09	2.5E-05	4E-05	3E-04	4E-11	6E-10			
Floodplain	93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	0.03	7.7E-13	5.8E-12	7.0E-10	1E-03	8E-03	3E-14	5E-13	1E+05	4E-09	6E-08
		Arsenic	7.8E+00	0.03	1.3E-07	9.7E-07	3.0E-04	4E-04	3E-03	6E-09	8E-08	2E+00	8E-09	1E-07
		Cadmium	2.1E+00	0.001	1.2E-09	8.8E-09	2.5E-05	5E-05	4E-04	5E-11	8E-10			
Floodplain	94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	0.03	3.7E-13	2.8E-12	7.0E-10	5E-04	4E-03	2E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	4.0E+00	0.03	6.7E-08	5.0E-07	3.0E-04	2E-04	2E-03	3E-09	4E-08	2E+00	4E-09	6E-08
		Cadmium	1.2E+00	0.001	6.4E-10	4.8E-09	2.5E-05	3E-05	2E-04	3E-11	4E-10			
Floodplain	95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	0.03	3.5E-13	2.6E-12	7.0E-10	5E-04	4E-03	2E-14	2E-13	1E+05	2E-09	3E-08
		Arsenic	5.6E+00	0.03	9.3E-08	7.0E-07	3.0E-04	3E-04	2E-03	4E-09	6E-08	2E+00	6E-09	9E-08
		Cadmium	1.2E+00	0.001	6.9E-10	5.1E-09	2.5E-05	3E-05	2E-04	3E-11	4E-10			
Floodplain	97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	4.6E-14	3.5E-13	7.0E-10	7E-05	5E-04	2E-15	3E-14	1E+05	3E-10	4E-09
		Arsenic	1.7E+00	0.03	2.8E-08	2.1E-07	3.0E-04	9E-05	7E-04	1E-09	2E-08	2E+00	2E-09	3E-08
		Cadmium	2.6E-01	0.001	1.4E-10	1.1E-09	2.5E-05	6E-06	4E-05	6E-12	9E-11			
Floodplain	98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	2.4E-13	1.8E-12	7.0E-10	3E-04	3E-03	1E-14	2E-13	1E+05	1E-09	2E-08
		Arsenic	4.9E+00	0.03	8.1E-08	6.1E-07	3.0E-04	3E-04	2E-03	3E-09	5E-08	2E+00	5E-09	8E-08
		Cadmium	1.2E+00	0.001	6.8E-10	5.1E-09	2.5E-05	3E-05	2E-04	3E-11	4E-10			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Recreational Fisher**
Exposure Area **Random grids across OU3 Floodplain Area**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME		MMOA HIFs	
				CTE	RME
Noncancer	8.77E-07	3.51E-06	*Based on Child HIFs*		
Cancer	6.10E-08	4.80E-07	*Based on TWA HIFs*	6.47E-07	2.59E-06

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	1.00	5.3E-13	2.1E-12	7.0E-10	8E-04	3E-03	4E-14	3E-13	1E+05	5E-09	4E-08
	Aluminum	7.0E+03	1.00	6.1E-03	2.5E-02	1.0E+00	6E-03	2E-02	4E-04	3E-03			
	Antimony	1.0E-01	1.00	8.8E-08	3.5E-07	4.0E-04	2E-04	9E-04	6E-09	5E-08			
	Arsenic	4.5E+00	0.60	2.4E-06	9.5E-06	3.0E-04	8E-03	3E-02	2E-07	1E-06	2E+00	2E-07	2E-06
	Barium	1.9E+02	1.00	1.6E-04	6.6E-04	2.0E-01	8E-04	3E-03	1E-05	9E-05			
	Cadmium	3.2E-01	1.00	2.8E-07	1.1E-06	1.0E-03	3E-04	1E-03	2E-08	2E-07			
	Chromium	8.4E+00	1.00	7.4E-06	2.9E-05	3.0E-03	2E-03	1E-02	5E-06	2E-05	5E-01	3E-06	1E-05
	Cobalt	3.9E+00	1.00	3.4E-06	1.4E-05	3.0E-04	1E-02	5E-02	2E-07	2E-06			
	Iron	9.6E+03	1.00	8.4E-03	3.4E-02	7.0E-01	1E-02	5E-02	6E-04	5E-03			
	Manganese	2.8E+02	1.00	2.5E-04	9.9E-04	2.4E-02	1E-02	4E-02	2E-05	1E-04			
	Mercury	3.3E-02	1.00	2.9E-08	1.2E-07	3.0E-04	1E-04	4E-04	2E-09	2E-08			
	Thallium	1.1E-01	1.00	9.6E-08	3.9E-07	1.0E-05	1E-02	4E-02	7E-09	5E-08			
	Vanadium	1.3E+01	1.00	1.1E-05	4.4E-05	5.0E-03	2E-03	9E-03	8E-07	6E-06			
85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	1.00	3.5E-13	1.4E-12	7.0E-10	5E-04	2E-03	2E-14	2E-13	1E+05	3E-09	3E-08
	Aluminum	2.9E+03	1.00	2.6E-03	1.0E-02	1.0E+00	3E-03	1E-02	2E-04	1E-03			
	Antimony	8.5E-02	1.00	7.5E-08	3.0E-07	4.0E-04	2E-04	7E-04	5E-09	4E-08			
	Arsenic	1.9E+00	0.60	1.0E-06	4.0E-06	3.0E-04	3E-03	1E-02	7E-08	5E-07	2E+00	1E-07	8E-07
	Barium	2.9E+01	1.00	2.6E-05	1.0E-04	2.0E-01	1E-04	5E-04	2E-06	1E-05			
	Cadmium	1.6E-02	1.00	1.4E-08	5.6E-08	1.0E-03	1E-05	6E-05	1E-09	8E-09			
	Chromium	3.9E+00	1.00	3.4E-06	1.4E-05	3.0E-03	1E-03	5E-03	3E-06	1E-05	5E-01	1E-06	5E-06
	Cobalt	1.8E+00	1.00	1.6E-06	6.3E-06	3.0E-04	5E-03	2E-02	1E-07	9E-07			
	Iron	5.2E+03	1.00	4.5E-03	1.8E-02	7.0E-01	6E-03	3E-02	3E-04	2E-03			
	Manganese	6.4E+01	1.00	5.6E-05	2.2E-04	2.4E-02	2E-03	9E-03	4E-06	3E-05			
	Mercury	4.4E-03	1.00	3.8E-09	1.5E-08	3.0E-04	1E-05	5E-05	3E-10	2E-09			
	Thallium	4.4E-02	1.00	3.9E-08	1.5E-07	1.0E-05	4E-03	2E-02	3E-09	2E-08			
	Vanadium	5.1E+00	1.00	4.5E-06	1.8E-05	5.0E-03	9E-04	4E-03	3E-07	2E-06			
86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	1.00	1.6E-11	6.5E-11	7.0E-10	2E-02	9E-02	1E-12	9E-12	1E+05	1E-07	1E-06
	Aluminum	2.0E+04	1.00	1.7E-02	6.9E-02	1.0E+00	2E-02	7E-02	1E-03	9E-03			
	Antimony	4.5E-01	1.00	3.9E-07	1.6E-06	4.0E-04	1E-03	4E-03	3E-08	2E-07			
	Arsenic	4.6E+00	0.60	2.4E-06	9.7E-06	3.0E-04	8E-03	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
	Barium	4.6E+02	1.00	4.0E-04	1.6E-03	2.0E-01	2E-03	8E-03	3E-05	2E-04			
	Cadmium	5.4E-01	1.00	4.7E-07	1.9E-06	1.0E-03	5E-04	2E-03	3E-08	3E-07			
	Chromium	2.0E+01	1.00	1.7E-05	6.8E-05	3.0E-03	6E-03	2E-02	1E-05	5E-05	5E-01	6E-06	3E-05
	Cobalt	5.6E+00	1.00	4.9E-06	2.0E-05	3.0E-04	2E-02	7E-02	3E-07	3E-06			
	Iron	2.3E+04	1.00	2.0E-02	8.0E-02	7.0E-01	3E-02	1E-01	1E-03	1E-02			
	Manganese	5.6E+02	1.00	4.9E-04	2.0E-03	2.4E-02	2E-02	8E-02	3E-05	3E-04			
	Mercury	5.3E-01	1.00	4.6E-07	1.9E-06	3.0E-04	2E-03	6E-03	3E-08	3E-07			
	Thallium	2.0E-01	1.00	1.8E-07	7.0E-07	1.0E-05	2E-02	7E-02	1E-08	1E-07			
	Vanadium	2.1E+01	1.00	1.9E-05	7.5E-05	5.0E-03	4E-03	2E-02	1E-06	1E-05			
87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	1.00	6.0E-12	2.4E-11	7.0E-10	9E-03	3E-02	4E-13	3E-12	1E+05	5E-08	4E-07
	Aluminum	1.1E+04	1.00	9.5E-03	3.8E-02	1.0E+00	9E-03	4E-02	7E-04	5E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	4.7E+00	0.60	2.5E-06	9.9E-06	3.0E-04	8E-03	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
	Barium	7.7E+02	1.00	6.8E-04	2.7E-03	2.0E-01	3E-03	1E-02	5E-05	4E-04			
	Cadmium	7.9E-01	1.00	6.9E-07	2.8E-06	1.0E-03	7E-04	3E-03	5E-08	4E-07			
	Chromium	1.6E+01	1.00	1.4E-05	5.4E-05	3.0E-03	5E-03	2E-02	1E-05	4E-05	5E-01	5E-06	2E-05
	Cobalt	4.0E+00	1.00	3.5E-06	1.4E-05	3.0E-04	1E-02	5E-02	2E-07	2E-06			
	Iron	1.2E+04	1.00	1.1E-02	4.3E-02	7.0E-01	2E-02	6E-02	7E-04	6E-03			
	Manganese	2.7E+02	1.00	2.4E-04	9.6E-04	2.4E-02	1E-02	4E-02	2E-05	1E-04			
	Mercury	1.0E-01	1.00	8.8E-08	3.5E-07	3.0E-04	3E-04	1E-03	6E-09	5E-08			
	Thallium	2.0E-01	1.00	1.8E-07	7.0E-07	1.0E-05	2E-02	7E-02	1E-08	1E-07			
	Vanadium	2.1E+01	1.00	1.8E-05	7.2E-05	5.0E-03	4E-03	1E-02	1E-06	1E-05			
88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	1.00	4.9E-11	2.0E-10	7.0E-10	7E-02	3E-01	3E-12	3E-11	1E+05	4E-07	3E-06
	Aluminum	1.2E+04	1.00	1.0E-02	4.1E-02	1.0E+00	1E-02	4E-02	7E-04	6E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	5.5E+00	0.60	2.9E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-07	2E-06	2E+00	3E-07	2E-06
	Barium	1.5E+03	1.00	1.3E-03	5.1E-03	2.0E-01	6E-03	3E-02	9E-05	7E-04			
	Cadmium	1.8E+00	1.00	1.6E-06	6.3E-06	1.0E-03	2E-03	6E-03	1E-07	9E-07			
	Chromium	2.6E+01	1.00	2.3E-05	9.3E-05	3.0E-03	8E-03	3E-02	2E-05	7E-05	5E-01	9E-06	3E-05
	Cobalt	2.6E+00	1.00	2.3E-06	9.1E-06	3.0E-04	8E-03	3E-02	2E-07	1E-06			
	Iron	8.7E+03	1.00	7.6E-03	3.0E-02	7.0E-01	1E-02	4E-02	5E-04	4E-03			
	Manganese	5.3E+02	1.00	4.6E-04	1.8E-03	2.4E-02	2E-02	8E-02	3E-05	3E-04			
	Mercury	6.9E-01	1.00	6.0E-07	2.4E-06	3.0E-04	2E-03	8E-03	4E-08	3E-07			
	Thallium	1.5E-01	1.00	1.3E-07	5.3E-07	1.0E-05	1E-02	5E-02	9E-09	7E-08			
	Vanadium	1.4E+01	1.00	1.2E-05	4.8E-05	5.0E-03	2E-03	1E-02	8E-07	7E-06			

	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	1.00	8.5E-12	3.4E-11	7.0E-10	1E-02	5E-02	6E-13	5E-12	1E+05	8E-08	6E-07
	Aluminum	1.1E+04	1.00	9.9E-03	3.9E-02	1.0E+00	1E-02	4E-02	7E-04	5E-03			
	Antimony	3.7E-01	1.00	3.2E-07	1.3E-06	4.0E-04	8E-04	3E-03	2E-08	2E-07			
	Arsenic	4.8E+00	0.60	2.5E-06	1.0E-05	3.0E-04	8E-03	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
	Barium	5.0E+02	1.00	4.4E-04	1.8E-03	2.0E-01	2E-03	9E-03	3E-05	2E-04			
	Cadmium	5.5E-01	1.00	4.8E-07	1.9E-06	1.0E-03	5E-04	2E-03	3E-08	3E-07			
89	Chromium	1.7E+01	1.00	1.5E-05	6.0E-05	3.0E-03	5E-03	2E-02	1E-05	4E-05	5E-01	6E-06	2E-05
	Cobalt	4.5E+00	1.00	3.9E-06	1.6E-05	3.0E-04	1E-02	5E-02	3E-07	2E-06			
	Iron	1.3E+04	1.00	1.1E-02	4.4E-02	7.0E-01	2E-02	6E-02	8E-04	6E-03			
	Manganese	3.7E+02	1.00	3.2E-04	1.3E-03	2.4E-02	1E-02	5E-02	2E-05	2E-04			
	Mercury	1.8E-01	1.00	1.6E-07	6.3E-07	3.0E-04	5E-04	2E-03	1E-08	9E-08			
	Thallium	1.6E-01	1.00	1.4E-07	5.5E-07	1.0E-05	1E-02	5E-02	1E-08	7E-08			
	Vanadium	1.9E+01	1.00	1.6E-05	6.6E-05	5.0E-03	3E-03	1E-02	1E-06	9E-06			
	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	4.9E-11	1.9E-10	7.0E-10	7E-02	3E-01	3E-12	3E-11	1E+05	4E-07	3E-06
	Aluminum	1.1E+04	1.00	9.8E-03	3.9E-02	1.0E+00	1E-02	4E-02	7E-04	5E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	1.0E+01	0.60	5.3E-06	2.1E-05	3.0E-04	2E-02	7E-02	4E-07	3E-06	2E+00	5E-07	4E-06
	Barium	7.6E+02	1.00	6.7E-04	2.7E-03	2.0E-01	3E-03	1E-02	5E-05	4E-04			
	Cadmium	2.8E+00	1.00	2.5E-06	9.8E-06	1.0E-03	2E-03	1E-02	2E-07	1E-06			
90	Chromium	2.8E+01	1.00	2.4E-05	9.7E-05	3.0E-03	8E-03	3E-02	2E-05	7E-05	5E-01	9E-06	4E-05
	Cobalt	3.1E+00	1.00	2.7E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	1E-06			
	Iron	9.3E+03	1.00	8.1E-03	3.2E-02	7.0E-01	1E-02	5E-02	6E-04	4E-03			
	Manganese	1.1E+03	1.00	9.8E-04	3.9E-03	2.4E-02	4E-02	2E-01	7E-05	5E-04			
	Mercury	1.5E+00	1.00	1.3E-06	5.2E-06	3.0E-04	4E-03	2E-02	9E-08	7E-07			
	Thallium	1.6E-01	1.00	1.4E-07	5.4E-07	1.0E-05	1E-02	5E-02	9E-09	7E-08			
	Vanadium	3.1E+01	1.00	2.7E-05	1.1E-04	5.0E-03	5E-03	2E-02	2E-06	2E-05			
	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	2.0E-11	7.9E-11	7.0E-10	3E-02	1E-01	1E-12	1E-11	1E+05	2E-07	1E-06
	Aluminum	1.5E+04	1.00	1.3E-02	5.2E-02	1.0E+00	1E-02	5E-02	9E-04	7E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	6.3E+00	0.60	3.3E-06	1.3E-05	3.0E-04	1E-02	4E-02	2E-07	2E-06	2E+00	3E-07	3E-06
	Barium	9.2E+02	1.00	8.1E-04	3.2E-03	2.0E-01	4E-03	2E-02	6E-05	4E-04			
	Cadmium	1.7E+00	1.00	1.5E-06	5.9E-06	1.0E-03	1E-03	6E-03	1E-07	8E-07			
91	Chromium	2.6E+01	1.00	2.3E-05	9.2E-05	3.0E-03	8E-03	3E-02	2E-05	7E-05	5E-01	9E-06	3E-05
	Cobalt	5.3E+00	1.00	4.6E-06	1.9E-05	3.0E-04	2E-02	6E-02	3E-07	3E-06			
	Iron	1.4E+04	1.00	1.2E-02	5.0E-02	7.0E-01	2E-02	7E-02	9E-04	7E-03			
	Manganese	4.0E+02	1.00	3.5E-04	1.4E-03	2.4E-02	1E-02	6E-02	2E-05	2E-04			
	Mercury	8.3E-01	1.00	7.3E-07	2.9E-06	3.0E-04	2E-03	1E-02	5E-08	4E-07			
	Thallium	1.9E-01	1.00	1.7E-07	6.7E-07	1.0E-05	2E-02	7E-02	1E-08	9E-08			
	Vanadium	2.6E+01	1.00	2.3E-05	9.3E-05	5.0E-03	5E-03	2E-02	2E-06	1E-05			
	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	1.00	4.0E-11	1.6E-10	7.0E-10	6E-02	2E-01	3E-12	2E-11	1E+05	4E-07	3E-06
	Aluminum	1.5E+04	1.00	1.3E-02	5.3E-02	1.0E+00	1E-02	5E-02	9E-04	7E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	7.8E+00	0.60	4.1E-06	1.6E-05	3.0E-04	1E-02	5E-02	3E-07	2E-06	2E+00	4E-07	3E-06
	Barium	4.3E+02	1.00	3.8E-04	1.5E-03	2.0E-01	2E-03	8E-03	3E-05	2E-04			
	Cadmium	2.1E+00	1.00	1.9E-06	7.5E-06	1.0E-03	2E-03	7E-03	1E-07	1E-06			
93	Chromium	2.5E+01	1.00	2.2E-05	8.8E-05	3.0E-03	7E-03	3E-02	2E-05	6E-05	5E-01	8E-06	3E-05
	Cobalt	3.2E+00	1.00	2.8E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	2E-06			
	Iron	7.9E+03	1.00	7.0E-03	2.8E-02	7.0E-01	1E-02	4E-02	5E-04	4E-03			
	Manganese	8.8E+02	1.00	7.7E-04	3.1E-03	2.4E-02	3E-02	1E-01	5E-05	4E-04			
	Mercury	3.2E+00	1.00	2.8E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	2E-06			
	Thallium	1.2E-01	1.00	1.1E-07	4.3E-07	1.0E-05	1E-02	4E-02	7E-09	6E-08			
	Vanadium	2.9E+01	1.00	2.5E-05	1.0E-04	5.0E-03	5E-03	2E-02	2E-06	1E-05			
	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	1.00	2.0E-11	7.9E-11	7.0E-10	3E-02	1E-01	1E-12	1E-11	1E+05	2E-07	1E-06
	Aluminum	1.0E+04	1.00	9.1E-03	3.6E-02	1.0E+00	9E-03	4E-02	6E-04	5E-03			
	Antimony	4.7E-01	1.00	4.1E-07	1.6E-06	4.0E-04	1E-03	4E-03	3E-08	2E-07			
	Arsenic	4.0E+00	0.60	2.1E-06	8.5E-06	3.0E-04	7E-03	3E-02	1E-07	1E-06	2E+00	2E-07	2E-06
	Barium	4.1E+02	1.00	3.6E-04	1.5E-03	2.0E-01	2E-03	7E-03	3E-05	2E-04			
	Cadmium	1.2E+00	1.00	1.0E-06	4.1E-06	1.0E-03	1E-03	4E-03	7E-08	6E-07			
94	Chromium	2.0E+01	1.00	1.7E-05	7.0E-05	3.0E-03	6E-03	2E-02	1E-05	5E-05	5E-01	6E-06	3E-05
	Cobalt	3.2E+00	1.00	2.8E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	2E-06			
	Iron	9.5E+03	1.00	8.3E-03	3.3E-02	7.0E-01	1E-02	5E-02	6E-04	5E-03			
	Manganese	4.0E+02	1.00	3.5E-04	1.4E-03	2.4E-02	1E-02	6E-02	2E-05	2E-04			
	Mercury	9.4E-01	1.00	8.2E-07	3.3E-06	3.0E-04	3E-03	1E-02	6E-08	4E-07			
	Thallium	1.5E-01	1.00	1.3E-07	5.4E-07	1.0E-05	1E-02	5E-02	9E-09	7E-08			
	Vanadium	1.8E+01	1.00	1.6E-05	6.3E-05	5.0E-03	3E-03	1E-02	1E-06	9E-06			

	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	1.00	1.8E-11	7.4E-11	7.0E-10	3E-02	1E-01	1E-12	1E-11	1E+05	2E-07	1E-06
	Aluminum	9.8E+03	1.00	8.6E-03	3.4E-02	1.0E+00	9E-03	3E-02	6E-04	5E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	5.6E+00	0.60	2.9E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-07	2E-06	2E+00	3E-07	2E-06
	Barium	3.9E+02	1.00	3.5E-04	1.4E-03	2.0E-01	2E-03	7E-03	2E-05	2E-04			
	Cadmium	1.2E+00	1.00	1.1E-06	4.3E-06	1.0E-03	1E-03	4E-03	8E-08	6E-07			
95	Chromium	1.8E+01	1.00	1.6E-05	6.2E-05	3.0E-03	5E-03	2E-02	1E-05	5E-05	5E-01	6E-06	2E-05
	Cobalt	3.5E+00	1.00	3.1E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-07	2E-06			
	Iron	9.7E+03	1.00	8.5E-03	3.4E-02	7.0E-01	1E-02	5E-02	6E-04	5E-03			
	Manganese	7.4E+02	1.00	6.5E-04	2.6E-03	2.4E-02	3E-02	1E-01	5E-05	4E-04			
	Mercury	1.0E+00	1.00	9.1E-07	3.7E-06	3.0E-04	3E-03	1E-02	6E-08	5E-07			
	Thallium	1.2E-01	1.00	1.1E-07	4.3E-07	1.0E-05	1E-02	4E-02	7E-09	6E-08			
	Vanadium	2.3E+01	1.00	2.0E-05	8.2E-05	5.0E-03	4E-03	2E-02	1E-06	1E-05			
	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	2.4E-12	9.8E-12	7.0E-10	3E-03	1E-02	2E-13	1E-12	1E+05	2E-08	2E-07
	Aluminum	6.9E+03	1.00	6.1E-03	2.4E-02	1.0E+00	6E-03	2E-02	4E-04	3E-03			
	Antimony	4.8E-02	1.00	4.2E-08	1.7E-07	4.0E-04	1E-04	4E-04	3E-09	2E-08			
	Arsenic	1.7E+00	0.60	8.9E-07	3.6E-06	3.0E-04	3E-03	1E-02	6E-08	5E-07	2E+00	9E-08	7E-07
	Barium	2.4E+02	1.00	2.1E-04	8.4E-04	2.0E-01	1E-03	4E-03	1E-05	1E-04			
	Cadmium	2.6E-01	1.00	2.3E-07	9.1E-07	1.0E-03	2E-04	9E-04	2E-08	1E-07			
97	Chromium	9.3E+00	1.00	8.2E-06	3.3E-05	3.0E-03	3E-03	1E-02	6E-06	2E-05	5E-01	3E-06	1E-05
	Cobalt	1.7E+00	1.00	1.5E-06	6.0E-06	3.0E-04	5E-03	2E-02	1E-07	8E-07			
	Iron	5.5E+03	1.00	4.9E-03	1.9E-02	7.0E-01	7E-03	3E-02	3E-04	3E-03			
	Manganese	9.3E+01	1.00	8.1E-05	3.2E-04	2.4E-02	3E-03	1E-02	6E-06	4E-05			
	Mercury	4.1E-02	1.00	3.6E-08	1.4E-07	3.0E-04	1E-04	5E-04	2E-09	2E-08			
	Thallium	7.5E-03	1.00	6.6E-09	2.6E-08	1.0E-05	7E-04	3E-03	5E-10	4E-09			
	Vanadium	8.7E+00	1.00	7.6E-06	3.1E-05	5.0E-03	2E-03	6E-03	5E-07	4E-06			
	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	1.3E-11	5.1E-11	7.0E-10	2E-02	7E-02	9E-13	7E-12	1E+05	1E-07	9E-07
	Aluminum	1.5E+04	1.00	1.3E-02	5.3E-02	1.0E+00	1E-02	5E-02	9E-04	7E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	4.9E+00	0.60	2.6E-06	1.0E-05	3.0E-04	9E-03	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
	Barium	2.2E+03	1.00	1.9E-03	7.7E-03	2.0E-01	1E-02	4E-02	1E-04	1E-03			
	Cadmium	1.2E+00	1.00	1.1E-06	4.3E-06	1.0E-03	1E-03	4E-03	7E-08	6E-07			
98	Chromium	1.9E+01	1.00	1.7E-05	6.8E-05	3.0E-03	6E-03	2E-02	1E-05	5E-05	5E-01	6E-06	3E-05
	Cobalt	3.2E+00	1.00	2.8E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	2E-06			
	Iron	1.1E+04	1.00	9.2E-03	3.7E-02	7.0E-01	1E-02	5E-02	6E-04	5E-03			
	Manganese	2.9E+02	1.00	2.5E-04	1.0E-03	2.4E-02	1E-02	4E-02	2E-05	1E-04			
	Mercury	3.1E-01	1.00	2.7E-07	1.1E-06	3.0E-04	9E-04	4E-03	2E-08	1E-07			
	Thallium	1.3E-01	1.00	1.1E-07	4.4E-07	1.0E-05	1E-02	4E-02	8E-09	6E-08			
	Vanadium	2.1E+01	1.00	1.9E-05	7.5E-05	5.0E-03	4E-03	1E-02	1E-06	1E-05			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Recreational Fisher**
Exposure Area **Random grids across OU3 Floodplain Area**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME	
Noncancer	9.46E-08	1.32E-06	*Based on Child HIFs*
Cancer	2.43E-08	6.78E-07	*Based on TWA HIFs*

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	0.03	1.7E-15	2.4E-14	7.0E-10	2E-06	3E-05	4E-16	1E-14	1E+05	6E-11	2E-09
	Arsenic	4.5E+00	0.03	1.3E-08	1.8E-07	3.0E-04	4E-05	6E-04	3E-09	9E-08	2E+00	5E-09	1E-07
	Cadmium	3.2E-01	0.001	3.0E-11	4.2E-10	2.5E-05	1E-06	2E-05	8E-12	2E-10			
85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	0.03	1.1E-15	1.6E-14	7.0E-10	2E-06	2E-05	3E-16	8E-15	1E+05	4E-11	1E-09
	Arsenic	1.9E+00	0.03	5.4E-09	7.5E-08	3.0E-04	2E-05	3E-04	1E-09	4E-08	2E+00	2E-09	6E-08
	Cadmium	1.6E-02	0.001	1.5E-12	2.1E-11	2.5E-05	6E-08	8E-07	4E-13	1E-11			
86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	0.03	5.2E-14	7.3E-13	7.0E-10	7E-05	1E-03	1E-14	4E-13	1E+05	2E-09	5E-08
	Arsenic	4.6E+00	0.03	1.3E-08	1.8E-07	3.0E-04	4E-05	6E-04	3E-09	9E-08	2E+00	5E-09	1E-07
	Cadmium	5.4E-01	0.001	5.1E-11	7.1E-10	2.5E-05	2E-06	3E-05	1E-11	4E-10			
87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	0.03	1.9E-14	2.7E-13	7.0E-10	3E-05	4E-04	5E-15	1E-13	1E+05	6E-10	2E-08
	Arsenic	4.7E+00	0.03	1.3E-08	1.9E-07	3.0E-04	4E-05	6E-04	3E-09	1E-07	2E+00	5E-09	1E-07
	Cadmium	7.9E-01	0.001	7.5E-11	1.0E-09	2.5E-05	3E-06	4E-05	2E-11	5E-10			
88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	0.03	1.6E-13	2.2E-12	7.0E-10	2E-04	3E-03	4E-14	1E-12	1E+05	5E-09	1E-07
	Arsenic	5.5E+00	0.03	1.6E-08	2.2E-07	3.0E-04	5E-05	7E-04	4E-09	1E-07	2E+00	6E-09	2E-07
	Cadmium	1.8E+00	0.001	1.7E-10	2.4E-09	2.5E-05	7E-06	9E-05	4E-11	1E-09			
89	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	0.03	2.8E-14	3.8E-13	7.0E-10	4E-05	5E-04	7E-15	2E-13	1E+05	9E-10	3E-08
	Arsenic	4.8E+00	0.03	1.4E-08	1.9E-07	3.0E-04	5E-05	6E-04	3E-09	1E-07	2E+00	5E-09	1E-07
	Cadmium	5.5E-01	0.001	5.2E-11	7.2E-10	2.5E-05	2E-06	3E-05	1E-11	4E-10			
90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	1.6E-13	2.2E-12	7.0E-10	2E-04	3E-03	4E-14	1E-12	1E+05	5E-09	1E-07
	Arsenic	1.0E+01	0.03	2.8E-08	4.0E-07	3.0E-04	9E-05	1E-03	7E-09	2E-07	2E+00	1E-08	3E-07
	Cadmium	2.8E+00	0.001	2.6E-10	3.7E-09	2.5E-05	1E-05	1E-04	7E-11	2E-09			
91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	6.4E-14	8.9E-13	7.0E-10	9E-05	1E-03	2E-14	5E-13	1E+05	2E-09	6E-08
	Arsenic	6.3E+00	0.03	1.8E-08	2.5E-07	3.0E-04	6E-05	8E-04	5E-09	1E-07	2E+00	7E-09	2E-07
	Cadmium	1.7E+00	0.001	1.6E-10	2.2E-09	2.5E-05	6E-06	9E-05	4E-11	1E-09			
93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	0.03	1.3E-13	1.8E-12	7.0E-10	2E-04	3E-03	3E-14	9E-13	1E+05	4E-09	1E-07
	Arsenic	7.8E+00	0.03	2.2E-08	3.1E-07	3.0E-04	7E-05	1E-03	6E-09	2E-07	2E+00	9E-09	2E-07
	Cadmium	2.1E+00	0.001	2.0E-10	2.8E-09	2.5E-05	8E-06	1E-04	5E-11	1E-09			
94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	0.03	6.4E-14	8.9E-13	7.0E-10	9E-05	1E-03	2E-14	5E-13	1E+05	2E-09	6E-08
	Arsenic	4.0E+00	0.03	1.1E-08	1.6E-07	3.0E-04	4E-05	5E-04	3E-09	8E-08	2E+00	4E-09	1E-07
	Cadmium	1.2E+00	0.001	1.1E-10	1.5E-09	2.5E-05	4E-06	6E-05	3E-11	8E-10			
95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	0.03	6.0E-14	8.3E-13	7.0E-10	9E-05	1E-03	2E-14	4E-13	1E+05	2E-09	6E-08
	Arsenic	5.6E+00	0.03	1.6E-08	2.2E-07	3.0E-04	5E-05	7E-04	4E-09	1E-07	2E+00	6E-09	2E-07
	Cadmium	1.2E+00	0.001	1.2E-10	1.6E-09	2.5E-05	5E-06	7E-05	3E-11	8E-10			
97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	7.9E-15	1.1E-13	7.0E-10	1E-05	2E-04	2E-15	6E-14	1E+05	3E-10	7E-09
	Arsenic	1.7E+00	0.03	4.8E-09	6.7E-08	3.0E-04	2E-05	2E-04	1E-09	3E-08	2E+00	2E-09	5E-08
	Cadmium	2.6E-01	0.001	2.5E-11	3.4E-10	2.5E-05	1E-06	1E-05	6E-12	2E-10			
98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	4.1E-14	5.7E-13	7.0E-10	6E-05	8E-04	1E-14	3E-13	1E+05	1E-09	4E-08
	Arsenic	4.9E+00	0.03	1.4E-08	1.9E-07	3.0E-04	5E-05	6E-04	4E-09	1E-07	2E+00	5E-09	1E-07
	Cadmium	1.2E+00	0.001	1.2E-10	1.6E-09	2.5E-05	5E-06	6E-05	3E-11	8E-10			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Tribal Fisher**
Exposure Area **Random grids across OU3 Floodplain Area**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME		MMOA HIFs CTE	MMOA HIFs RME
Noncancer	8.77E-07	3.51E-06	*Based on Child HIFs*		
Cancer	6.10E-08	4.80E-07	*Based on TWA HIFs*	6.47E-07	2.59E-06

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	1.00	5.3E-13	2.1E-12	7.0E-10	8E-04	3E-03	4E-14	3E-13	1E+05	5E-09	4E-08
	Aluminum	7.0E+03	1.00	6.1E-03	2.5E-02	1.0E+00	6E-03	2E-02	4E-04	3E-03			
	Antimony	1.0E-01	1.00	8.8E-08	3.5E-07	4.0E-04	2E-04	9E-04	6E-09	5E-08			
	Arsenic	4.5E+00	0.60	2.4E-06	9.5E-06	3.0E-04	8E-03	3E-02	2E-07	1E-06	2E+00	2E-07	2E-06
	Barium	1.9E+02	1.00	1.6E-04	6.6E-04	2.0E-01	8E-04	3E-03	1E-05	9E-05			
	Cadmium	3.2E-01	1.00	2.8E-07	1.1E-06	1.0E-03	3E-04	1E-03	2E-08	2E-07			
	Chromium	8.4E+00	1.00	7.4E-06	2.9E-05	3.0E-03	2E-03	1E-02	5E-06	2E-05	5E-01	3E-06	1E-05
	Cobalt	3.9E+00	1.00	3.4E-06	1.4E-05	3.0E-04	1E-02	5E-02	2E-07	2E-06			
	Iron	9.6E+03	1.00	8.4E-03	3.4E-02	7.0E-01	1E-02	5E-02	6E-04	5E-03			
	Manganese	2.8E+02	1.00	2.5E-04	9.9E-04	2.4E-02	1E-02	4E-02	2E-05	1E-04			
	Mercury	3.3E-02	1.00	2.9E-08	1.2E-07	3.0E-04	1E-04	4E-04	2E-09	2E-08			
	Thallium	1.1E-01	1.00	9.6E-08	3.9E-07	1.0E-05	1E-02	4E-02	7E-09	5E-08			
	Vanadium	1.3E+01	1.00	1.1E-05	4.4E-05	5.0E-03	2E-03	9E-03	8E-07	6E-06			
85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	1.00	3.5E-13	1.4E-12	7.0E-10	5E-04	2E-03	2E-14	2E-13	1E+05	3E-09	3E-08
	Aluminum	2.9E+03	1.00	2.6E-03	1.0E-02	1.0E+00	3E-03	1E-02	2E-04	1E-03			
	Antimony	8.5E-02	1.00	7.5E-08	3.0E-07	4.0E-04	2E-04	7E-04	5E-09	4E-08			
	Arsenic	1.9E+00	0.60	1.0E-06	4.0E-06	3.0E-04	3E-03	1E-02	7E-08	5E-07	2E+00	1E-07	8E-07
	Barium	2.9E+01	1.00	2.6E-05	1.0E-04	2.0E-01	1E-04	5E-04	2E-06	1E-05			
	Cadmium	1.6E-02	1.00	1.4E-08	5.6E-08	1.0E-03	1E-05	6E-05	1E-09	8E-09			
	Chromium	3.9E+00	1.00	3.4E-06	1.4E-05	3.0E-03	1E-03	5E-03	3E-06	1E-05	5E-01	1E-06	5E-06
	Cobalt	1.8E+00	1.00	1.6E-06	6.3E-06	3.0E-04	5E-03	2E-02	1E-07	9E-07			
	Iron	5.2E+03	1.00	4.5E-03	1.8E-02	7.0E-01	6E-03	3E-02	3E-04	2E-03			
	Manganese	6.4E+01	1.00	5.6E-05	2.2E-04	2.4E-02	2E-03	9E-03	4E-06	3E-05			
	Mercury	4.4E-03	1.00	3.8E-09	1.5E-08	3.0E-04	1E-05	5E-05	3E-10	2E-09			
	Thallium	4.4E-02	1.00	3.9E-08	1.5E-07	1.0E-05	4E-03	2E-02	3E-09	2E-08			
	Vanadium	5.1E+00	1.00	4.5E-06	1.8E-05	5.0E-03	9E-04	4E-03	3E-07	2E-06			
86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	1.00	1.6E-11	6.5E-11	7.0E-10	2E-02	9E-02	1E-12	9E-12	1E+05	1E-07	1E-06
	Aluminum	2.0E+04	1.00	1.7E-02	6.9E-02	1.0E+00	2E-02	7E-02	1E-03	9E-03			
	Antimony	4.5E-01	1.00	3.9E-07	1.6E-06	4.0E-04	1E-03	4E-03	3E-08	2E-07			
	Arsenic	4.6E+00	0.60	2.4E-06	9.7E-06	3.0E-04	8E-03	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
	Barium	4.6E+02	1.00	4.0E-04	1.6E-03	2.0E-01	2E-03	8E-03	3E-05	2E-04			
	Cadmium	5.4E-01	1.00	4.7E-07	1.9E-06	1.0E-03	5E-04	2E-03	3E-08	3E-07			
	Chromium	2.0E+01	1.00	1.7E-05	6.8E-05	3.0E-03	6E-03	2E-02	1E-05	5E-05	5E-01	6E-06	3E-05
	Cobalt	5.6E+00	1.00	4.9E-06	2.0E-05	3.0E-04	2E-02	7E-02	3E-07	3E-06			
	Iron	2.3E+04	1.00	2.0E-02	8.0E-02	7.0E-01	3E-02	1E-01	1E-03	1E-02			
	Manganese	5.6E+02	1.00	4.9E-04	2.0E-03	2.4E-02	2E-02	8E-02	3E-05	3E-04			
	Mercury	5.3E-01	1.00	4.6E-07	1.9E-06	3.0E-04	2E-03	6E-03	3E-08	3E-07			
	Thallium	2.0E-01	1.00	1.8E-07	7.0E-07	1.0E-05	2E-02	7E-02	1E-08	1E-07			
	Vanadium	2.1E+01	1.00	1.9E-05	7.5E-05	5.0E-03	4E-03	2E-02	1E-06	1E-05			
87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	1.00	6.0E-12	2.4E-11	7.0E-10	9E-03	3E-02	4E-13	3E-12	1E+05	5E-08	4E-07
	Aluminum	1.1E+04	1.00	9.5E-03	3.8E-02	1.0E+00	9E-03	4E-02	7E-04	5E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	4.7E+00	0.60	2.5E-06	9.9E-06	3.0E-04	8E-03	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
	Barium	7.7E+02	1.00	6.8E-04	2.7E-03	2.0E-01	3E-03	1E-02	5E-05	4E-04			
	Cadmium	7.9E-01	1.00	6.9E-07	2.8E-06	1.0E-03	7E-04	3E-03	5E-08	4E-07			
	Chromium	1.6E+01	1.00	1.4E-05	5.4E-05	3.0E-03	5E-03	2E-02	1E-05	4E-05	5E-01	5E-06	2E-05
	Cobalt	4.0E+00	1.00	3.5E-06	1.4E-05	3.0E-04	1E-02	5E-02	2E-07	2E-06			
	Iron	1.2E+04	1.00	1.1E-02	4.3E-02	7.0E-01	2E-02	6E-02	7E-04	6E-03			
	Manganese	2.7E+02	1.00	2.4E-04	9.6E-04	2.4E-02	1E-02	4E-02	2E-05	1E-04			
	Mercury	1.0E-01	1.00	8.8E-08	3.5E-07	3.0E-04	3E-04	1E-03	6E-09	5E-08			
	Thallium	2.0E-01	1.00	1.8E-07	7.0E-07	1.0E-05	2E-02	7E-02	1E-08	1E-07			
	Vanadium	2.1E+01	1.00	1.8E-05	7.2E-05	5.0E-03	4E-03	1E-02	1E-06	1E-05			
88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	1.00	4.9E-11	2.0E-10	7.0E-10	7E-02	3E-01	3E-12	3E-11	1E+05	4E-07	3E-06
	Aluminum	1.2E+04	1.00	1.0E-02	4.1E-02	1.0E+00	1E-02	4E-02	7E-04	6E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	5.5E+00	0.60	2.9E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-07	2E-06	2E+00	3E-07	2E-06
	Barium	1.5E+03	1.00	1.3E-03	5.1E-03	2.0E-01	6E-03	3E-02	9E-05	7E-04			
	Cadmium	1.8E+00	1.00	1.6E-06	6.3E-06	1.0E-03	2E-03	6E-03	1E-07	9E-07			
	Chromium	2.6E+01	1.00	2.3E-05	9.3E-05	3.0E-03	8E-03	3E-02	2E-05	7E-05	5E-01	9E-06	3E-05
	Cobalt	2.6E+00	1.00	2.3E-06	9.1E-06	3.0E-04	8E-03	3E-02	2E-07	1E-06			
	Iron	8.7E+03	1.00	7.6E-03	3.0E-02	7.0E-01	1E-02	4E-02	5E-04	4E-03			
	Manganese	5.3E+02	1.00	4.6E-04	1.8E-03	2.4E-02	2E-02	8E-02	3E-05	3E-04			
	Mercury	6.9E-01	1.00	6.0E-07	2.4E-06	3.0E-04	2E-03	8E-03	4E-08	3E-07			
	Thallium	1.5E-01	1.00	1.3E-07	5.3E-07	1.0E-05	1E-02	5E-02	9E-09	7E-08			
	Vanadium	1.4E+01	1.00	1.2E-05	4.8E-05	5.0E-03	2E-03	1E-02	8E-07	7E-06			

	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	1.00	8.5E-12	3.4E-11	7.0E-10	1E-02	5E-02	6E-13	5E-12	1E+05	8E-08	6E-07
	Aluminum	1.1E+04	1.00	9.9E-03	3.9E-02	1.0E+00	1E-02	4E-02	7E-04	5E-03			
	Antimony	3.7E-01	1.00	3.2E-07	1.3E-06	4.0E-04	8E-04	3E-03	2E-08	2E-07			
	Arsenic	4.8E+00	0.60	2.5E-06	1.0E-05	3.0E-04	8E-03	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
	Barium	5.0E+02	1.00	4.4E-04	1.8E-03	2.0E-01	2E-03	9E-03	3E-05	2E-04			
	Cadmium	5.5E-01	1.00	4.8E-07	1.9E-06	1.0E-03	5E-04	2E-03	3E-08	3E-07			
89	Chromium	1.7E+01	1.00	1.5E-05	6.0E-05	3.0E-03	5E-03	2E-02	1E-05	4E-05	5E-01	6E-06	2E-05
	Cobalt	4.5E+00	1.00	3.9E-06	1.6E-05	3.0E-04	1E-02	5E-02	3E-07	2E-06			
	Iron	1.3E+04	1.00	1.1E-02	4.4E-02	7.0E-01	2E-02	6E-02	8E-04	6E-03			
	Manganese	3.7E+02	1.00	3.2E-04	1.3E-03	2.4E-02	1E-02	5E-02	2E-05	2E-04			
	Mercury	1.8E-01	1.00	1.6E-07	6.3E-07	3.0E-04	5E-04	2E-03	1E-08	9E-08			
	Thallium	1.6E-01	1.00	1.4E-07	5.5E-07	1.0E-05	1E-02	5E-02	1E-08	7E-08			
	Vanadium	1.9E+01	1.00	1.6E-05	6.6E-05	5.0E-03	3E-03	1E-02	1E-06	9E-06			
	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	1.00	4.9E-11	1.9E-10	7.0E-10	7E-02	3E-01	3E-12	3E-11	1E+05	4E-07	3E-06
	Aluminum	1.1E+04	1.00	9.8E-03	3.9E-02	1.0E+00	1E-02	4E-02	7E-04	5E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	1.0E+01	0.60	5.3E-06	2.1E-05	3.0E-04	2E-02	7E-02	4E-07	3E-06	2E+00	5E-07	4E-06
	Barium	7.6E+02	1.00	6.7E-04	2.7E-03	2.0E-01	3E-03	1E-02	5E-05	4E-04			
	Cadmium	2.8E+00	1.00	2.5E-06	9.8E-06	1.0E-03	2E-03	1E-02	2E-07	1E-06			
90	Chromium	2.8E+01	1.00	2.4E-05	9.7E-05	3.0E-03	8E-03	3E-02	2E-05	7E-05	5E-01	9E-06	4E-05
	Cobalt	3.1E+00	1.00	2.7E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	1E-06			
	Iron	9.3E+03	1.00	8.1E-03	3.2E-02	7.0E-01	1E-02	5E-02	6E-04	4E-03			
	Manganese	1.1E+03	1.00	9.8E-04	3.9E-03	2.4E-02	4E-02	2E-01	7E-05	5E-04			
	Mercury	1.5E+00	1.00	1.3E-06	5.2E-06	3.0E-04	4E-03	2E-02	9E-08	7E-07			
	Thallium	1.6E-01	1.00	1.4E-07	5.4E-07	1.0E-05	1E-02	5E-02	9E-09	7E-08			
	Vanadium	3.1E+01	1.00	2.7E-05	1.1E-04	5.0E-03	5E-03	2E-02	2E-06	2E-05			
	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	1.00	2.0E-11	7.9E-11	7.0E-10	3E-02	1E-01	1E-12	1E-11	1E+05	2E-07	1E-06
	Aluminum	1.5E+04	1.00	1.3E-02	5.2E-02	1.0E+00	1E-02	5E-02	9E-04	7E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	6.3E+00	0.60	3.3E-06	1.3E-05	3.0E-04	1E-02	4E-02	2E-07	2E-06	2E+00	3E-07	3E-06
	Barium	9.2E+02	1.00	8.1E-04	3.2E-03	2.0E-01	4E-03	2E-02	6E-05	4E-04			
	Cadmium	1.7E+00	1.00	1.5E-06	5.9E-06	1.0E-03	1E-03	6E-03	1E-07	8E-07			
91	Chromium	2.6E+01	1.00	2.3E-05	9.2E-05	3.0E-03	8E-03	3E-02	2E-05	7E-05	5E-01	9E-06	3E-05
	Cobalt	5.3E+00	1.00	4.6E-06	1.9E-05	3.0E-04	2E-02	6E-02	3E-07	3E-06			
	Iron	1.4E+04	1.00	1.2E-02	5.0E-02	7.0E-01	2E-02	7E-02	9E-04	7E-03			
	Manganese	4.0E+02	1.00	3.5E-04	1.4E-03	2.4E-02	1E-02	6E-02	2E-05	2E-04			
	Mercury	8.3E-01	1.00	7.3E-07	2.9E-06	3.0E-04	2E-03	1E-02	5E-08	4E-07			
	Thallium	1.9E-01	1.00	1.7E-07	6.7E-07	1.0E-05	2E-02	7E-02	1E-08	9E-08			
	Vanadium	2.6E+01	1.00	2.3E-05	9.3E-05	5.0E-03	5E-03	2E-02	2E-06	1E-05			
	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	1.00	4.0E-11	1.6E-10	7.0E-10	6E-02	2E-01	3E-12	2E-11	1E+05	4E-07	3E-06
	Aluminum	1.5E+04	1.00	1.3E-02	5.3E-02	1.0E+00	1E-02	5E-02	9E-04	7E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	7.8E+00	0.60	4.1E-06	1.6E-05	3.0E-04	1E-02	5E-02	3E-07	2E-06	2E+00	4E-07	3E-06
	Barium	4.3E+02	1.00	3.8E-04	1.5E-03	2.0E-01	2E-03	8E-03	3E-05	2E-04			
	Cadmium	2.1E+00	1.00	1.9E-06	7.5E-06	1.0E-03	2E-03	7E-03	1E-07	1E-06			
93	Chromium	2.5E+01	1.00	2.2E-05	8.8E-05	3.0E-03	7E-03	3E-02	2E-05	6E-05	5E-01	8E-06	3E-05
	Cobalt	3.2E+00	1.00	2.8E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	2E-06			
	Iron	7.9E+03	1.00	7.0E-03	2.8E-02	7.0E-01	1E-02	4E-02	5E-04	4E-03			
	Manganese	8.8E+02	1.00	7.7E-04	3.1E-03	2.4E-02	3E-02	1E-01	5E-05	4E-04			
	Mercury	3.2E+00	1.00	2.8E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	2E-06			
	Thallium	1.2E-01	1.00	1.1E-07	4.3E-07	1.0E-05	1E-02	4E-02	7E-09	6E-08			
	Vanadium	2.9E+01	1.00	2.5E-05	1.0E-04	5.0E-03	5E-03	2E-02	2E-06	1E-05			
	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	1.00	2.0E-11	7.9E-11	7.0E-10	3E-02	1E-01	1E-12	1E-11	1E+05	2E-07	1E-06
	Aluminum	1.0E+04	1.00	9.1E-03	3.6E-02	1.0E+00	9E-03	4E-02	6E-04	5E-03			
	Antimony	4.7E-01	1.00	4.1E-07	1.6E-06	4.0E-04	1E-03	4E-03	3E-08	2E-07			
	Arsenic	4.0E+00	0.60	2.1E-06	8.5E-06	3.0E-04	7E-03	3E-02	1E-07	1E-06	2E+00	2E-07	2E-06
	Barium	4.1E+02	1.00	3.6E-04	1.5E-03	2.0E-01	2E-03	7E-03	3E-05	2E-04			
	Cadmium	1.2E+00	1.00	1.0E-06	4.1E-06	1.0E-03	1E-03	4E-03	7E-08	6E-07			
94	Chromium	2.0E+01	1.00	1.7E-05	7.0E-05	3.0E-03	6E-03	2E-02	1E-05	5E-05	5E-01	6E-06	3E-05
	Cobalt	3.2E+00	1.00	2.8E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	2E-06			
	Iron	9.5E+03	1.00	8.3E-03	3.3E-02	7.0E-01	1E-02	5E-02	6E-04	5E-03			
	Manganese	4.0E+02	1.00	3.5E-04	1.4E-03	2.4E-02	1E-02	6E-02	2E-05	2E-04			
	Mercury	9.4E-01	1.00	8.2E-07	3.3E-06	3.0E-04	3E-03	1E-02	6E-08	4E-07			
	Thallium	1.5E-01	1.00	1.3E-07	5.4E-07	1.0E-05	1E-02	5E-02	9E-09	7E-08			
	Vanadium	1.8E+01	1.00	1.6E-05	6.3E-05	5.0E-03	3E-03	1E-02	1E-06	9E-06			

95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	1.00	1.8E-11	7.4E-11	7.0E-10	3E-02	1E-01	1E-12	1E-11	1E+05	2E-07	1E-06
	Aluminum	9.8E+03	1.00	8.6E-03	3.4E-02	1.0E+00	9E-03	3E-02	6E-04	5E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	5.6E+00	0.60	2.9E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-07	2E-06	2E+00	3E-07	2E-06
	Barium	3.9E+02	1.00	3.5E-04	1.4E-03	2.0E-01	2E-03	7E-03	2E-05	2E-04			
	Cadmium	1.2E+00	1.00	1.1E-06	4.3E-06	1.0E-03	1E-03	4E-03	8E-08	6E-07			
	Chromium	1.8E+01	1.00	1.6E-05	6.2E-05	3.0E-03	5E-03	2E-02	1E-05	5E-05	5E-01	6E-06	2E-05
	Cobalt	3.5E+00	1.00	3.1E-06	1.2E-05	3.0E-04	1E-02	4E-02	2E-07	2E-06			
	Iron	9.7E+03	1.00	8.5E-03	3.4E-02	7.0E-01	1E-02	5E-02	6E-04	5E-03			
	Manganese	7.4E+02	1.00	6.5E-04	2.6E-03	2.4E-02	3E-02	1E-01	5E-05	4E-04			
	Mercury	1.0E+00	1.00	9.1E-07	3.7E-06	3.0E-04	3E-03	1E-02	6E-08	5E-07			
	Thallium	1.2E-01	1.00	1.1E-07	4.3E-07	1.0E-05	1E-02	4E-02	7E-09	6E-08			
	Vanadium	2.3E+01	1.00	2.0E-05	8.2E-05	5.0E-03	4E-03	2E-02	1E-06	1E-05			
97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	1.00	2.4E-12	9.8E-12	7.0E-10	3E-03	1E-02	2E-13	1E-12	1E+05	2E-08	2E-07
	Aluminum	6.9E+03	1.00	6.1E-03	2.4E-02	1.0E+00	6E-03	2E-02	4E-04	3E-03			
	Antimony	4.8E-02	1.00	4.2E-08	1.7E-07	4.0E-04	1E-04	4E-04	3E-09	2E-08			
	Arsenic	1.7E+00	0.60	8.9E-07	3.6E-06	3.0E-04	3E-03	1E-02	6E-08	5E-07	2E+00	9E-08	7E-07
	Barium	2.4E+02	1.00	2.1E-04	8.4E-04	2.0E-01	1E-03	4E-03	1E-05	1E-04			
	Cadmium	2.6E-01	1.00	2.3E-07	9.1E-07	1.0E-03	2E-04	9E-04	2E-08	1E-07			
	Chromium	9.3E+00	1.00	8.2E-06	3.3E-05	3.0E-03	3E-03	1E-02	6E-06	2E-05	5E-01	3E-06	1E-05
	Cobalt	1.7E+00	1.00	1.5E-06	6.0E-06	3.0E-04	5E-03	2E-02	1E-07	8E-07			
	Iron	5.5E+03	1.00	4.9E-03	1.9E-02	7.0E-01	7E-03	3E-02	3E-04	3E-03			
	Manganese	9.3E+01	1.00	8.1E-05	3.2E-04	2.4E-02	3E-03	1E-02	6E-06	4E-05			
	Mercury	4.1E-02	1.00	3.6E-08	1.4E-07	3.0E-04	1E-04	5E-04	2E-09	2E-08			
	Thallium	7.5E-03	1.00	6.6E-09	2.6E-08	1.0E-05	7E-04	3E-03	5E-10	4E-09			
	Vanadium	8.7E+00	1.00	7.6E-06	3.1E-05	5.0E-03	2E-03	6E-03	5E-07	4E-06			
98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	1.00	1.3E-11	5.1E-11	7.0E-10	2E-02	7E-02	9E-13	7E-12	1E+05	1E-07	9E-07
	Aluminum	1.5E+04	1.00	1.3E-02	5.3E-02	1.0E+00	1E-02	5E-02	9E-04	7E-03			
	Antimony	no data	1.00	--	--	4.0E-04	--	--	--	--			
	Arsenic	4.9E+00	0.60	2.6E-06	1.0E-05	3.0E-04	9E-03	3E-02	2E-07	1E-06	2E+00	3E-07	2E-06
	Barium	2.2E+03	1.00	1.9E-03	7.7E-03	2.0E-01	1E-02	4E-02	1E-04	1E-03			
	Cadmium	1.2E+00	1.00	1.1E-06	4.3E-06	1.0E-03	1E-03	4E-03	7E-08	6E-07			
	Chromium	1.9E+01	1.00	1.7E-05	6.8E-05	3.0E-03	6E-03	2E-02	1E-05	5E-05	5E-01	6E-06	3E-05
	Cobalt	3.2E+00	1.00	2.8E-06	1.1E-05	3.0E-04	9E-03	4E-02	2E-07	2E-06			
	Iron	1.1E+04	1.00	9.2E-03	3.7E-02	7.0E-01	1E-02	5E-02	6E-04	5E-03			
	Manganese	2.9E+02	1.00	2.5E-04	1.0E-03	2.4E-02	1E-02	4E-02	2E-05	1E-04			
	Mercury	3.1E-01	1.00	2.7E-07	1.1E-06	3.0E-04	9E-04	4E-03	2E-08	1E-07			
	Thallium	1.3E-01	1.00	1.1E-07	4.4E-07	1.0E-05	1E-02	4E-02	8E-09	6E-08			
	Vanadium	2.1E+01	1.00	1.9E-05	7.5E-05	5.0E-03	4E-03	1E-02	1E-06	1E-05			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. SOIL RISK CALCULATIONS

Population **Current/Hypothetical Future Tribal Fisher**
Exposure Area **Random grids across OU3 Floodplain Area**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME	
Noncancer	2.30E-07	3.22E-06	*Based on Child HIFs*
Cancer	2.43E-08	6.78E-07	*Based on TWA HIFs*

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
81	$TEQ_{D/F}$ (ND=1/2 DL)	6.0E-07	0.03	4.1E-15	5.8E-14	7.0E-10	6E-06	8E-05	4E-16	1E-14	1E+05	6E-11	2E-09
	Arsenic	4.5E+00	0.03	3.1E-08	4.3E-07	3.0E-04	1E-04	1E-03	3E-09	9E-08	2E+00	5E-09	1E-07
	Cadmium	3.2E-01	0.001	7.4E-11	1.0E-09	2.5E-05	3E-06	4E-05	8E-12	2E-10			
85[a]	$TEQ_{D/F}$ (ND=1/2 DL)	4.0E-07	0.03	2.8E-15	3.9E-14	7.0E-10	4E-06	6E-05	3E-16	8E-15	1E+05	4E-11	1E-09
	Arsenic	1.9E+00	0.03	1.3E-08	1.8E-07	3.0E-04	4E-05	6E-04	1E-09	4E-08	2E+00	2E-09	6E-08
	Cadmium	1.6E-02	0.001	3.7E-12	5.2E-11	2.5E-05	1E-07	2E-06	4E-13	1E-11			
86	$TEQ_{D/F}$ (ND=1/2 DL)	1.8E-05	0.03	1.3E-13	1.8E-12	7.0E-10	2E-04	3E-03	1E-14	4E-13	1E+05	2E-09	5E-08
	Arsenic	4.6E+00	0.03	3.2E-08	4.4E-07	3.0E-04	1E-04	1E-03	3E-09	9E-08	2E+00	5E-09	1E-07
	Cadmium	5.4E-01	0.001	1.2E-10	1.7E-09	2.5E-05	5E-06	7E-05	1E-11	4E-10			
87	$TEQ_{D/F}$ (ND=1/2 DL)	6.8E-06	0.03	4.7E-14	6.6E-13	7.0E-10	7E-05	9E-04	5E-15	1E-13	1E+05	6E-10	2E-08
	Arsenic	4.7E+00	0.03	3.2E-08	4.5E-07	3.0E-04	1E-04	2E-03	3E-09	1E-07	2E+00	5E-09	1E-07
	Cadmium	7.9E-01	0.001	1.8E-10	2.5E-09	2.5E-05	7E-06	1E-04	2E-11	5E-10			
88	$TEQ_{D/F}$ (ND=1/2 DL)	5.6E-05	0.03	3.8E-13	5.4E-12	7.0E-10	5E-04	8E-03	4E-14	1E-12	1E+05	5E-09	1E-07
	Arsenic	5.5E+00	0.03	3.8E-08	5.3E-07	3.0E-04	1E-04	2E-03	4E-09	1E-07	2E+00	6E-09	2E-07
	Cadmium	1.8E+00	0.001	4.1E-10	5.8E-09	2.5E-05	2E-05	2E-04	4E-11	1E-09			
89	$TEQ_{D/F}$ (ND=1/2 DL)	9.7E-06	0.03	6.7E-14	9.4E-13	7.0E-10	1E-04	1E-03	7E-15	2E-13	1E+05	9E-10	3E-08
	Arsenic	4.8E+00	0.03	3.3E-08	4.6E-07	3.0E-04	1E-04	2E-03	3E-09	1E-07	2E+00	5E-09	1E-07
	Cadmium	5.5E-01	0.001	1.3E-10	1.8E-09	2.5E-05	5E-06	7E-05	1E-11	4E-10			
90	$TEQ_{D/F}$ (ND=1/2 DL)	5.5E-05	0.03	3.8E-13	5.3E-12	7.0E-10	5E-04	8E-03	4E-14	1E-12	1E+05	5E-09	1E-07
	Arsenic	1.0E+01	0.03	6.9E-08	9.7E-07	3.0E-04	2E-04	3E-03	7E-09	2E-07	2E+00	1E-08	3E-07
	Cadmium	2.8E+00	0.001	6.4E-10	9.0E-09	2.5E-05	3E-05	4E-04	7E-11	2E-09			
91	$TEQ_{D/F}$ (ND=1/2 DL)	2.3E-05	0.03	1.6E-13	2.2E-12	7.0E-10	2E-04	3E-03	2E-14	5E-13	1E+05	2E-09	6E-08
	Arsenic	6.3E+00	0.03	4.3E-08	6.1E-07	3.0E-04	1E-04	2E-03	5E-09	1E-07	2E+00	7E-09	2E-07
	Cadmium	1.7E+00	0.001	3.9E-10	5.5E-09	2.5E-05	2E-05	2E-04	4E-11	1E-09			
93	$TEQ_{D/F}$ (ND=1/2 DL)	4.6E-05	0.03	3.2E-13	4.5E-12	7.0E-10	5E-04	6E-03	3E-14	9E-13	1E+05	4E-09	1E-07
	Arsenic	7.8E+00	0.03	5.4E-08	7.5E-07	3.0E-04	2E-04	3E-03	6E-09	2E-07	2E+00	9E-09	2E-07
	Cadmium	2.1E+00	0.001	4.9E-10	6.8E-09	2.5E-05	2E-05	3E-04	5E-11	1E-09			
94	$TEQ_{D/F}$ (ND=1/2 DL)	2.2E-05	0.03	1.5E-13	2.2E-12	7.0E-10	2E-04	3E-03	2E-14	5E-13	1E+05	2E-09	6E-08
	Arsenic	4.0E+00	0.03	2.8E-08	3.9E-07	3.0E-04	9E-05	1E-03	3E-09	8E-08	2E+00	4E-09	1E-07
	Cadmium	1.2E+00	0.001	2.7E-10	3.7E-09	2.5E-05	1E-05	1E-04	3E-11	8E-10			
95	$TEQ_{D/F}$ (ND=1/2 DL)	2.1E-05	0.03	1.5E-13	2.0E-12	7.0E-10	2E-04	3E-03	2E-14	4E-13	1E+05	2E-09	6E-08
	Arsenic	5.6E+00	0.03	3.9E-08	5.4E-07	3.0E-04	1E-04	2E-03	4E-09	1E-07	2E+00	6E-09	2E-07
	Cadmium	1.2E+00	0.001	2.8E-10	4.0E-09	2.5E-05	1E-05	2E-04	3E-11	8E-10			
97	$TEQ_{D/F}$ (ND=1/2 DL)	2.8E-06	0.03	1.9E-14	2.7E-13	7.0E-10	3E-05	4E-04	2E-15	6E-14	1E+05	3E-10	7E-09
	Arsenic	1.7E+00	0.03	1.2E-08	1.6E-07	3.0E-04	4E-05	5E-04	1E-09	3E-08	2E+00	2E-09	5E-08
	Cadmium	2.6E-01	0.001	6.0E-11	8.4E-10	2.5E-05	2E-06	3E-05	6E-12	2E-10			
98	$TEQ_{D/F}$ (ND=1/2 DL)	1.4E-05	0.03	1.0E-13	1.4E-12	7.0E-10	1E-04	2E-03	1E-14	3E-13	1E+05	1E-09	4E-08
	Arsenic	4.9E+00	0.03	3.3E-08	4.7E-07	3.0E-04	1E-04	2E-03	4E-09	1E-07	2E+00	5E-09	1E-07
	Cadmium	1.2E+00	0.001	2.8E-10	3.9E-09	2.5E-05	1E-05	2E-04	3E-11	8E-10			

[a]Only subsurface depth intervals were sampled at this grid. No surface soil sample data are available. The EPC was derived from subsurface samples.

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)$^{-1}$	CTE	RME
ATMW6	TEQ	Reproductive	2.2E-06	4.6E-11	1.1E-10	7.0E-10	7E-02	2E-01	4.9E-12	2.8E-11	1.3E+05	6E-07	4E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	3.1E+02	6.4E-03	1.5E-02	1.0E+00	6E-03	2E-02					
	Antimony	Systemic	2.7E-01	5.7E-06	1.3E-05	4.0E-04	1E-02	3E-02					
	Arsenic	Dermal	8.2E+00	1.7E-04	4.1E-04	3.0E-04	6E-01	1E+00	1.8E-05	1.0E-04	1.5E+00	3E-05	2E-04
	Barium	Kidney	9.1E+01	1.9E-03	4.6E-03	2.0E-01	1E-02	2E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	5.1E-02	1.1E-06	2.5E-06	5.0E-04	2E-03	5E-03					
	Chromium	--	2.4E+00	5.0E-05	1.2E-04	3.0E-03	2E-02	4E-02	6.9E-05	1.8E-04	5.0E-01	3E-05	9E-05
	Cobalt	Thyroid	1.7E-01	3.5E-06	8.3E-06	3.0E-04	1E-02	3E-02					
	Copper	--	6.6E+00	1.4E-04	3.3E-04	4.0E-02	3E-03	8E-03					
	Iron	Gastrointestinal	3.7E+03	7.9E-02	1.9E-01	7.0E-01	1E-01	3E-01					
	Manganese	Nervous	3.2E+03	6.7E-02	1.6E-01	2.4E-02	3E+00	7E+00					
	Nickel	Systemic	1.2E+00	2.6E-05	6.1E-05	2.0E-02	1E-03	3E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.2E+01	2.5E-04	6.0E-04	5.0E-03	5E-02	1E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
NFMW1d	TEQ	Reproductive	2.0E-06	4.2E-11	9.9E-11	7.0E-10	6E-02	1E-01	4.5E-12	2.6E-11	1.3E+05	6E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.3E+02	2.6E-03	6.3E-03	1.0E+00	3E-03	6E-03					
	Antimony	Systemic	4.2E-01	8.8E-06	2.1E-05	4.0E-04	2E-02	5E-02					
	Arsenic	Dermal	2.1E+01	4.3E-04	1.0E-03	3.0E-04	1E+00	3E+00	4.6E-05	2.6E-04	1.5E+00	7E-05	4E-04
	Barium	Kidney	5.4E+02	1.1E-02	2.7E-02	2.0E-01	6E-02	1E-01					
	Beryllium	Gastrointestinal	1.1E-01	2.3E-06	5.5E-06	2.0E-03	1E-03	3E-03					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	7.6E+00	1.6E-04	3.8E-04	3.0E-03	5E-02	1E-01	2.2E-04	5.8E-04	5.0E-01	1E-04	3E-04
	Cobalt	Thyroid	5.2E-01	1.1E-05	2.6E-05	3.0E-04	4E-02	9E-02					
	Copper	--	4.7E+01	1.0E-03	2.4E-03	4.0E-02	2E-02	6E-02					
	Iron	Gastrointestinal	1.7E+03	3.6E-02	8.5E-02	7.0E-01	5E-02	1E-01					
	Manganese	Nervous	4.1E+03	8.7E-02	2.1E-01	2.4E-02	4E+00	9E+00					
	Nickel	Systemic	1.1E+01	2.3E-04	5.5E-04	2.0E-02	1E-02	3E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	3.3E+01	7.0E-04	1.7E-03	5.0E-03	1E-01	3E-01					
	1,4-Dichlorobenzene	Liver	8.6E-01	1.8E-05	4.3E-05	7.0E-02	3E-04	6E-04	1.9E-06	1.1E-05	5.4E-03	1E-08	6E-08
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	2.9E-01	6.1E-06	1.4E-05	2.0E-02	3E-04	7E-04					
NFMW1s	TEQ	Reproductive	3.4E-06	7.1E-11	1.7E-10	7.0E-10	1E-01	2E-01	7.6E-12	4.3E-11	1.3E+05	1E-06	6E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	7.9E+03	1.7E-01	3.9E-01	1.0E+00	2E-01	4E-01					
	Antimony	Systemic	6.2E+00	1.3E-04	3.1E-04	4.0E-04	3E-01	8E-01					
	Arsenic	Dermal	2.1E+01	4.3E-04	1.0E-03	3.0E-04	1E+00	3E+00	4.6E-05	2.6E-04	1.5E+00	7E-05	4E-04
	Barium	Kidney	3.0E+02	6.4E-03	1.5E-02	2.0E-01	3E-02	8E-02					
	Beryllium	Gastrointestinal	7.3E-02	1.5E-06	3.6E-06	2.0E-03	8E-04	2E-03					
	Cadmium	Kidney	1.5E-01	3.2E-06	7.7E-06	5.0E-04	6E-03	2E-02					
	Chromium	--	1.8E+02	3.7E-03	8.8E-03	3.0E-03	1E+00	3E+00	5.1E-03	1.3E-02	5.0E-01	3E-03	7E-03
	Cobalt	Thyroid	3.8E+00	8.0E-05	1.9E-04	3.0E-04	3E-01	6E-01					
	Copper	--	1.1E+02	2.3E-03	5.4E-03	4.0E-02	6E-02	1E-01					
	Iron	Gastrointestinal	1.2E+03	2.4E-02	5.8E-02	7.0E-01	3E-02	8E-02					
	Manganese	Nervous	1.3E+02	2.8E-03	6.7E-03	2.4E-02	1E-01	3E-01					
	Nickel	Systemic	5.2E+01	1.1E-03	2.6E-03	2.0E-02	5E-02	1E-01					
	Thallium	Dermal	2.2E-01	4.6E-06	1.1E-05	1.0E-05	5E-01	1E+00					
	Vanadium	Dermal	1.2E+02	2.6E-03	6.2E-03	5.0E-03	5E-01	1E+00					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW2	TEQ	Reproductive	1.6E-06	3.4E-11	8.0E-11	7.0E-10	5E-02	1E-01	3.6E-12	2.1E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	1.4E-01	3.0E-06	7.1E-06		--	--	3.2E-07	1.8E-06	2.0E+00	6E-07	4E-06
	Aluminum	Nervous	2.4E+02	5.0E-03	1.2E-02	1.0E+00	5E-03	1E-02					
	Antimony	Systemic	2.0E-01	4.2E-06	9.9E-06	4.0E-04	1E-02	2E-02					
	Arsenic	Dermal	1.2E+01	2.5E-04	5.8E-04	3.0E-04	8E-01	2E+00	2.6E-05	1.5E-04	1.5E+00	4E-05	2E-04
	Barium	Kidney	2.0E+02	4.3E-03	1.0E-02	2.0E-01	2E-02	5E-02					
	Beryllium	Gastrointestinal	7.5E-02	1.6E-06	3.7E-06	2.0E-03	8E-04	2E-03					
	Cadmium	Kidney	5.2E-02	1.1E-06	2.6E-06	5.0E-04	2E-03	5E-03					
	Chromium	--	5.5E-01	1.2E-05	2.8E-05	3.0E-03	4E-03	9E-03	1.6E-05	4.2E-05	5.0E-01	8E-06	2E-05
	Cobalt	Thyroid	2.6E-01	5.6E-06	1.3E-05	3.0E-04	2E-02	4E-02					
	Copper	--	2.2E+00	4.6E-05	1.1E-04	4.0E-02	1E-03	3E-03					
	Iron	Gastrointestinal	6.9E+03	1.5E-01	3.4E-01	7.0E-01	2E-01	5E-01					
	Manganese	Nervous	5.0E+03	1.1E-01	2.5E-01	2.4E-02	4E+00	1E+01					
	Nickel	Systemic	2.1E+00	4.4E-05	1.0E-04	2.0E-02	2E-03	5E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	4.8E+00	1.0E-04	2.4E-04	5.0E-03	2E-02	5E-02					
	1,4-Dichlorobenzene	Liver	2.8E+01	5.8E-04	1.4E-03	7.0E-02	8E-03	2E-02	6.2E-05	3.5E-04	5.4E-03	3E-07	2E-06
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	3.8E-01	8.0E-06	1.9E-05	2.0E-02	4E-04	1E-03					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
NFMW3	TEQ	Reproductive	1.5E-06	3.1E-11	7.5E-11	7.0E-10	4E-02	1E-01	3.4E-12	1.9E-11	1.3E+05	4E-07	2E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	6.3E+01	1.3E-03	3.1E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	1.7E-01	3.6E-06	8.6E-06	4.0E-04	9E-03	2E-02					
	Arsenic	Dermal	5.9E+00	1.2E-04	3.0E-04	3.0E-04	4E-01	1E+00	1.3E-05	7.6E-05	1.5E+00	2E-05	1E-04
	Barium	Kidney	1.1E+03	2.2E-02	5.3E-02	2.0E-01	1E-01	3E-01					
	Beryllium	Gastrointestinal	1.3E-01	2.7E-06	6.3E-06	2.0E-03	1E-03	3E-03					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	5.0E+00	1.0E-04	2.5E-04	3.0E-03	3E-02	8E-02	1.4E-04	3.8E-04	5.0E-01	7E-05	2E-04
	Cobalt	Thyroid	1.1E+00	2.3E-05	5.5E-05	3.0E-04	8E-02	2E-01					
	Copper	--	5.5E-01	1.2E-05	2.7E-05	4.0E-02	3E-04	7E-04					
	Iron	Gastrointestinal	7.5E+03	1.6E-01	3.8E-01	7.0E-01	2E-01	5E-01					
	Manganese	Nervous	6.9E+03	1.4E-01	3.4E-01	2.4E-02	6E+00	**1E+01**					
	Nickel	Systemic	5.3E+00	1.1E-04	2.6E-04	2.0E-02	6E-03	1E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.3E+01	2.6E-04	6.2E-04	5.0E-03	5E-02	1E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
NFMW4	TEQ	Reproductive	1.6E-06	3.3E-11	7.8E-11	7.0E-10	5E-02	1E-01	3.5E-12	2.0E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.9E+01	6.2E-04	1.5E-03	1.0E+00	6E-04	1E-03					
	Antimony	Systemic	2.1E-01	4.4E-06	1.1E-05	4.0E-04	1E-02	3E-02					
	Arsenic	Dermal	3.7E+00	7.8E-05	1.9E-04	3.0E-04	3E-01	6E-01	8.4E-06	4.8E-05	1.5E+00	1E-05	7E-05
	Barium	Kidney	1.4E+02	2.9E-03	6.8E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	7.3E-02	1.5E-06	3.6E-06	2.0E-03	8E-04	2E-03					
	Cadmium	Kidney	3.1E-02	6.4E-07	1.5E-06	5.0E-04	1E-03	3E-03					
	Chromium	--	9.9E-01	2.1E-05	5.0E-05	3.0E-03	7E-03	2E-02	2.9E-05	7.6E-05	5.0E-01	1E-05	4E-05
	Cobalt	Thyroid	2.7E-01	5.6E-06	1.3E-05	3.0E-04	2E-02	4E-02					
	Copper	--	1.8E+00	3.7E-05	8.8E-05	4.0E-02	9E-04	2E-03					
	Iron	Gastrointestinal	1.4E+04	2.9E-01	6.9E-01	7.0E-01	4E-01	1E+00					
	Manganese	Nervous	7.4E+03	1.6E-01	3.7E-01	2.4E-02	6E+00	**2E+01**					
	Nickel	Systemic	6.0E-01	1.3E-05	3.0E-05	2.0E-02	6E-04	1E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.4E+00	3.0E-05	7.2E-05	5.0E-03	6E-03	1E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
NFMW7	TEQ	Reproductive	1.6E-06	3.5E-11	8.2E-11	7.0E-10	5E-02	1E-01	3.7E-12	2.1E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.7E+02	3.6E-03	8.5E-03	1.0E+00	4E-03	9E-03					
	Antimony	Systemic	1.5E+00	3.3E-05	7.7E-05	4.0E-04	8E-02	2E-01					
	Arsenic	Dermal	6.8E+00	1.4E-04	3.4E-04	3.0E-04	5E-01	1E+00	1.5E-05	8.7E-05	1.5E+00	2E-05	1E-04
	Barium	Kidney	1.2E+02	2.5E-03	6.0E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	6.5E-02	1.4E-06	3.2E-06	2.0E-03	7E-04	2E-03					
	Cadmium	Kidney	8.7E-02	1.8E-06	4.3E-06	5.0E-04	4E-03	9E-03					
	Chromium	--	3.5E+00	7.4E-05	1.7E-04	3.0E-03	2E-02	6E-02	1.0E-04	2.7E-04	5.0E-01	5E-05	1E-04
	Cobalt	Thyroid	1.5E+00	3.2E-05	7.5E-05	3.0E-04	1E-01	2E-01					
	Copper	--	8.8E+00	1.9E-04	4.4E-04	4.0E-02	5E-03	1E-02					
	Iron	Gastrointestinal	8.2E+02	1.7E-02	4.1E-02	7.0E-01	2E-02	6E-02					
	Manganese	Nervous	3.4E+02	7.2E-03	1.7E-02	2.4E-02	3E-01	7E-01					
	Nickel	Systemic	3.2E+00	6.7E-05	1.6E-04	2.0E-02	3E-03	8E-03					
	Thallium	Dermal	1.9E-01	4.0E-06	9.5E-06	1.0E-05	4E-01	9E-01					
	Vanadium	Dermal	2.0E+01	4.2E-04	1.0E-03	5.0E-03	8E-02	2E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW8	TEQ	Reproductive	1.5E-06	3.1E-11	7.3E-11	7.0E-10	4E-02	1E-01	3.3E-12	1.9E-11	1.3E+05	4E-07	2E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	9.0E+01	1.9E-03	4.5E-03	1.0E+00	2E-03	5E-03					
	Antimony	Systemic	8.6E-02	1.8E-06	4.3E-06	4.0E-04	5E-03	1E-02					
	Arsenic	Dermal	4.5E+00	9.5E-05	2.3E-04	3.0E-04	3E-01	8E-01	1.0E-05	5.8E-05	1.5E+00	2E-05	9E-05
	Barium	Kidney	1.2E+03	2.5E-02	5.9E-02	2.0E-01	1E-01	3E-01					
	Beryllium	Gastrointestinal	8.4E-02	1.8E-06	4.2E-06	2.0E-03	9E-04	2E-03					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	3.2E+00	6.8E-05	1.6E-04	3.0E-03	2E-02	5E-02	9.3E-05	2.5E-04	5.0E-01	5E-05	1E-04
	Cobalt	Thyroid	7.9E-01	1.7E-05	3.9E-05	3.0E-04	6E-02	1E-01					
	Copper	--	2.6E+00	5.5E-05	1.3E-04	4.0E-02	1E-03	3E-03					
	Iron	Gastrointestinal	3.9E+03	8.2E-02	2.0E-01	7.0E-01	1E-01	3E-01					
	Manganese	Nervous	9.7E+03	2.1E-01	4.9E-01	2.4E-02	9E+00	**2E+01**					
	Nickel	Systemic	4.9E+00	1.0E-04	2.5E-04	2.0E-02	5E-03	1E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	7.5E+00	1.6E-04	3.8E-04	5.0E-03	3E-02	8E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
NFMW9	TEQ	Reproductive	1.0E-05	2.1E-10	5.0E-10	7.0E-10	3E-01	7E-01	2.3E-11	1.3E-10	1.3E+05	3E-06	2E-05
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.8E+02	3.8E-03	9.1E-03	1.0E+00	4E-03	9E-03					
	Antimony	Systemic	7.9E-01	1.7E-05	3.9E-05	4.0E-04	4E-02	1E-01					
	Arsenic	Dermal	2.7E+01	5.6E-04	1.3E-03	3.0E-04	2E+00	4E+00	6.0E-05	3.4E-04	1.5E+00	9E-05	5E-04
	Barium	Kidney	5.5E+02	1.1E-02	2.7E-02	2.0E-01	6E-02	1E-01					
	Beryllium	Gastrointestinal	3.1E-01	6.5E-06	1.5E-05	2.0E-03	3E-03	8E-03					
	Cadmium	Kidney	1.8E-01	3.7E-06	8.8E-06	5.0E-04	7E-03	2E-02					
	Chromium	--	1.1E+01	2.3E-04	5.4E-04	3.0E-03	8E-02	2E-01	3.1E-04	8.2E-04	5.0E-01	2E-04	4E-04
	Cobalt	Thyroid	3.8E+01	8.1E-04	1.9E-03	3.0E-04	3E+00	6E+00					
	Copper	--	3.2E+01	6.7E-04	1.6E-03	4.0E-02	2E-02	4E-02					
	Iron	Gastrointestinal	3.5E+04	7.3E-01	1.7E+00	7.0E-01	1E+00	2E+00					
	Manganese	Nervous	8.8E+03	1.9E-01	4.4E-01	2.4E-02	8E+00	**2E+01**					
	Nickel	Systemic	1.6E+01	3.5E-04	8.2E-04	2.0E-02	2E-02	4E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.7E+01	5.6E-04	1.3E-03	5.0E-03	1E-01	3E-01					
	1,4-Dichlorobenzene	Liver	1.3E+00	2.7E-05	6.4E-05	7.0E-02	4E-04	9E-04	2.9E-06	1.6E-05	5.4E-03	2E-08	9E-08
	Benzene	Immune	5.1E-01	1.1E-05	2.5E-05	4.0E-03	3E-03	6E-03	1.1E-06	6.5E-06	5.5E-02	6E-08	4E-07
	Chlorobenzene	Liver	1.0E+02	2.2E-03	5.2E-03	2.0E-02	1E-01	3E-01					
NFMW10	TEQ	Reproductive	2.4E-06	5.0E-11	1.2E-10	7.0E-10	7E-02	2E-01	5.4E-12	3.1E-11	1.3E+05	7E-07	4E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.6E+02	3.3E-03	7.8E-03	1.0E+00	3E-03	8E-03					
	Antimony	Systemic	5.2E-01	1.1E-05	2.6E-05	4.0E-04	3E-02	6E-02					
	Arsenic	Dermal	1.7E+01	3.6E-04	8.6E-04	3.0E-04	1E+00	3E+00	3.9E-05	2.2E-04	1.5E+00	6E-05	3E-04
	Barium	Kidney	2.9E+02	6.2E-03	1.5E-02	2.0E-01	3E-02	7E-02					
	Beryllium	Gastrointestinal	1.3E-01	2.7E-06	6.5E-06	2.0E-03	1E-03	3E-03					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	6.1E+00	1.3E-04	3.0E-04	3.0E-03	4E-02	1E-01	1.8E-04	4.6E-04	5.0E-01	9E-05	2E-04
	Cobalt	Thyroid	6.7E-01	1.4E-05	3.3E-05	3.0E-04	5E-02	1E-01					
	Copper	--	3.3E+00	7.0E-05	1.7E-04	4.0E-02	2E-03	4E-03					
	Iron	Gastrointestinal	2.6E+03	5.4E-02	1.3E-01	7.0E-01	8E-02	2E-01					
	Manganese	Nervous	7.6E+03	1.6E-01	3.8E-01	2.4E-02	7E+00	**2E+01**					
	Nickel	Systemic	5.6E+00	1.2E-04	2.8E-04	2.0E-02	6E-03	1E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	3.4E+01	7.1E-04	1.7E-03	5.0E-03	1E-01	3E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW11	TEQ	Reproductive	2.0E-06	4.2E-11	9.9E-11	7.0E-10	6E-02	1E-01	4.5E-12	2.6E-11	1.3E+05	6E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.8E+01	5.8E-04	1.4E-03	1.0E+00	6E-04	1E-03					
	Antimony	Systemic	ND	--	--	4.0E-04	--	--					
	Arsenic	Dermal	3.7E+00	7.8E-05	1.8E-04	3.0E-04	3E-01	6E-01	8.4E-06	4.8E-05	1.5E+00	1E-05	7E-05
	Barium	Kidney	1.9E+02	4.0E-03	9.5E-03	2.0E-01	2E-02	5E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	9.2E-01	1.9E-05	4.6E-05	3.0E-03	6E-03	2E-02	2.6E-05	7.0E-05	5.0E-01	1E-05	3E-05
	Cobalt	Thyroid	3.2E-01	6.7E-06	1.6E-05	3.0E-04	2E-02	5E-02					
	Copper	--	2.3E-01	4.8E-06	1.1E-05	4.0E-02	1E-04	3E-04					
	Iron	Gastrointestinal	5.2E+02	1.1E-02	2.6E-02	7.0E-01	2E-02	4E-02					
	Manganese	Nervous	4.2E+03	8.9E-02	2.1E-01	2.4E-02	4E+00	9E+00					
	Nickel	Systemic	2.4E+00	5.0E-05	1.2E-04	2.0E-02	3E-03	6E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	3.0E+00	6.3E-05	1.5E-04	5.0E-03	1E-02	3E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW12	TEQ	Reproductive	1.2E-06	2.5E-11	5.8E-11	7.0E-10	4E-02	8E-02	2.6E-12	1.5E-11	1.3E+05	3E-07	2E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.0E+02	4.1E-03	9.8E-03	1.0E+00	4E-03	1E-02					
	Antimony	Systemic	1.0E-01	2.2E-06	5.2E-06	4.0E-04	5E-03	1E-02					
	Arsenic	Dermal	1.8E+00	3.7E-05	8.7E-05	3.0E-04	1E-01	3E-01	3.9E-06	2.2E-05	1.5E+00	6E-06	3E-05
	Barium	Kidney	8.8E+01	1.9E-03	4.4E-03	2.0E-01	9E-03	2E-02					
	Beryllium	Gastrointestinal	5.8E-02	1.2E-06	2.9E-06	2.0E-03	6E-04	1E-03					
	Cadmium	Kidney	2.7E-01	5.7E-06	1.3E-05	5.0E-04	1E-02	3E-02					
	Chromium	--	3.2E-01	6.6E-06	1.6E-05	3.0E-03	2E-03	5E-03	9.1E-06	2.4E-05	5.0E-01	5E-06	1E-05
	Cobalt	Thyroid	2.1E+00	4.4E-05	1.0E-04	3.0E-04	1E-01	3E-01					
	Copper	--	1.3E+00	2.8E-05	6.6E-05	4.0E-02	7E-04	2E-03					
	Iron	Gastrointestinal	1.4E+04	3.0E-01	7.1E-01	7.0E-01	4E-01	1E+00					
	Manganese	Nervous	6.3E+03	1.3E-01	3.1E-01	2.4E-02	6E+00	**1E+01**					
	Nickel	Systemic	1.2E+01	2.5E-04	5.9E-04	2.0E-02	1E-02	3E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	6.7E-01	1.4E-05	3.4E-05	5.0E-03	3E-03	7E-03					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
NFMW19	TEQ	Reproductive	1.4E-06	2.9E-11	6.9E-11	7.0E-10	4E-02	1E-01	3.1E-12	1.8E-11	1.3E+05	4E-07	2E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.3E+04	2.7E-01	6.4E-01	1.0E+00	3E-01	6E-01					
	Antimony	Systemic	ND	--	--	4.0E-04	--	--					
	Arsenic	Dermal	4.6E+00	9.7E-05	2.3E-04	3.0E-04	3E-01	8E-01	1.0E-05	5.9E-05	1.5E+00	2E-05	9E-05
	Barium	Kidney	3.7E+01	7.7E-04	1.8E-03	2.0E-01	4E-03	9E-03					
	Beryllium	Gastrointestinal	3.0E+00	6.4E-05	1.5E-04	2.0E-03	3E-02	8E-02					
	Cadmium	Kidney	9.6E-01	2.0E-05	4.8E-05	5.0E-04	4E-02	1E-01					
	Chromium	--	1.5E+00	3.1E-05	7.3E-05	3.0E-03	1E-02	2E-02	4.2E-05	1.1E-04	5.0E-01	2E-05	6E-05
	Cobalt	Thyroid	8.7E+01	1.8E-03	4.4E-03	3.0E-04	6E+00	**1E+01**					
	Copper	--	2.2E+01	4.6E-04	1.1E-03	4.0E-02	1E-02	3E-02					
	Iron	Gastrointestinal	4.4E+04	9.3E-01	2.2E+00	7.0E-01	1E+00	3E+00					
	Manganese	Nervous	4.7E+04	9.8E-01	2.3E+00	2.4E-02	**4E+01**	**1E+02**					
	Nickel	Systemic	4.3E+01	9.1E-04	2.1E-03	2.0E-02	5E-02	1E-01					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.5E+00	5.2E-05	1.2E-04	5.0E-03	1E-02	2E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW20	TEQ	Reproductive	2.0E-06	4.2E-11	9.9E-11	7.0E-10	6E-02	1E-01	4.5E-12	2.6E-11	1.3E+05	6E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	5.0E+01	1.1E-03	2.5E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	2.3E-01	4.8E-06	1.1E-05	4.0E-04	1E-02	3E-02					
	Arsenic	Dermal	4.7E+00	9.9E-05	2.3E-04	3.0E-04	3E-01	8E-01	1.1E-05	6.0E-05	1.5E+00	2E-05	9E-05
	Barium	Kidney	5.8E+01	1.2E-03	2.9E-03	2.0E-01	6E-03	1E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	2.2E+00	4.6E-05	1.1E-04	3.0E-03	2E-02	4E-02	6.3E-05	1.7E-04	5.0E-01	3E-05	8E-05
	Cobalt	Thyroid	7.4E-01	1.5E-05	3.7E-05	3.0E-04	5E-02	1E-01					
	Copper	--	1.6E+00	3.3E-05	7.9E-05	4.0E-02	8E-04	2E-03					
	Iron	Gastrointestinal	6.7E+03	1.4E-01	3.3E-01	7.0E-01	2E-01	5E-01					
	Manganese	Nervous	1.4E+04	3.0E-01	7.1E-01	2.4E-02	**1E+01**	**3E+01**					
	Nickel	Systemic	3.6E+00	7.6E-05	1.8E-04	2.0E-02	4E-03	9E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	5.7E+00	1.2E-04	2.9E-04	5.0E-03	2E-02	6E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW22	TEQ	Reproductive	2.3E-06	4.8E-11	1.1E-10	7.0E-10	7E-02	2E-01	5.2E-12	2.9E-11	1.3E+05	7E-07	4E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.7E+02	3.6E-03	8.5E-03	1.0E+00	4E-03	8E-03					
	Antimony	Systemic	6.8E-01	1.4E-05	3.4E-05	4.0E-04	4E-02	8E-02					
	Arsenic	Dermal	1.4E+01	3.0E-04	7.1E-04	3.0E-04	1E+00	2E+00	3.2E-05	1.8E-04	1.5E+00	5E-05	3E-04
	Barium	Kidney	4.6E+01	9.7E-04	2.3E-03	2.0E-01	5E-03	1E-02					
	Beryllium	Gastrointestinal	1.3E-01	2.7E-06	6.4E-06	2.0E-03	1E-03	3E-03					
	Cadmium	Kidney	5.6E-02	1.2E-06	2.8E-06	5.0E-04	2E-03	6E-03					
	Chromium	--	4.2E+00	8.8E-05	2.1E-04	3.0E-03	3E-02	7E-02	1.2E-04	3.2E-04	5.0E-01	6E-05	2E-04
	Cobalt	Thyroid	4.5E-01	9.4E-06	2.2E-05	3.0E-04	3E-02	7E-02					
	Copper	--	5.0E+00	1.0E-04	2.5E-04	4.0E-02	3E-03	6E-03					
	Iron	Gastrointestinal	1.3E+03	2.8E-02	6.7E-02	7.0E-01	4E-02	1E-01					
	Manganese	Nervous	3.0E+03	6.3E-02	1.5E-01	2.4E-02	3E+00	6E+00					
	Nickel	Systemic	6.9E+00	1.5E-04	3.4E-04	2.0E-02	7E-03	2E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	3.5E+01	7.4E-04	1.8E-03	5.0E-03	1E-01	4E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW23	TEQ	Reproductive	2.2E-06	4.6E-11	1.1E-10	7.0E-10	7E-02	2E-01	4.9E-12	2.8E-11	1.3E+05	6E-07	4E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.7E+02	3.6E-03	8.6E-03	1.0E+00	4E-03	9E-03					
	Antimony	Systemic	1.1E+00	2.3E-05	5.4E-05	4.0E-04	6E-02	1E-01					
	Arsenic	Dermal	7.2E+01	1.5E-03	3.6E-03	3.0E-04	5E+00	**1E+01**	1.6E-04	9.3E-04	1.5E+00	2E-04	1E-03
	Barium	Kidney	1.2E+02	2.6E-03	6.2E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	6.4E-02	1.4E-06	3.2E-06	2.0E-03	7E-04	2E-03					
	Cadmium	Kidney	1.5E-01	3.1E-06	7.4E-06	5.0E-04	6E-03	1E-02					
	Chromium	--	3.9E+00	8.2E-05	1.9E-04	3.0E-03	3E-02	6E-02	1.1E-04	3.0E-04	5.0E-01	6E-05	1E-04
	Cobalt	Thyroid	7.3E-01	1.5E-05	3.6E-05	3.0E-04	5E-02	1E-01					
	Copper	--	1.6E+01	3.4E-04	8.1E-04	4.0E-02	9E-03	2E-02					
	Iron	Gastrointestinal	1.1E+04	2.2E-01	5.3E-01	7.0E-01	3E-01	8E-01					
	Manganese	Nervous	4.8E+03	1.0E-01	2.4E-01	2.4E-02	4E+00	1E+01					
	Nickel	Systemic	6.8E+00	1.4E-04	3.4E-04	2.0E-02	7E-03	2E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	5.5E+01	1.2E-03	2.7E-03	5.0E-03	2E-01	5E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
SMW7	TEQ	Reproductive	1.6E-06	3.4E-11	8.0E-11	7.0E-10	5E-02	1E-01	3.6E-12	2.1E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	6.0E+00	1.3E-04	3.0E-04	1.0E+00	1E-04	3E-04					
	Antimony	Systemic	1.7E-01	3.6E-06	8.5E-06	4.0E-04	9E-03	2E-02					
	Arsenic	Dermal	3.4E+00	7.1E-05	1.7E-04	3.0E-04	2E-01	6E-01	7.6E-06	4.3E-05	1.5E+00	1E-05	6E-05
	Barium	Kidney	1.1E+02	2.4E-03	5.7E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	6.7E-02	1.4E-06	3.4E-06	5.0E-04	3E-03	7E-03					
	Chromium	--	3.4E-01	7.2E-06	1.7E-05	3.0E-03	2E-03	6E-03	9.9E-06	2.6E-05	5.0E-01	5E-06	1E-05
	Cobalt	Thyroid	2.7E+00	5.7E-05	1.3E-04	3.0E-04	2E-01	4E-01					
	Copper	--	5.3E+00	1.1E-04	2.6E-04	4.0E-02	3E-03	7E-03					
	Iron	Gastrointestinal	4.7E+01	9.9E-04	2.3E-03	7.0E-01	1E-03	3E-03					
	Manganese	Nervous	9.6E+02	2.0E-02	4.8E-02	2.4E-02	8E-01	2E+00					
	Nickel	Systemic	1.5E+00	3.1E-05	7.5E-05	2.0E-02	2E-03	4E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.2E+00	4.7E-05	1.1E-04	5.0E-03	9E-03	2E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW8	TEQ	Reproductive	1.8E-06	3.8E-11	9.0E-11	7.0E-10	5E-02	1E-01	4.1E-12	2.3E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	4.3E+02	9.0E-03	2.1E-02	1.0E+00	9E-03	2E-02					
	Antimony	Systemic	9.3E-02	2.0E-06	4.6E-06	4.0E-04	5E-03	1E-02					
	Arsenic	Dermal	6.3E+00	1.3E-04	3.2E-04	3.0E-04	4E-01	1E+00	1.4E-05	8.1E-05	1.5E+00	2E-05	1E-04
	Barium	Kidney	1.0E+02	2.2E-03	5.1E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	2.5E-01	5.2E-06	1.2E-05	3.0E-03	2E-03	4E-03	7.2E-06	1.9E-05	5.0E-01	4E-06	9E-06
	Cobalt	Thyroid	9.2E-02	1.9E-06	4.6E-06	3.0E-04	6E-03	2E-02					
	Copper	--	1.3E+01	2.7E-04	6.3E-04	4.0E-02	7E-03	2E-02					
	Iron	Gastrointestinal	1.5E+03	3.1E-02	7.4E-02	7.0E-01	4E-02	1E-01					
	Manganese	Nervous	1.1E+03	2.3E-02	5.4E-02	2.4E-02	9E-01	2E+00					
	Nickel	Systemic	3.5E-01	7.4E-06	1.8E-05	2.0E-02	4E-04	9E-04					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	5.5E-01	1.2E-05	2.8E-05	5.0E-03	2E-03	6E-03					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW9	TEQ	Reproductive	1.9E-06	3.9E-11	9.3E-11	7.0E-10	6E-02	1E-01	4.2E-12	2.4E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	3.0E+01	6.3E-04	1.5E-03	1.0E+00	6E-04	1E-03					
	Antimony	Systemic	5.2E-01	1.1E-05	2.6E-05	4.0E-04	3E-02	6E-02					
	Arsenic	Dermal	9.8E+00	2.1E-04	4.9E-04	3.0E-04	7E-01	2E+00	2.2E-05	1.3E-04	1.5E+00	3E-05	2E-04
	Barium	Kidney	5.3E+01	1.1E-03	2.7E-03	2.0E-01	6E-03	1E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	4.7E-02	1.0E-06	2.4E-06	5.0E-04	2E-03	5E-03					
	Chromium	--	6.4E-01	1.4E-05	3.2E-05	3.0E-03	5E-03	1E-02	1.9E-05	4.9E-05	5.0E-01	9E-06	2E-05
	Cobalt	Thyroid	2.6E-01	5.4E-06	1.3E-05	3.0E-04	2E-02	4E-02					
	Copper	--	9.9E+00	2.1E-04	4.9E-04	4.0E-02	5E-03	1E-02					
	Iron	Gastrointestinal	4.7E+01	9.8E-04	2.3E-03	7.0E-01	1E-03	3E-03					
	Manganese	Nervous	2.1E+02	4.4E-03	1.0E-02	2.4E-02	2E-01	4E-01					
	Nickel	Systemic	4.1E+00	8.7E-05	2.1E-04	2.0E-02	4E-03	1E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	7.6E+00	1.6E-04	3.8E-04	5.0E-03	3E-02	8E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW10	TEQ	Reproductive	2.3E-06	4.8E-11	1.1E-10	7.0E-10	7E-02	2E-01	5.1E-12	2.9E-11	1.3E+05	7E-07	4E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	7.8E+01	1.6E-03	3.9E-03	1.0E+00	2E-03	4E-03					
	Antimony	Systemic	5.3E-01	1.1E-05	2.7E-05	4.0E-04	3E-02	7E-02					
	Arsenic	Dermal	3.4E+01	7.1E-04	1.7E-03	3.0E-04	2E+00	6E+00	7.6E-05	4.4E-04	1.5E+00	1E-04	7E-04
	Barium	Kidney	1.0E+02	2.2E-03	5.2E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	1.8E-02	3.8E-07	9.0E-07	5.0E-04	8E-04	2E-03					
	Chromium	--	2.0E+00	4.2E-05	1.0E-04	3.0E-03	1E-02	3E-02	5.8E-05	1.5E-04	5.0E-01	3E-05	8E-05
	Cobalt	Thyroid	3.7E-01	7.7E-06	1.8E-05	3.0E-04	3E-02	6E-02					
	Copper	--	3.3E+00	7.0E-05	1.7E-04	4.0E-02	2E-03	4E-03					
	Iron	Gastrointestinal	2.4E+03	5.1E-02	1.2E-01	7.0E-01	7E-02	2E-01					
	Manganese	Nervous	2.6E+03	5.4E-02	1.3E-01	2.4E-02	2E+00	5E+00					
	Nickel	Systemic	5.1E+00	1.1E-04	2.6E-04	2.0E-02	5E-03	1E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.5E+01	3.2E-04	7.6E-04	5.0E-03	6E-02	2E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
SMW11	TEQ	Reproductive	3.0E-06	6.3E-11	1.5E-10	7.0E-10	9E-02	2E-01	6.8E-12	3.9E-11	1.3E+05	9E-07	5E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.1E+02	4.3E-03	1.0E-02	1.0E+00	4E-03	1E-02					
	Antimony	Systemic	7.8E-01	1.6E-05	3.9E-05	4.0E-04	4E-02	1E-01					
	Arsenic	Dermal	4.0E+01	8.4E-04	2.0E-03	3.0E-04	3E+00	7E+00	9.0E-05	5.1E-04	1.5E+00	1E-04	8E-04
	Barium	Kidney	1.5E+02	3.2E-03	7.5E-03	2.0E-01	2E-02	4E-02					
	Beryllium	Gastrointestinal	1.1E-01	2.4E-06	5.6E-06	2.0E-03	1E-03	3E-03					
	Cadmium	Kidney	2.0E-02	4.2E-07	1.0E-06	5.0E-04	8E-04	2E-03					
	Chromium	--	4.3E+00	9.0E-05	2.1E-04	3.0E-03	3E-02	7E-02	1.2E-04	3.3E-04	5.0E-01	6E-05	2E-04
	Cobalt	Thyroid	1.0E+01	2.1E-04	5.0E-04	3.0E-04	7E-01	2E+00					
	Copper	--	1.0E+01	2.2E-04	5.2E-04	4.0E-02	5E-03	1E-02					
	Iron	Gastrointestinal	3.6E+03	7.5E-02	1.8E-01	7.0E-01	1E-01	3E-01					
	Manganese	Nervous	1.0E+04	2.2E-01	5.1E-01	2.4E-02	9E+00	**2E+01**					
	Nickel	Systemic	7.0E+00	1.5E-04	3.5E-04	2.0E-02	7E-03	2E-02					
	Thallium	Dermal	4.4E-02	9.3E-07	2.2E-06	1.0E-05	9E-02	2E-01					
	Vanadium	Dermal	2.4E+01	5.0E-04	1.2E-03	5.0E-03	1E-01	2E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW12	TEQ	Reproductive	3.2E-06	6.8E-11	1.6E-10	7.0E-10	1E-01	2E-01	7.2E-12	4.1E-11	1.3E+05	9E-07	5E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	3.3E+02	6.9E-03	1.6E-02	1.0E+00	7E-03	2E-02					
	Antimony	Systemic	4.7E-01	9.8E-06	2.3E-05	4.0E-04	2E-02	6E-02					
	Arsenic	Dermal	1.5E+01	3.3E-04	7.7E-04	3.0E-04	1E+00	3E+00	3.5E-05	2.0E-04	1.5E+00	5E-05	3E-04
	Barium	Kidney	1.1E+02	2.3E-03	5.5E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	6.0E-02	1.3E-06	3.0E-06	2.0E-03	6E-04	1E-03					
	Cadmium	Kidney	1.0E-01	2.1E-06	5.0E-06	5.0E-04	4E-03	1E-02					
	Chromium	--	5.4E+00	1.1E-04	2.7E-04	3.0E-03	4E-02	9E-02	1.5E-04	4.1E-04	5.0E-01	8E-05	2E-04
	Cobalt	Thyroid	4.7E-01	9.9E-06	2.3E-05	3.0E-04	3E-02	8E-02					
	Copper	--	4.0E+00	8.4E-05	2.0E-04	4.0E-02	2E-03	5E-03					
	Iron	Gastrointestinal	8.1E+01	1.7E-03	4.0E-03	7.0E-01	2E-03	6E-03					
	Manganese	Nervous	4.0E+03	8.3E-02	2.0E-01	2.4E-02	3E+00	8E+00					
	Nickel	Systemic	7.6E+00	1.6E-04	3.8E-04	2.0E-02	8E-03	2E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.9E+01	4.0E-04	9.4E-04	5.0E-03	8E-02	2E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW13	TEQ	Reproductive	2.4E-06	5.1E-11	1.2E-10	7.0E-10	7E-02	2E-01	5.5E-12	3.1E-11	1.3E+05	7E-07	4E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.2E+02	2.5E-03	5.9E-03	1.0E+00	3E-03	6E-03					
	Antimony	Systemic	4.1E-01	8.5E-06	2.0E-05	4.0E-04	2E-02	5E-02					
	Arsenic	Dermal	1.2E+01	2.5E-04	5.9E-04	3.0E-04	8E-01	2E+00	2.7E-05	1.5E-04	1.5E+00	4E-05	2E-04
	Barium	Kidney	1.4E+02	3.0E-03	7.0E-03	2.0E-01	1E-02	4E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	9.6E-02	2.0E-06	4.8E-06	5.0E-04	4E-03	1E-02					
	Chromium	--	1.7E+00	3.6E-05	8.6E-05	3.0E-03	1E-02	3E-02	5.0E-05	1.3E-04	5.0E-01	2E-05	7E-05
	Cobalt	Thyroid	9.0E+00	1.9E-04	4.5E-04	3.0E-04	6E-01	2E+00					
	Copper	--	3.7E+00	7.8E-05	1.9E-04	4.0E-02	2E-03	5E-03					
	Iron	Gastrointestinal	5.1E+03	1.1E-01	2.6E-01	7.0E-01	2E-01	4E-01					
	Manganese	Nervous	4.9E+03	1.0E-01	2.4E-01	2.4E-02	4E+00	1E+01					
	Nickel	Systemic	5.7E+00	1.2E-04	2.8E-04	2.0E-02	6E-03	1E-02					
	Thallium	Dermal	1.2E-02	2.5E-07	6.0E-07	1.0E-05	3E-02	6E-02					
	Vanadium	Dermal	1.8E+01	3.7E-04	8.8E-04	5.0E-03	7E-02	2E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW14	TEQ	Reproductive	2.2E-06	4.6E-11	1.1E-10	7.0E-10	7E-02	2E-01	4.9E-12	2.8E-11	1.3E+05	6E-07	4E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.5E+02	5.3E-03	1.3E-02	1.0E+00	5E-03	1E-02					
	Antimony	Systemic	7.0E-01	1.5E-05	3.5E-05	4.0E-04	4E-02	9E-02					
	Arsenic	Dermal	2.2E+01	4.6E-04	1.1E-03	3.0E-04	2E+00	4E+00	4.9E-05	2.8E-04	1.5E+00	7E-05	4E-04
	Barium	Kidney	1.3E+02	2.6E-03	6.3E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	1.2E-01	2.4E-06	5.7E-06	5.0E-04	5E-03	1E-02					
	Chromium	--	1.2E+00	2.4E-05	5.8E-05	3.0E-03	8E-03	2E-02	3.3E-05	8.8E-05	5.0E-01	2E-05	4E-05
	Cobalt	Thyroid	7.5E-01	1.6E-05	3.7E-05	3.0E-04	5E-02	1E-01					
	Copper	--	6.9E+00	1.5E-04	3.4E-04	4.0E-02	4E-03	9E-03					
	Iron	Gastrointestinal	1.3E+03	2.7E-02	6.4E-02	7.0E-01	4E-02	9E-02					
	Manganese	Nervous	3.2E+03	6.7E-02	1.6E-01	2.4E-02	3E+00	7E+00					
	Nickel	Systemic	4.0E+00	8.5E-05	2.0E-04	2.0E-02	4E-03	1E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.3E+01	2.7E-04	6.4E-04	5.0E-03	5E-02	1E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)$^{-1}$	CTE	RME
SMW15	TEQ	Reproductive	1.6E-06	3.3E-11	7.8E-11	7.0E-10	5E-02	1E-01	3.5E-12	2.0E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.1E+03	2.3E-02	5.5E-02	1.0E+00	2E-02	5E-02					
	Antimony	Systemic	4.6E-01	9.7E-06	2.3E-05	4.0E-04	2E-02	6E-02					
	Arsenic	Dermal	7.7E+00	1.6E-04	3.8E-04	3.0E-04	5E-01	1E+00	1.7E-05	9.9E-05	1.5E+00	3E-05	1E-04
	Barium	Kidney	3.9E+01	8.1E-04	1.9E-03	2.0E-01	4E-03	1E-02					
	Beryllium	Gastrointestinal	2.8E+00	5.9E-05	1.4E-04	2.0E-03	3E-02	7E-02					
	Cadmium	Kidney	3.7E+00	7.8E-05	1.9E-04	5.0E-04	2E-01	4E-01					
	Chromium	--	4.5E+00	9.5E-05	2.3E-04	3.0E-03	3E-02	8E-02	1.3E-04	3.4E-04	5.0E-01	7E-05	2E-04
	Cobalt	Thyroid	2.5E+02	5.2E-03	1.2E-02	3.0E-04	**2E+01**	**4E+01**					
	Copper	--	5.3E+01	1.1E-03	2.6E-03	4.0E-02	3E-02	7E-02					
	Iron	Gastrointestinal	1.1E+04	2.4E-01	5.6E-01	7.0E-01	3E-01	8E-01					
	Manganese	Nervous	1.1E+04	2.3E-01	5.4E-01	2.4E-02	9E+00	**2E+01**					
	Nickel	Systemic	2.4E+02	5.0E-03	1.2E-02	2.0E-02	3E-01	6E-01					
	Thallium	Dermal	1.1E-01	2.3E-06	5.4E-06	1.0E-05	2E-01	5E-01					
	Vanadium	Dermal	5.6E+01	1.2E-03	2.8E-03	5.0E-03	2E-01	6E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW16	TEQ	Reproductive	2.1E-06	4.5E-11	1.1E-10	7.0E-10	6E-02	2E-01	4.8E-12	2.7E-11	1.3E+05	6E-07	4E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.6E+02	5.6E-03	1.3E-02	1.0E+00	6E-03	1E-02					
	Antimony	Systemic	1.2E+00	2.5E-05	5.8E-05	4.0E-04	6E-02	1E-01					
	Arsenic	Dermal	3.1E+01	6.4E-04	1.5E-03	3.0E-04	2E+00	5E+00	6.9E-05	3.9E-04	1.5E+00	1E-04	6E-04
	Barium	Kidney	1.6E+02	3.3E-03	7.9E-03	2.0E-01	2E-02	4E-02					
	Beryllium	Gastrointestinal	1.8E-01	3.8E-06	8.9E-06	2.0E-03	2E-03	4E-03					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	1.6E+01	3.3E-04	7.8E-04	3.0E-03	1E-01	3E-01	4.5E-04	1.2E-03	5.0E-01	2E-04	6E-04
	Cobalt	Thyroid	1.3E+00	2.8E-05	6.6E-05	3.0E-04	9E-02	2E-01					
	Copper	--	1.1E+00	2.3E-05	5.3E-05	4.0E-02	6E-04	1E-03					
	Iron	Gastrointestinal	6.7E+03	1.4E-01	3.4E-01	7.0E-01	2E-01	5E-01					
	Manganese	Nervous	4.8E+03	1.0E-01	2.4E-01	2.4E-02	4E+00	1E+01					
	Nickel	Systemic	1.3E+01	2.8E-04	6.5E-04	2.0E-02	1E-02	3E-02					
	Thallium	Dermal	1.4E-02	2.9E-07	7.0E-07	1.0E-05	3E-02	7E-02					
	Vanadium	Dermal	5.8E+01	1.2E-03	2.9E-03	5.0E-03	2E-01	6E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW16d	TEQ	Reproductive	1.1E-06	2.4E-11	5.7E-11	7.0E-10	3E-02	8E-02	2.6E-12	1.5E-11	1.3E+05	3E-07	2E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.3E+02	2.7E-03	6.3E-03	1.0E+00	3E-03	6E-03					
	Antimony	Systemic	2.6E-01	5.4E-06	1.3E-05	4.0E-04	1E-02	3E-02					
	Arsenic	Dermal	1.9E+00	4.0E-05	9.4E-05	3.0E-04	1E-01	3E-01	4.3E-06	2.4E-05	1.5E+00	6E-06	4E-05
	Barium	Kidney	5.0E+01	1.0E-03	2.5E-03	2.0E-01	5E-03	1E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	5.4E-02	1.1E-06	2.7E-06	5.0E-04	2E-03	5E-03					
	Chromium	--	3.6E-01	7.6E-06	1.8E-05	3.0E-03	3E-03	6E-03	1.0E-05	2.7E-05	5.0E-01	5E-06	1E-05
	Cobalt	Thyroid	4.1E-01	8.6E-06	2.0E-05	3.0E-04	3E-02	7E-02					
	Copper	--	2.3E+00	4.7E-05	1.1E-04	4.0E-02	1E-03	3E-03					
	Iron	Gastrointestinal	5.1E+02	1.1E-02	2.5E-02	7.0E-01	2E-02	4E-02					
	Manganese	Nervous	3.9E+02	8.2E-03	1.9E-02	2.4E-02	3E-01	8E-01					
	Nickel	Systemic	1.6E+00	3.5E-05	8.2E-05	2.0E-02	2E-03	4E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.3E+00	2.8E-05	6.6E-05	5.0E-03	6E-03	1E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW17	TEQ	Reproductive	6.9E-06	1.5E-10	3.5E-10	7.0E-10	2E-01	5E-01	1.6E-11	8.9E-11	1.3E+05	2E-06	1E-05
	Aroclor-1260	--	8.7E-02	1.8E-06	4.3E-06		--	--	2.0E-07	1.1E-06	2.0E+00	4E-07	2E-06
	Aluminum	Nervous	5.0E+02	1.1E-02	2.5E-02	1.0E+00	1E-02	2E-02					
	Antimony	Systemic	1.3E+00	2.8E-05	6.7E-05	4.0E-04	7E-02	2E-01					
	Arsenic	Dermal	5.0E+01	1.1E-03	2.5E-03	3.0E-04	4E+00	8E+00	1.1E-04	6.5E-04	1.5E+00	2E-04	1E-03
	Barium	Kidney	1.4E+02	2.9E-03	7.0E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	6.2E-01	1.3E-05	3.1E-05	2.0E-03	7E-03	2E-02					
	Cadmium	Kidney	2.2E-02	4.6E-07	1.1E-06	5.0E-04	9E-04	2E-03					
	Chromium	--	1.6E+01	3.3E-04	7.8E-04	3.0E-03	1E-01	3E-01	4.5E-04	1.2E-03	5.0E-01	2E-04	6E-04
	Cobalt	Thyroid	1.5E+00	3.1E-05	7.4E-05	3.0E-04	1E-01	2E-01					
	Copper	--	1.2E+00	2.5E-05	6.0E-05	4.0E-02	6E-04	1E-03					
	Iron	Gastrointestinal	2.1E+04	4.4E-01	1.0E+00	7.0E-01	6E-01	1E+00					
	Manganese	Nervous	8.9E+03	1.9E-01	4.4E-01	2.4E-02	8E+00	**2E+01**					
	Nickel	Systemic	1.2E+01	2.4E-04	5.8E-04	2.0E-02	1E-02	3E-02					
	Thallium	Dermal	1.0E-02	2.1E-07	5.0E-07	1.0E-05	2E-02	5E-02					
	Vanadium	Dermal	6.6E+01	1.4E-03	3.3E-03	5.0E-03	3E-01	7E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
SMW17d	TEQ	Reproductive	1.5E-06	3.2E-11	7.6E-11	7.0E-10	5E-02	1E-01	3.4E-12	1.9E-11	1.3E+05	4E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.8E+01	3.8E-04	9.0E-04	1.0E+00	4E-04	9E-04					
	Antimony	Systemic	8.6E-02	1.8E-06	4.3E-06	4.0E-04	4E-03	1E-02					
	Arsenic	Dermal	3.2E+00	6.8E-05	1.6E-04	3.0E-04	2E-01	5E-01	7.3E-06	4.2E-05	1.5E+00	1E-05	6E-05
	Barium	Kidney	6.3E+01	1.3E-03	3.1E-03	2.0E-01	7E-03	2E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	5.8E-02	1.2E-06	2.9E-06	5.0E-04	2E-03	6E-03					
	Chromium	--	2.9E-01	6.1E-06	1.4E-05	3.0E-03	2E-03	5E-03	8.4E-06	2.2E-05	5.0E-01	4E-06	1E-05
	Cobalt	Thyroid	4.1E-01	8.6E-06	2.0E-05	3.0E-04	3E-02	7E-02					
	Copper	--	2.5E+00	5.3E-05	1.2E-04	4.0E-02	1E-03	3E-03					
	Iron	Gastrointestinal	2.0E+01	4.1E-04	9.7E-04	7.0E-01	6E-04	1E-03					
	Manganese	Nervous	6.9E+02	1.5E-02	3.4E-02	2.4E-02	6E-01	1E+00					
	Nickel	Systemic	3.8E+00	8.1E-05	1.9E-04	2.0E-02	4E-03	1E-02					
	Thallium	Dermal	1.2E-02	2.5E-07	6.0E-07	1.0E-05	3E-02	6E-02					
	Vanadium	Dermal	3.0E+00	6.4E-05	1.5E-04	5.0E-03	1E-02	3E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW18	TEQ	Reproductive	2.1E-06	4.3E-11	1.0E-10	7.0E-10	6E-02	1E-01	4.6E-12	2.6E-11	1.3E+05	6E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	3.0E+02	6.3E-03	1.5E-02	1.0E+00	6E-03	1E-02					
	Antimony	Systemic	6.2E-01	1.3E-05	3.1E-05	4.0E-04	3E-02	8E-02					
	Arsenic	Dermal	9.7E+00	2.0E-04	4.8E-04	3.0E-04	7E-01	2E+00	2.2E-05	1.2E-04	1.5E+00	3E-05	2E-04
	Barium	Kidney	8.0E+01	1.7E-03	4.0E-03	2.0E-01	8E-03	2E-02					
	Beryllium	Gastrointestinal	8.3E-02	1.7E-06	4.1E-06	2.0E-03	9E-04	2E-03					
	Cadmium	Kidney	4.8E-02	1.0E-06	2.4E-06	5.0E-04	2E-03	5E-03					
	Chromium	--	5.1E+00	1.1E-04	2.5E-04	3.0E-03	4E-02	8E-02	1.5E-04	3.8E-04	5.0E-01	7E-05	2E-04
	Cobalt	Thyroid	1.1E+00	2.4E-05	5.7E-05	3.0E-04	8E-02	2E-01					
	Copper	--	5.0E+00	1.1E-04	2.5E-04	4.0E-02	3E-03	6E-03					
	Iron	Gastrointestinal	1.8E+03	3.7E-02	8.8E-02	7.0E-01	5E-02	1E-01					
	Manganese	Nervous	5.4E+03	1.1E-01	2.7E-01	2.4E-02	5E+00	**1E+01**					
	Nickel	Systemic	1.7E+01	3.5E-04	8.2E-04	2.0E-02	2E-02	4E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.3E+01	4.8E-04	1.1E-03	5.0E-03	1E-01	2E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW18d	TEQ	Reproductive	1.8E-06	3.8E-11	9.0E-11	7.0E-10	5E-02	1E-01	4.1E-12	2.3E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	7.9E+01	1.7E-03	3.9E-03	1.0E+00	2E-03	4E-03					
	Antimony	Systemic	2.3E-01	4.9E-06	1.2E-05	4.0E-04	1E-02	3E-02					
	Arsenic	Dermal	4.4E+00	9.3E-05	2.2E-04	3.0E-04	3E-01	7E-01	1.0E-05	5.7E-05	1.5E+00	2E-05	9E-05
	Barium	Kidney	5.1E+01	1.1E-03	2.5E-03	2.0E-01	5E-03	1E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	1.1E-01	2.3E-06	5.4E-06	5.0E-04	5E-03	1E-02					
	Chromium	--	6.3E-01	1.3E-05	3.2E-05	3.0E-03	4E-03	1E-02	1.8E-05	4.8E-05	5.0E-01	9E-06	2E-05
	Cobalt	Thyroid	1.2E+00	2.5E-05	5.8E-05	3.0E-04	8E-02	2E-01					
	Copper	--	1.9E+01	4.0E-04	9.5E-04	4.0E-02	1E-02	2E-02					
	Iron	Gastrointestinal	9.5E+01	2.0E-03	4.8E-03	7.0E-01	3E-03	7E-03					
	Manganese	Nervous	1.0E+03	2.1E-02	5.1E-02	2.4E-02	9E-01	2E+00					
	Nickel	Systemic	3.4E+00	7.2E-05	1.7E-04	2.0E-02	4E-03	9E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	7.1E+00	1.5E-04	3.6E-04	5.0E-03	3E-02	7E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW19	TEQ	Reproductive	2.0E-06	4.1E-11	9.8E-11	7.0E-10	6E-02	1E-01	4.4E-12	2.5E-11	1.3E+05	6E-07	3E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	6.6E+01	1.4E-03	3.3E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	3.9E-01	8.2E-06	2.0E-05	4.0E-04	2E-02	5E-02					
	Arsenic	Dermal	3.2E+00	6.7E-05	1.6E-04	3.0E-04	2E-01	5E-01	7.2E-06	4.1E-05	1.5E+00	1E-05	6E-05
	Barium	Kidney	1.7E+02	3.6E-03	8.6E-03	2.0E-01	2E-02	4E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	7.5E-02	1.6E-06	3.7E-06	5.0E-04	3E-03	7E-03					
	Chromium	--	1.3E+00	2.7E-05	6.3E-05	3.0E-03	9E-03	2E-02	3.7E-05	9.7E-05	5.0E-01	2E-05	5E-05
	Cobalt	Thyroid	5.7E+00	1.2E-04	2.8E-04	3.0E-04	4E-01	9E-01					
	Copper	--	2.5E+00	5.2E-05	1.2E-04	4.0E-02	1E-03	3E-03					
	Iron	Gastrointestinal	3.1E+04	6.5E-01	1.5E+00	7.0E-01	9E-01	2E+00					
	Manganese	Nervous	7.3E+03	1.5E-01	3.7E-01	2.4E-02	6E+00	**2E+01**					
	Nickel	Systemic	7.8E+00	1.6E-04	3.9E-04	2.0E-02	8E-03	2E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	4.3E+00	9.1E-05	2.2E-04	5.0E-03	2E-02	4E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Residents**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME		HIFs	CTE	RME
Noncancer	2.10E-02	4.99E-02	*Based on child HIFs*			
Cancer	2.25E-03	1.28E-02	*Based on TWA HIFs*	Cancer MMOA	2.88E-02	7.61E-02

Well ID	COPC	Endpoint	EPC	Non-Cancer DI (mg/kg-d)		RfD	HQ		Cancer DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
TW2R	TEQ	Reproductive	1.9E-06	3.9E-11	9.3E-11	7.0E-10	6E-02	1E-01	4.2E-12	2.4E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	8.0E+01	1.7E-03	4.0E-03	1.0E+00	2E-03	4E-03					
	Antimony	Systemic	1.5E-01	3.2E-06	7.5E-06	4.0E-04	8E-03	2E-02					
	Arsenic	Dermal	7.0E+00	1.5E-04	3.5E-04	3.0E-04	5E-01	1E+00	1.6E-05	8.9E-05	1.5E+00	2E-05	1E-04
	Barium	Kidney	6.7E+01	1.4E-03	3.4E-03	2.0E-01	7E-03	2E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	1.9E+00	3.9E-05	9.3E-05	3.0E-03	1E-02	3E-02	5.4E-05	1.4E-04	5.0E-01	3E-05	7E-05
	Cobalt	Thyroid	4.0E-01	8.4E-06	2.0E-05	3.0E-04	3E-02	7E-02					
	Copper	--	2.0E+00	4.2E-05	9.9E-05	4.0E-02	1E-03	2E-03					
	Iron	Gastrointestinal	1.8E+04	3.8E-01	9.0E-01	7.0E-01	5E-01	1E+00					
	Manganese	Nervous	1.6E+03	3.4E-02	8.0E-02	2.4E-02	1E+00	3E+00					
	Nickel	Systemic	1.6E+00	3.3E-05	7.8E-05	2.0E-02	2E-03	4E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.8E+01	3.8E-04	9.0E-04	5.0E-03	8E-02	2E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
TW5R	TEQ	Reproductive	1.5E-06	3.2E-11	7.5E-11	7.0E-10	5E-02	1E-01	3.4E-12	1.9E-11	1.3E+05	4E-07	3E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	4.6E+02	9.6E-03	2.3E-02	1.0E+00	1E-02	2E-02					
	Antimony	Systemic	3.0E-01	6.2E-06	1.5E-05	4.0E-04	2E-02	4E-02					
	Arsenic	Dermal	4.6E+00	9.6E-05	2.3E-04	3.0E-04	3E-01	8E-01	1.0E-05	5.9E-05	1.5E+00	2E-05	9E-05
	Barium	Kidney	1.0E+02	2.2E-03	5.2E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	5.8E-02	1.2E-06	2.9E-06	2.0E-03	6E-04	1E-03					
	Cadmium	Kidney	3.0E-02	6.4E-07	1.5E-06	5.0E-04	1E-03	3E-03					
	Chromium	--	6.5E-01	1.4E-05	3.2E-05	3.0E-03	5E-03	1E-02	1.9E-05	5.0E-05	5.0E-01	9E-06	2E-05
	Cobalt	Thyroid	6.0E-01	1.3E-05	3.0E-05	3.0E-04	4E-02	1E-01					
	Copper	--	4.6E+00	9.7E-05	2.3E-04	4.0E-02	2E-03	6E-03					
	Iron	Gastrointestinal	3.6E+03	7.6E-02	1.8E-01	7.0E-01	1E-01	3E-01					
	Manganese	Nervous	6.9E+02	1.5E-02	3.4E-02	2.4E-02	6E-01	1E+00					
	Nickel	Systemic	2.0E+00	4.1E-05	9.8E-05	2.0E-02	2E-03	5E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.9E+00	6.1E-05	1.4E-04	5.0E-03	1E-02	3E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
Waste Water Clarifier Well	TEQ	Reproductive	1.4E-06	3.0E-11	7.1E-11	7.0E-10	4E-02	1E-01	3.2E-12	1.8E-11	1.3E+05	4E-07	2E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	6.5E+01	1.4E-03	3.3E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	8.2E-01	1.7E-05	4.1E-05	4.0E-04	4E-02	1E-01					
	Arsenic	Dermal	2.8E+01	5.8E-04	1.4E-03	3.0E-04	2E+00	5E+00	6.2E-05	3.5E-04	1.5E+00	9E-05	5E-04
	Barium	Kidney	2.9E+02	6.1E-03	1.5E-02	2.0E-01	3E-02	7E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	5.8E-01	1.2E-05	2.9E-05	5.0E-04	2E-02	6E-02					
	Chromium	--	2.3E+00	4.8E-05	1.1E-04	3.0E-03	2E-02	4E-02	6.6E-05	1.7E-04	5.0E-01	3E-05	9E-05
	Cobalt	Thyroid	1.3E+01	2.6E-04	6.2E-04	3.0E-04	9E-01	2E+00					
	Copper	--	1.6E+01	3.4E-04	8.1E-04	4.0E-02	9E-03	2E-02					
	Iron	Gastrointestinal	1.1E+04	2.4E-01	5.6E-01	7.0E-01	3E-01	8E-01					
	Manganese	Nervous	2.0E+03	4.2E-02	9.9E-02	2.4E-02	2E+00	4E+00					
	Nickel	Systemic	8.8E+00	1.9E-04	4.4E-04	2.0E-02	9E-03	2E-02					
	Thallium	Dermal	1.7E-01	3.6E-06	8.5E-06	1.0E-05	4E-01	8E-01					
	Vanadium	Dermal	1.6E+01	3.3E-04	7.9E-04	5.0E-03	7E-02	2E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

NA = not analyzed; NC = not calculated; ND = not detected

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
ATMW6	TEQ	Reproductive	2.2E-06	1.0E-11	2.3E-11	7.0E-10	1E-02	3E-02	1.3E-12	8.4E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	3.1E+02	1.4E-03	3.3E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	2.7E-01	1.3E-06	2.9E-06	4.0E-04	3E-03	7E-03					
	Arsenic	Dermal	8.2E+00	3.8E-05	8.8E-05	3.0E-04	1E-01	3E-01	4.9E-06	3.1E-05	1.5E+00	7E-06	5E-05
	Barium	Kidney	9.1E+01	4.3E-04	9.8E-04	2.0E-01	2E-03	5E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	5.1E-02	2.4E-07	5.5E-07	5.0E-04	5E-04	1E-03					
	Chromium	--	2.4E+00	1.1E-05	2.6E-05	3.0E-03	4E-03	9E-03	1.4E-06	9.2E-06	5.0E-01	7E-07	5E-06
	Cobalt	Thyroid	1.7E-01	7.8E-07	1.8E-06	3.0E-04	3E-03	6E-03					
	Copper	--	6.6E+00	3.1E-05	7.0E-05	4.0E-02	8E-04	2E-03					
	Iron	Gastrointestinal	3.7E+03	1.8E-02	4.0E-02	7.0E-01	3E-02	6E-02					
	Manganese	Nervous	3.2E+03	1.5E-02	3.4E-02	2.4E-02	6E-01	1E+00					
	Nickel	Systemic	1.2E+00	5.7E-06	1.3E-05	2.0E-02	3E-04	7E-04					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.2E+01	5.6E-05	1.3E-04	5.0E-03	1E-02	3E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
NFMW1d	TEQ	Reproductive	2.0E-06	9.3E-12	2.1E-11	7.0E-10	1E-02	3E-02	1.2E-12	7.6E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.3E+02	5.9E-04	1.3E-03	1.0E+00	6E-04	1E-03					
	Antimony	Systemic	4.2E-01	2.0E-06	4.5E-06	4.0E-04	5E-03	1E-02					
	Arsenic	Dermal	2.1E+01	9.6E-05	2.2E-04	3.0E-04	3E-01	7E-01	1.2E-05	7.9E-05	1.5E+00	2E-05	1E-04
	Barium	Kidney	5.4E+02	2.5E-03	5.7E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	1.1E-01	5.2E-07	1.2E-06	2.0E-03	3E-04	6E-04					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	7.6E+00	3.6E-05	8.1E-05	3.0E-03	1E-02	3E-02	4.6E-06	2.9E-05	5.0E-01	2E-06	1E-05
	Cobalt	Thyroid	5.2E-01	2.5E-06	5.6E-06	3.0E-04	8E-03	2E-02					
	Copper	--	4.7E+01	2.2E-04	5.1E-04	4.0E-02	6E-03	1E-02					
	Iron	Gastrointestinal	1.7E+03	8.0E-03	1.8E-02	7.0E-01	1E-02	3E-02					
	Manganese	Nervous	4.1E+03	1.9E-02	4.4E-02	2.4E-02	8E-01	2E+00					
	Nickel	Systemic	1.1E+01	5.2E-05	1.2E-04	2.0E-02	3E-03	6E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	3.3E+01	1.6E-04	3.5E-04	5.0E-03	3E-02	7E-02					
	1,4-Dichlorobenzene	Liver	8.6E-01	4.0E-06	9.2E-06	7.0E-02	6E-05	1E-04	5.2E-07	3.3E-06	5.4E-03	3E-09	2E-08
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	2.9E-01	1.4E-06	3.1E-06	2.0E-02	7E-05	2E-04					
NFMW1s	TEQ	Reproductive	3.4E-06	1.6E-11	3.6E-11	7.0E-10	2E-02	5E-02	2.0E-12	1.3E-11	1.3E+05	3E-07	2E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	7.9E+03	3.7E-02	8.4E-02	1.0E+00	4E-02	8E-02					
	Antimony	Systemic	6.2E+00	2.9E-05	6.7E-05	4.0E-04	7E-02	2E-01					
	Arsenic	Dermal	2.1E+01	9.6E-05	2.2E-04	3.0E-04	3E-01	7E-01	1.2E-05	7.9E-05	1.5E+00	2E-05	1E-04
	Barium	Kidney	3.0E+02	1.4E-03	3.3E-03	2.0E-01	7E-03	2E-02					
	Beryllium	Gastrointestinal	7.3E-02	3.4E-07	7.8E-07	2.0E-03	2E-04	4E-04					
	Cadmium	Kidney	1.5E-01	7.2E-07	1.6E-06	5.0E-04	1E-03	3E-03					
	Chromium	--	1.8E+02	8.3E-04	1.9E-03	3.0E-03	3E-01	6E-01	1.1E-04	6.8E-04	5.0E-01	5E-05	3E-04
	Cobalt	Thyroid	3.8E+00	1.8E-05	4.1E-05	3.0E-04	6E-02	1E-01					
	Copper	--	1.1E+02	5.1E-04	1.2E-03	4.0E-02	1E-02	3E-02					
	Iron	Gastrointestinal	1.2E+03	5.4E-03	1.2E-02	7.0E-01	8E-03	2E-02					
	Manganese	Nervous	1.3E+02	6.3E-04	1.4E-03	2.4E-02	3E-02	6E-02					
	Nickel	Systemic	5.2E+01	2.4E-04	5.5E-04	2.0E-02	1E-02	3E-02					
	Thallium	Dermal	2.2E-01	1.0E-06	2.4E-06	1.0E-05	1E-01	2E-01					
	Vanadium	Dermal	1.2E+02	5.8E-04	1.3E-03	5.0E-03	1E-01	3E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW2	TEQ	Reproductive	1.6E-06	7.5E-12	1.7E-11	7.0E-10	1E-02	2E-02	9.7E-13	6.1E-12	1.3E+05	1E-07	8E-07
	Aroclor-1260	--	1.4E-01	6.7E-07	1.5E-06		--	--	8.6E-08	5.5E-07	2.0E+00	2E-07	1E-06
	Aluminum	Nervous	2.4E+02	1.1E-03	2.5E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	2.0E-01	9.3E-07	2.1E-06	4.0E-04	2E-03	5E-03					
	Arsenic	Dermal	1.2E+01	5.5E-05	1.3E-04	3.0E-04	2E-01	4E-01	7.1E-06	4.5E-05	1.5E+00	1E-05	7E-05
	Barium	Kidney	2.0E+02	9.6E-04	2.2E-03	2.0E-01	5E-03	1E-02					
	Beryllium	Gastrointestinal	7.5E-02	3.5E-07	8.0E-07	2.0E-03	2E-04	4E-04					
	Cadmium	Kidney	5.2E-02	2.4E-07	5.6E-07	5.0E-04	5E-04	1E-03					
	Chromium	--	5.5E-01	2.6E-06	5.9E-06	3.0E-03	9E-04	2E-03	3.3E-07	2.1E-06	5.0E-01	2E-07	1E-06
	Cobalt	Thyroid	2.6E-01	1.2E-06	2.8E-06	3.0E-04	4E-03	9E-03					
	Copper	--	2.2E+00	1.0E-05	2.3E-05	4.0E-02	3E-04	6E-04					
	Iron	Gastrointestinal	6.9E+03	3.2E-02	7.4E-02	7.0E-01	5E-02	1E-01					
	Manganese	Nervous	5.0E+03	2.3E-02	5.3E-02	2.4E-02	1E+00	2E+00					
	Nickel	Systemic	2.1E+00	9.7E-06	2.2E-05	2.0E-02	5E-04	1E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	4.8E+00	2.2E-05	5.1E-05	5.0E-03	4E-03	1E-02					
	1,4-Dichlorobenzene	Liver	2.8E+01	1.3E-04	3.0E-04	7.0E-02	2E-03	4E-03	1.7E-05	1.1E-04	5.4E-03	9E-08	6E-07
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	3.8E-01	1.8E-06	4.1E-06	2.0E-02	9E-05	2E-04					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
NFMW3	TEQ	Reproductive	1.5E-06	7.0E-12	1.6E-11	7.0E-10	1E-02	2E-02	9.0E-13	5.7E-12	1.3E+05	1E-07	7E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	6.3E+01	3.0E-04	6.7E-04	1.0E+00	3E-04	7E-04					
	Antimony	Systemic	1.7E-01	8.1E-07	1.9E-06	4.0E-04	2E-03	5E-03					
	Arsenic	Dermal	5.9E+00	2.8E-05	6.3E-05	3.0E-04	9E-02	2E-01	3.6E-06	2.3E-05	1.5E+00	5E-06	3E-05
	Barium	Kidney	1.1E+03	5.0E-03	1.1E-02	2.0E-01	2E-02	6E-02					
	Beryllium	Gastrointestinal	1.3E-01	5.9E-07	1.3E-06	2.0E-03	3E-04	7E-04					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	5.0E+00	2.3E-05	5.3E-05	3.0E-03	8E-03	2E-02	3.0E-06	1.9E-05	5.0E-01	2E-06	1E-05
	Cobalt	Thyroid	1.1E+00	5.2E-06	1.2E-05	3.0E-04	2E-02	4E-02					
	Copper	--	5.5E-01	2.6E-06	5.9E-06	4.0E-02	6E-05	1E-04					
	Iron	Gastrointestinal	7.5E+03	3.5E-02	8.1E-02	7.0E-01	5E-02	1E-01					
	Manganese	Nervous	6.9E+03	3.2E-02	7.3E-02	2.4E-02	1E+00	3E+00					
	Nickel	Systemic	5.3E+00	2.5E-05	5.7E-05	2.0E-02	1E-03	3E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.3E+01	5.9E-05	1.3E-04	5.0E-03	1E-02	3E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
NFMW4	TEQ	Reproductive	1.6E-06	7.4E-12	1.7E-11	7.0E-10	1E-02	2E-02	9.5E-13	6.0E-12	1.3E+05	1E-07	8E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.9E+01	1.4E-04	3.1E-04	1.0E+00	1E-04	3E-04					
	Antimony	Systemic	2.1E-01	9.9E-07	2.3E-06	4.0E-04	2E-03	6E-03					
	Arsenic	Dermal	3.7E+00	1.7E-05	4.0E-05	3.0E-04	6E-02	1E-01	2.2E-06	1.4E-05	1.5E+00	3E-06	2E-05
	Barium	Kidney	1.4E+02	6.4E-04	1.5E-03	2.0E-01	3E-03	7E-03					
	Beryllium	Gastrointestinal	7.3E-02	3.4E-07	7.8E-07	2.0E-03	2E-04	4E-04					
	Cadmium	Kidney	3.1E-02	1.4E-07	3.3E-07	5.0E-04	3E-04	7E-04					
	Chromium	--	9.9E-01	4.7E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.0E-07	3.8E-06	5.0E-01	3E-07	2E-06
	Cobalt	Thyroid	2.7E-01	1.2E-06	2.8E-06	3.0E-04	4E-03	9E-03					
	Copper	--	1.8E+00	8.3E-06	1.9E-05	4.0E-02	2E-04	5E-04					
	Iron	Gastrointestinal	1.4E+04	6.5E-02	1.5E-01	7.0E-01	9E-02	2E-01					
	Manganese	Nervous	7.4E+03	3.5E-02	7.9E-02	2.4E-02	1E+00	3E+00					
	Nickel	Systemic	6.0E-01	2.8E-06	6.4E-06	2.0E-02	1E-04	3E-04					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.4E+00	6.8E-06	1.5E-05	5.0E-03	1E-03	3E-03					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
NFMW7	TEQ	Reproductive	1.6E-06	7.7E-12	1.8E-11	7.0E-10	1E-02	3E-02	9.9E-13	6.3E-12	1.3E+05	1E-07	8E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.7E+02	8.0E-04	1.8E-03	1.0E+00	8E-04	2E-03					
	Antimony	Systemic	1.5E+00	7.2E-06	1.7E-05	4.0E-04	2E-02	4E-02					
	Arsenic	Dermal	6.8E+00	3.2E-05	7.2E-05	3.0E-04	1E-01	2E-01	4.1E-06	2.6E-05	1.5E+00	6E-06	4E-05
	Barium	Kidney	1.2E+02	5.6E-04	1.3E-03	2.0E-01	3E-03	6E-03					
	Beryllium	Gastrointestinal	6.5E-02	3.0E-07	7.0E-07	2.0E-03	2E-04	3E-04					
	Cadmium	Kidney	8.7E-02	4.1E-07	9.3E-07	5.0E-04	8E-04	2E-03					
	Chromium	--	3.5E+00	1.6E-05	3.7E-05	3.0E-03	5E-03	1E-02	2.1E-06	1.3E-05	5.0E-01	1E-06	7E-06
	Cobalt	Thyroid	1.5E+00	7.0E-06	1.6E-05	3.0E-04	2E-02	5E-02					
	Copper	--	8.8E+00	4.1E-05	9.5E-05	4.0E-02	1E-03	2E-03					
	Iron	Gastrointestinal	8.2E+02	3.8E-03	8.8E-03	7.0E-01	5E-03	1E-02					
	Manganese	Nervous	3.4E+02	1.6E-03	3.7E-03	2.4E-02	7E-02	2E-01					
	Nickel	Systemic	3.2E+00	1.5E-05	3.4E-05	2.0E-02	7E-04	2E-03					
	Thallium	Dermal	1.9E-01	8.9E-07	2.0E-06	1.0E-05	9E-02	2E-01					
	Vanadium	Dermal	2.0E+01	9.4E-05	2.2E-04	5.0E-03	2E-02	4E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW8	TEQ	Reproductive	1.5E-06	6.9E-12	1.6E-11	7.0E-10	1E-02	2E-02	8.9E-13	5.6E-12	1.3E+05	1E-07	7E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	9.0E+01	4.2E-04	9.7E-04	1.0E+00	4E-04	1E-03					
	Antimony	Systemic	8.6E-02	4.0E-07	9.2E-07	4.0E-04	1E-03	2E-03					
	Arsenic	Dermal	4.5E+00	2.1E-05	4.8E-05	3.0E-04	7E-02	2E-01	2.7E-06	1.7E-05	1.5E+00	4E-06	3E-05
	Barium	Kidney	1.2E+03	5.5E-03	1.3E-02	2.0E-01	3E-02	6E-02					
	Beryllium	Gastrointestinal	8.4E-02	3.9E-07	8.9E-07	2.0E-03	2E-04	4E-04					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	3.2E+00	1.5E-05	3.5E-05	3.0E-03	5E-03	1E-02	1.9E-06	1.2E-05	5.0E-01	1E-06	6E-06
	Cobalt	Thyroid	7.9E-01	3.7E-06	8.4E-06	3.0E-04	1E-02	3E-02					
	Copper	--	2.6E+00	1.2E-05	2.8E-05	4.0E-02	3E-04	7E-04					
	Iron	Gastrointestinal	3.9E+03	1.8E-02	4.2E-02	7.0E-01	3E-02	6E-02					
	Manganese	Nervous	9.7E+03	4.6E-02	1.0E-01	2.4E-02	2E+00	4E+00					
	Nickel	Systemic	4.9E+00	2.3E-05	5.3E-05	2.0E-02	1E-03	3E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	7.5E+00	3.5E-05	8.1E-05	5.0E-03	7E-03	2E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
NFMW9	TEQ	Reproductive	1.0E-05	4.7E-11	1.1E-10	7.0E-10	7E-02	2E-01	6.1E-12	3.9E-11	1.3E+05	8E-07	5E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.8E+02	8.6E-04	2.0E-03	1.0E+00	9E-04	2E-03					
	Antimony	Systemic	7.9E-01	3.7E-06	8.5E-06	4.0E-04	9E-03	2E-02					
	Arsenic	Dermal	2.7E+01	1.2E-04	2.8E-04	3.0E-04	4E-01	9E-01	1.6E-05	1.0E-04	1.5E+00	2E-05	2E-04
	Barium	Kidney	5.5E+02	2.6E-03	5.8E-03	2.0E-01	1E-02	3E-02					
	Beryllium	Gastrointestinal	3.1E-01	1.5E-06	3.3E-06	2.0E-03	7E-04	2E-03					
	Cadmium	Kidney	1.8E-01	8.3E-07	1.9E-06	5.0E-04	2E-03	4E-03					
	Chromium	--	1.1E+01	5.1E-05	1.2E-04	3.0E-03	2E-02	4E-02	6.5E-06	4.1E-05	5.0E-01	3E-06	2E-05
	Cobalt	Thyroid	3.8E+01	1.8E-04	4.1E-04	3.0E-04	6E-01	1E+00					
	Copper	--	3.2E+01	1.5E-04	3.4E-04	4.0E-02	4E-03	9E-03					
	Iron	Gastrointestinal	3.5E+04	1.6E-01	3.7E-01	7.0E-01	2E-01	5E-01					
	Manganese	Nervous	8.8E+03	4.1E-02	9.4E-02	2.4E-02	2E+00	4E+00					
	Nickel	Systemic	1.6E+01	7.7E-05	1.8E-04	2.0E-02	4E-03	9E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.7E+01	1.3E-04	2.9E-04	5.0E-03	3E-02	6E-02					
	1,4-Dichlorobenzene	Liver	1.3E+00	6.0E-06	1.4E-05	7.0E-02	9E-05	2E-04	7.7E-07	4.9E-06	5.4E-03	4E-09	3E-08
	Benzene	Immune	5.1E-01	2.4E-06	5.4E-06	4.0E-03	6E-04	1E-03	3.0E-07	1.9E-06	5.5E-02	2E-08	1E-07
	Chlorobenzene	Liver	1.0E+02	4.9E-04	1.1E-03	2.0E-02	2E-02	6E-02					
NFMW10	TEQ	Reproductive	2.4E-06	1.1E-11	2.6E-11	7.0E-10	2E-02	4E-02	1.4E-12	9.2E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.6E+02	7.4E-04	1.7E-03	1.0E+00	7E-04	2E-03					
	Antimony	Systemic	5.2E-01	2.4E-06	5.5E-06	4.0E-04	6E-03	1E-02					
	Arsenic	Dermal	1.7E+01	8.1E-05	1.9E-04	3.0E-04	3E-01	6E-01	1.0E-05	6.6E-05	1.5E+00	2E-05	1E-04
	Barium	Kidney	2.9E+02	1.4E-03	3.2E-03	2.0E-01	7E-03	2E-02					
	Beryllium	Gastrointestinal	1.3E-01	6.1E-07	1.4E-06	2.0E-03	3E-04	7E-04					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	6.1E+00	2.9E-05	6.5E-05	3.0E-03	1E-02	2E-02	3.7E-06	2.3E-05	5.0E-01	2E-06	1E-05
	Cobalt	Thyroid	6.7E-01	3.1E-06	7.1E-06	3.0E-04	1E-02	2E-02					
	Copper	--	3.3E+00	1.6E-05	3.6E-05	4.0E-02	4E-04	9E-04					
	Iron	Gastrointestinal	2.6E+03	1.2E-02	2.7E-02	7.0E-01	2E-02	4E-02					
	Manganese	Nervous	7.6E+03	3.5E-02	8.1E-02	2.4E-02	1E+00	3E+00					
	Nickel	Systemic	5.6E+00	2.6E-05	6.0E-05	2.0E-02	1E-03	3E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	3.4E+01	1.6E-04	3.6E-04	5.0E-03	3E-02	7E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW11	TEQ	Reproductive	2.0E-06	9.3E-12	2.1E-11	7.0E-10	1E-02	3E-02	1.2E-12	7.6E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.8E+01	1.3E-04	3.0E-04	1.0E+00	1E-04	3E-04					
	Antimony	Systemic	ND	--	--	4.0E-04	--	--					
	Arsenic	Dermal	3.7E+00	1.7E-05	4.0E-05	3.0E-04	6E-02	1E-01	2.2E-06	1.4E-05	1.5E+00	3E-06	2E-05
	Barium	Kidney	1.9E+02	8.9E-04	2.0E-03	2.0E-01	4E-03	1E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	9.2E-01	4.3E-06	9.8E-06	3.0E-03	1E-03	3E-03	5.5E-07	3.5E-06	5.0E-01	3E-07	2E-06
	Cobalt	Thyroid	3.2E-01	1.5E-06	3.4E-06	3.0E-04	5E-03	1E-02					
	Copper	--	2.3E-01	1.1E-06	2.5E-06	4.0E-02	3E-05	6E-05					
	Iron	Gastrointestinal	5.2E+02	2.4E-03	5.5E-03	7.0E-01	3E-03	8E-03					
	Manganese	Nervous	4.2E+03	2.0E-02	4.5E-02	2.4E-02	8E-01	2E+00					
	Nickel	Systemic	2.4E+00	1.1E-05	2.6E-05	2.0E-02	6E-04	1E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	3.0E+00	1.4E-05	3.2E-05	5.0E-03	3E-03	6E-03					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW12	TEQ	Reproductive	1.2E-06	5.5E-12	1.2E-11	7.0E-10	8E-03	2E-02	7.0E-13	4.5E-12	1.3E+05	9E-08	6E-07
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.0E+02	9.2E-04	2.1E-03	1.0E+00	9E-04	2E-03					
	Antimony	Systemic	1.0E-01	4.9E-07	1.1E-06	4.0E-04	1E-03	3E-03					
	Arsenic	Dermal	1.8E+00	8.2E-06	1.9E-05	3.0E-04	3E-02	6E-02	1.1E-06	6.7E-06	1.5E+00	2E-06	1E-05
	Barium	Kidney	8.8E+01	4.1E-04	9.5E-04	2.0E-01	2E-03	5E-03					
	Beryllium	Gastrointestinal	5.8E-02	2.7E-07	6.2E-07	2.0E-03	1E-04	3E-04					
	Cadmium	Kidney	2.7E-01	1.3E-06	2.9E-06	5.0E-04	3E-03	6E-03					
	Chromium	--	3.2E-01	1.5E-06	3.4E-06	3.0E-03	5E-04	1E-03	1.9E-07	1.2E-06	5.0E-01	9E-08	6E-07
	Cobalt	Thyroid	2.1E+00	9.7E-06	2.2E-05	3.0E-04	3E-02	7E-02					
	Copper	--	1.3E+00	6.2E-06	1.4E-05	4.0E-02	2E-04	4E-04					
	Iron	Gastrointestinal	1.4E+04	6.6E-02	1.5E-01	7.0E-01	9E-02	2E-01					
	Manganese	Nervous	6.3E+03	3.0E-02	6.7E-02	2.4E-02	1E+00	3E+00					
	Nickel	Systemic	1.2E+01	5.5E-05	1.3E-04	2.0E-02	3E-03	6E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	6.7E-01	3.2E-06	7.2E-06	5.0E-03	6E-04	1E-03					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
NFMW19	TEQ	Reproductive	1.4E-06	6.5E-12	1.5E-11	7.0E-10	9E-03	2E-02	8.3E-13	5.3E-12	1.3E+05	1E-07	7E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.3E+04	6.0E-02	1.4E-01	1.0E+00	6E-02	1E-01					
	Antimony	Systemic	ND	--	--	4.0E-04	--	--					
	Arsenic	Dermal	4.6E+00	2.2E-05	4.9E-05	3.0E-04	7E-02	2E-01	2.8E-06	1.8E-05	1.5E+00	4E-06	3E-05
	Barium	Kidney	3.7E+01	1.7E-04	3.9E-04	2.0E-01	9E-04	2E-03					
	Beryllium	Gastrointestinal	3.0E+00	1.4E-05	3.3E-05	2.0E-03	7E-03	2E-02					
	Cadmium	Kidney	9.6E-01	4.5E-06	1.0E-05	5.0E-04	9E-03	2E-02					
	Chromium	--	1.5E+00	6.9E-06	1.6E-05	3.0E-03	2E-03	5E-03	8.8E-07	5.6E-06	5.0E-01	4E-07	3E-06
	Cobalt	Thyroid	8.7E+01	4.1E-04	9.3E-04	3.0E-04	1E+00	3E+00					
	Copper	--	2.2E+01	1.0E-04	2.4E-04	4.0E-02	3E-03	6E-03					
	Iron	Gastrointestinal	4.4E+04	2.1E-01	4.7E-01	7.0E-01	3E-01	7E-01					
	Manganese	Nervous	4.7E+04	2.2E-01	5.0E-01	2.4E-02	9E+00	2E+01					
	Nickel	Systemic	4.3E+01	2.0E-04	4.6E-04	2.0E-02	1E-02	2E-02					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.5E+00	1.2E-05	2.6E-05	5.0E-03	2E-03	5E-03					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW20	TEQ	Reproductive	2.0E-06	9.3E-12	2.1E-11	7.0E-10	1E-02	3E-02	1.2E-12	7.6E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	5.0E+01	2.4E-04	5.4E-04	1.0E+00	2E-04	5E-04					
	Antimony	Systemic	2.3E-01	1.1E-06	2.4E-06	4.0E-04	3E-03	6E-03					
	Arsenic	Dermal	4.7E+00	2.2E-05	5.0E-05	3.0E-04	7E-02	2E-01	2.8E-06	1.8E-05	1.5E+00	4E-06	3E-05
	Barium	Kidney	5.8E+01	2.7E-04	6.2E-04	2.0E-01	1E-03	3E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	2.2E+00	1.0E-05	2.3E-05	3.0E-03	3E-03	8E-03	1.3E-06	8.4E-06	5.0E-01	7E-07	4E-06
	Cobalt	Thyroid	7.4E-01	3.4E-06	7.9E-06	3.0E-04	1E-02	3E-02					
	Copper	--	1.6E+00	7.4E-06	1.7E-05	4.0E-02	2E-04	4E-04					
	Iron	Gastrointestinal	6.7E+03	3.1E-02	7.2E-02	7.0E-01	4E-02	1E-01					
	Manganese	Nervous	1.4E+04	6.7E-02	1.5E-01	2.4E-02	3E+00	6E+00					
	Nickel	Systemic	3.6E+00	1.7E-05	3.9E-05	2.0E-02	8E-04	2E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	5.7E+00	2.7E-05	6.1E-05	5.0E-03	5E-03	1E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW22	TEQ	Reproductive	2.3E-06	1.1E-11	2.5E-11	7.0E-10	2E-02	4E-02	1.4E-12	8.8E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.7E+02	8.0E-04	1.8E-03	1.0E+00	8E-04	2E-03					
	Antimony	Systemic	6.8E-01	3.2E-06	7.3E-06	4.0E-04	8E-03	2E-02					
	Arsenic	Dermal	1.4E+01	6.7E-05	1.5E-04	3.0E-04	2E-01	5E-01	8.6E-06	5.5E-05	1.5E+00	1E-05	8E-05
	Barium	Kidney	4.6E+01	2.2E-04	4.9E-04	2.0E-01	1E-03	2E-03					
	Beryllium	Gastrointestinal	1.3E-01	6.0E-07	1.4E-06	2.0E-03	3E-04	7E-04					
	Cadmium	Kidney	5.6E-02	2.6E-07	6.0E-07	5.0E-04	5E-04	1E-03					
	Chromium	--	4.2E+00	2.0E-05	4.5E-05	3.0E-03	7E-03	1E-02	2.5E-06	1.6E-05	5.0E-01	1E-06	8E-06
	Cobalt	Thyroid	4.5E-01	2.1E-06	4.8E-06	3.0E-04	7E-03	2E-02					
	Copper	--	5.0E+00	2.3E-05	5.3E-05	4.0E-02	6E-04	1E-03					
	Iron	Gastrointestinal	1.3E+03	6.3E-03	1.4E-02	7.0E-01	9E-03	2E-02					
	Manganese	Nervous	3.0E+03	1.4E-02	3.2E-02	2.4E-02	6E-01	1E+00					
	Nickel	Systemic	6.9E+00	3.2E-05	7.4E-05	2.0E-02	2E-03	4E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	3.5E+01	1.7E-04	3.8E-04	5.0E-03	3E-02	8E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
NFMW23	TEQ	Reproductive	2.2E-06	1.0E-11	2.3E-11	7.0E-10	1E-02	3E-02	1.3E-12	8.3E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.7E+02	8.1E-04	1.8E-03	1.0E+00	8E-04	2E-03					
	Antimony	Systemic	1.1E+00	5.1E-06	1.2E-05	4.0E-04	1E-02	3E-02					
	Arsenic	Dermal	7.2E+01	3.4E-04	7.7E-04	3.0E-04	1E+00	3E+00	4.4E-05	2.8E-04	1.5E+00	7E-05	4E-04
	Barium	Kidney	1.2E+02	5.8E-04	1.3E-03	2.0E-01	3E-03	7E-03					
	Beryllium	Gastrointestinal	6.4E-02	3.0E-07	6.9E-07	2.0E-03	2E-04	3E-04					
	Cadmium	Kidney	1.5E-01	6.9E-07	1.6E-06	5.0E-04	1E-03	3E-03					
	Chromium	--	3.9E+00	1.8E-05	4.2E-05	3.0E-03	6E-03	1E-02	2.4E-06	1.5E-05	5.0E-01	1E-06	7E-06
	Cobalt	Thyroid	7.3E-01	3.4E-06	7.8E-06	3.0E-04	1E-02	3E-02					
	Copper	--	1.6E+01	7.6E-05	1.7E-04	4.0E-02	2E-03	4E-03					
	Iron	Gastrointestinal	1.1E+04	5.0E-02	1.1E-01	7.0E-01	7E-02	2E-01					
	Manganese	Nervous	4.8E+03	2.3E-02	5.2E-02	2.4E-02	9E-01	2E+00					
	Nickel	Systemic	6.8E+00	3.2E-05	7.3E-05	2.0E-02	2E-03	4E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	5.5E+01	2.6E-04	5.9E-04	5.0E-03	5E-02	1E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
SMW7	TEQ	Reproductive	1.6E-06	7.6E-12	1.7E-11	7.0E-10	1E-02	2E-02	9.7E-13	6.2E-12	1.3E+05	1E-07	8E-07
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	6.0E+00	2.8E-05	6.4E-05	1.0E+00	3E-05	6E-05					
	Antimony	Systemic	1.7E-01	8.0E-07	1.8E-06	4.0E-04	2E-03	5E-03					
	Arsenic	Dermal	3.4E+00	1.6E-05	3.6E-05	3.0E-04	5E-02	1E-01	2.0E-06	1.3E-05	1.5E+00	3E-06	2E-05
	Barium	Kidney	1.1E+02	5.3E-04	1.2E-03	2.0E-01	3E-03	6E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	6.7E-02	3.2E-07	7.2E-07	5.0E-04	6E-04	1E-03					
	Chromium	--	3.4E-01	1.6E-06	3.7E-06	3.0E-03	5E-04	1E-03	2.1E-07	1.3E-06	5.0E-01	1E-07	7E-07
	Cobalt	Thyroid	2.7E+00	1.3E-05	2.9E-05	3.0E-04	4E-02	1E-01					
	Copper	--	5.3E+00	2.5E-05	5.6E-05	4.0E-02	6E-04	1E-03					
	Iron	Gastrointestinal	4.7E+01	2.2E-04	5.0E-04	7.0E-01	3E-04	7E-04					
	Manganese	Nervous	9.6E+02	4.5E-03	1.0E-02	2.4E-02	2E-01	4E-01					
	Nickel	Systemic	1.5E+00	7.0E-06	1.6E-05	2.0E-02	4E-04	8E-04					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.2E+00	1.0E-05	2.4E-05	5.0E-03	2E-03	5E-03					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW8	TEQ	Reproductive	1.8E-06	8.5E-12	1.9E-11	7.0E-10	1E-02	3E-02	1.1E-12	6.9E-12	1.3E+05	1E-07	9E-07
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	4.3E+02	2.0E-03	4.6E-03	1.0E+00	2E-03	5E-03					
	Antimony	Systemic	9.3E-02	4.4E-07	1.0E-06	4.0E-04	1E-03	2E-03					
	Arsenic	Dermal	6.3E+00	3.0E-05	6.8E-05	3.0E-04	1E-01	2E-01	3.8E-06	2.4E-05	1.5E+00	6E-06	4E-05
	Barium	Kidney	1.0E+02	4.8E-04	1.1E-03	2.0E-01	2E-03	5E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	2.5E-01	1.2E-06	2.7E-06	3.0E-03	4E-04	9E-04	1.5E-07	9.5E-07	5.0E-01	8E-08	5E-07
	Cobalt	Thyroid	9.2E-02	4.3E-07	9.8E-07	3.0E-04	1E-03	3E-03					
	Copper	--	1.3E+01	5.9E-05	1.4E-04	4.0E-02	1E-03	3E-03					
	Iron	Gastrointestinal	1.5E+03	6.9E-03	1.6E-02	7.0E-01	1E-02	2E-02					
	Manganese	Nervous	1.1E+03	5.0E-03	1.2E-02	2.4E-02	2E-01	5E-01					
	Nickel	Systemic	3.5E-01	1.7E-06	3.8E-06	2.0E-02	8E-05	2E-04					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	5.5E-01	2.6E-06	5.9E-06	5.0E-03	5E-04	1E-03					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW9	TEQ	Reproductive	1.9E-06	8.8E-12	2.0E-11	7.0E-10	1E-02	3E-02	1.1E-12	7.2E-12	1.3E+05	1E-07	9E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	3.0E+01	1.4E-04	3.2E-04	1.0E+00	1E-04	3E-04					
	Antimony	Systemic	5.2E-01	2.4E-06	5.6E-06	4.0E-04	6E-03	1E-02					
	Arsenic	Dermal	9.8E+00	4.6E-05	1.0E-04	3.0E-04	2E-01	3E-01	5.9E-06	3.7E-05	1.5E+00	9E-06	6E-05
	Barium	Kidney	5.3E+01	2.5E-04	5.7E-04	2.0E-01	1E-03	3E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	4.7E-02	2.2E-07	5.1E-07	5.0E-04	4E-04	1E-03					
	Chromium	--	6.4E-01	3.0E-06	6.9E-06	3.0E-03	1E-03	2E-03	3.9E-07	2.5E-06	5.0E-01	2E-07	1E-06
	Cobalt	Thyroid	2.6E-01	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03					
	Copper	--	9.9E+00	4.6E-05	1.1E-04	4.0E-02	1E-03	3E-03					
	Iron	Gastrointestinal	4.7E+01	2.2E-04	5.0E-04	7.0E-01	3E-04	7E-04					
	Manganese	Nervous	2.1E+02	9.8E-04	2.2E-03	2.4E-02	4E-02	9E-02					
	Nickel	Systemic	4.1E+00	1.9E-05	4.4E-05	2.0E-02	1E-03	2E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	7.6E+00	3.6E-05	8.2E-05	5.0E-03	7E-03	2E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW10	TEQ	Reproductive	2.3E-06	1.1E-11	2.4E-11	7.0E-10	2E-02	3E-02	1.4E-12	8.7E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	7.8E+01	3.7E-04	8.4E-04	1.0E+00	4E-04	8E-04					
	Antimony	Systemic	5.3E-01	2.5E-06	5.7E-06	4.0E-04	6E-03	1E-02					
	Arsenic	Dermal	3.4E+01	1.6E-04	3.6E-04	3.0E-04	5E-01	1E+00	2.0E-05	1.3E-04	1.5E+00	3E-05	2E-04
	Barium	Kidney	1.0E+02	4.9E-04	1.1E-03	2.0E-01	2E-03	6E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	1.8E-02	8.4E-08	1.9E-07	5.0E-04	2E-04	4E-04					
	Chromium	--	2.0E+00	9.4E-06	2.1E-05	3.0E-03	3E-03	7E-03	1.2E-06	7.7E-06	5.0E-01	6E-07	4E-06
	Cobalt	Thyroid	3.7E-01	1.7E-06	3.9E-06	3.0E-04	6E-03	1E-02					
	Copper	--	3.3E+00	1.6E-05	3.5E-05	4.0E-02	4E-04	9E-04					
	Iron	Gastrointestinal	2.4E+03	1.1E-02	2.6E-02	7.0E-01	2E-02	4E-02					
	Manganese	Nervous	2.6E+03	1.2E-02	2.7E-02	2.4E-02	5E-01	1E+00					
	Nickel	Systemic	5.1E+00	2.4E-05	5.5E-05	2.0E-02	1E-03	3E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.5E+01	7.2E-05	1.6E-04	5.0E-03	1E-02	3E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
SMW11	TEQ	Reproductive	3.0E-06	1.4E-11	3.2E-11	7.0E-10	2E-02	5E-02	1.8E-12	1.1E-11	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.1E+02	9.6E-04	2.2E-03	1.0E+00	1E-03	2E-03					
	Antimony	Systemic	7.8E-01	3.7E-06	8.4E-06	4.0E-04	9E-03	2E-02					
	Arsenic	Dermal	4.0E+01	1.9E-04	4.3E-04	3.0E-04	6E-01	1E+00	2.4E-05	1.5E-04	1.5E+00	4E-05	2E-04
	Barium	Kidney	1.5E+02	7.1E-04	1.6E-03	2.0E-01	4E-03	8E-03					
	Beryllium	Gastrointestinal	1.1E-01	5.3E-07	1.2E-06	2.0E-03	3E-04	6E-04					
	Cadmium	Kidney	2.0E-02	9.4E-08	2.1E-07	5.0E-04	2E-04	4E-04					
	Chromium	--	4.3E+00	2.0E-05	4.6E-05	3.0E-03	7E-03	2E-02	2.6E-06	1.6E-05	5.0E-01	1E-06	8E-06
	Cobalt	Thyroid	1.0E+01	4.7E-05	1.1E-04	3.0E-04	2E-01	4E-01					
	Copper	--	1.0E+01	4.9E-05	1.1E-04	4.0E-02	1E-03	3E-03					
	Iron	Gastrointestinal	3.6E+03	1.7E-02	3.8E-02	7.0E-01	2E-02	5E-02					
	Manganese	Nervous	1.0E+04	4.8E-02	1.1E-01	2.4E-02	2E+00	5E+00					
	Nickel	Systemic	7.0E+00	3.3E-05	7.5E-05	2.0E-02	2E-03	4E-03					
	Thallium	Dermal	4.4E-02	2.1E-07	4.7E-07	1.0E-05	2E-02	5E-02					
	Vanadium	Dermal	2.4E+01	1.1E-04	2.5E-04	5.0E-03	2E-02	5E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW12	TEQ	Reproductive	3.2E-06	1.5E-11	3.4E-11	7.0E-10	2E-02	5E-02	1.9E-12	1.2E-11	1.3E+05	3E-07	2E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	3.3E+02	1.5E-03	3.5E-03	1.0E+00	2E-03	3E-03					
	Antimony	Systemic	4.7E-01	2.2E-06	5.0E-06	4.0E-04	5E-03	1E-02					
	Arsenic	Dermal	1.5E+01	7.3E-05	1.7E-04	3.0E-04	2E-01	6E-01	9.3E-06	5.9E-05	1.5E+00	1E-05	9E-05
	Barium	Kidney	1.1E+02	5.2E-04	1.2E-03	2.0E-01	3E-03	6E-03					
	Beryllium	Gastrointestinal	6.0E-02	2.8E-07	6.4E-07	2.0E-03	1E-04	3E-04					
	Cadmium	Kidney	1.0E-01	4.7E-07	1.1E-06	5.0E-04	9E-04	2E-03					
	Chromium	--	5.4E+00	2.5E-05	5.8E-05	3.0E-03	8E-03	2E-02	3.2E-06	2.1E-05	5.0E-01	2E-06	1E-05
	Cobalt	Thyroid	4.7E-01	2.2E-06	5.0E-06	3.0E-04	7E-03	2E-02					
	Copper	--	4.0E+00	1.9E-05	4.3E-05	4.0E-02	5E-04	1E-03					
	Iron	Gastrointestinal	8.1E+01	3.8E-04	8.6E-04	7.0E-01	5E-04	1E-03					
	Manganese	Nervous	4.0E+03	1.9E-02	4.2E-02	2.4E-02	8E-01	2E+00					
	Nickel	Systemic	7.6E+00	3.6E-05	8.1E-05	2.0E-02	2E-03	4E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.9E+01	8.9E-05	2.0E-04	5.0E-03	2E-02	4E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW13	TEQ	Reproductive	2.4E-06	1.1E-11	2.6E-11	7.0E-10	2E-02	4E-02	1.5E-12	9.3E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.2E+02	5.6E-04	1.3E-03	1.0E+00	6E-04	1E-03					
	Antimony	Systemic	4.1E-01	1.9E-06	4.3E-06	4.0E-04	5E-03	1E-02					
	Arsenic	Dermal	1.2E+01	5.6E-05	1.3E-04	3.0E-04	2E-01	4E-01	7.2E-06	4.6E-05	1.5E+00	1E-05	7E-05
	Barium	Kidney	1.4E+02	6.6E-04	1.5E-03	2.0E-01	3E-03	8E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	9.6E-02	4.5E-07	1.0E-06	5.0E-04	9E-04	2E-03					
	Chromium	--	1.7E+00	8.1E-06	1.9E-05	3.0E-03	3E-03	6E-03	1.0E-06	6.6E-06	5.0E-01	5E-07	3E-06
	Cobalt	Thyroid	9.0E+00	4.2E-05	9.7E-05	3.0E-04	1E-01	3E-01					
	Copper	--	3.7E+00	1.7E-05	4.0E-05	4.0E-02	4E-04	1E-03					
	Iron	Gastrointestinal	5.1E+03	2.4E-02	5.5E-02	7.0E-01	3E-02	8E-02					
	Manganese	Nervous	4.9E+03	2.3E-02	5.2E-02	2.4E-02	1E+00	2E+00					
	Nickel	Systemic	5.7E+00	2.7E-05	6.1E-05	2.0E-02	1E-03	3E-03					
	Thallium	Dermal	1.2E-02	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02					
	Vanadium	Dermal	1.8E+01	8.3E-05	1.9E-04	5.0E-03	2E-02	4E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW14	TEQ	Reproductive	2.2E-06	1.0E-11	2.3E-11	7.0E-10	1E-02	3E-02	1.3E-12	8.4E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.5E+02	1.2E-03	2.7E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	7.0E-01	3.3E-06	7.5E-06	4.0E-04	8E-03	2E-02					
	Arsenic	Dermal	2.2E+01	1.0E-04	2.3E-04	3.0E-04	3E-01	8E-01	1.3E-05	8.4E-05	1.5E+00	2E-05	1E-04
	Barium	Kidney	1.3E+02	5.9E-04	1.3E-03	2.0E-01	3E-03	7E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	1.2E-01	5.4E-07	1.2E-06	5.0E-04	1E-03	2E-03					
	Chromium	--	1.2E+00	5.4E-06	1.2E-05	3.0E-03	2E-03	4E-03	7.0E-07	4.4E-06	5.0E-01	3E-07	2E-06
	Cobalt	Thyroid	7.5E-01	3.5E-06	8.0E-06	3.0E-04	1E-02	3E-02					
	Copper	--	6.9E+00	3.2E-05	7.4E-05	4.0E-02	8E-04	2E-03					
	Iron	Gastrointestinal	1.3E+03	6.0E-03	1.4E-02	7.0E-01	9E-03	2E-02					
	Manganese	Nervous	3.2E+03	1.5E-02	3.4E-02	2.4E-02	6E-01	1E+00					
	Nickel	Systemic	4.0E+00	1.9E-05	4.3E-05	2.0E-02	9E-04	2E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.3E+01	6.0E-05	1.4E-04	5.0E-03	1E-02	3E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
SMW15	TEQ	Reproductive	1.6E-06	7.3E-12	1.7E-11	7.0E-10	1E-02	2E-02	9.4E-13	6.0E-12	1.3E+05	1E-07	8E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.1E+03	5.2E-03	1.2E-02	1.0E+00	5E-03	1E-02					
	Antimony	Systemic	4.6E-01	2.2E-06	4.9E-06	4.0E-04	5E-03	1E-02					
	Arsenic	Dermal	7.7E+00	3.6E-05	8.2E-05	3.0E-04	1E-01	3E-01	4.6E-06	2.9E-05	1.5E+00	7E-06	4E-05
	Barium	Kidney	3.9E+01	1.8E-04	4.1E-04	2.0E-01	9E-04	2E-03					
	Beryllium	Gastrointestinal	2.8E+00	1.3E-05	3.0E-05	2.0E-03	7E-03	1E-02					
	Cadmium	Kidney	3.7E+00	1.7E-05	4.0E-05	5.0E-04	3E-02	8E-02					
	Chromium	--	4.5E+00	2.1E-05	4.8E-05	3.0E-03	7E-03	2E-02	2.7E-06	1.7E-05	5.0E-01	1E-06	9E-06
	Cobalt	Thyroid	2.5E+02	1.2E-03	2.6E-03	3.0E-04	4E+00	9E+00					
	Copper	--	5.3E+01	2.5E-04	5.6E-04	4.0E-02	6E-03	1E-02					
	Iron	Gastrointestinal	1.1E+04	5.2E-02	1.2E-01	7.0E-01	7E-02	2E-01					
	Manganese	Nervous	1.1E+04	5.1E-02	1.2E-01	2.4E-02	2E+00	5E+00					
	Nickel	Systemic	2.4E+02	1.1E-03	2.6E-03	2.0E-02	6E-02	1E-01					
	Thallium	Dermal	1.1E-01	5.1E-07	1.2E-06	1.0E-05	5E-02	1E-01					
	Vanadium	Dermal	5.6E+01	2.6E-04	6.0E-04	5.0E-03	5E-02	1E-01					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
SMW16	TEQ	Reproductive	2.1E-06	1.0E-11	2.3E-11	7.0E-10	1E-02	3E-02	1.3E-12	8.1E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	2.6E+02	1.2E-03	2.8E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	1.2E+00	5.5E-06	1.2E-05	4.0E-04	1E-02	3E-02					
	Arsenic	Dermal	3.1E+01	1.4E-04	3.3E-04	3.0E-04	5E-01	1E+00	1.8E-05	1.2E-04	1.5E+00	3E-05	2E-04
	Barium	Kidney	1.6E+02	7.4E-04	1.7E-03	2.0E-01	4E-03	8E-03					
	Beryllium	Gastrointestinal	1.8E-01	8.4E-07	1.9E-06	2.0E-03	4E-04	1E-03					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	1.6E+01	7.3E-05	1.7E-04	3.0E-03	2E-02	6E-02	9.4E-06	6.0E-05	5.0E-01	5E-06	3E-05
	Cobalt	Thyroid	1.3E+00	6.2E-06	1.4E-05	3.0E-04	2E-02	5E-02					
	Copper	--	1.1E+00	5.0E-06	1.1E-05	4.0E-02	1E-04	3E-04					
	Iron	Gastrointestinal	6.7E+03	3.2E-02	7.2E-02	7.0E-01	5E-02	1E-01					
	Manganese	Nervous	4.8E+03	2.2E-02	5.1E-02	2.4E-02	9E-01	2E+00					
	Nickel	Systemic	1.3E+01	6.1E-05	1.4E-04	2.0E-02	3E-03	7E-03					
	Thallium	Dermal	1.4E-02	6.6E-08	1.5E-07	1.0E-05	7E-03	1E-02					
	Vanadium	Dermal	5.8E+01	2.7E-04	6.2E-04	5.0E-03	5E-02	1E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW16d	TEQ	Reproductive	1.1E-06	5.3E-12	1.2E-11	7.0E-10	8E-03	2E-02	6.9E-13	4.3E-12	1.3E+05	9E-08	6E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.3E+02	5.9E-04	1.3E-03	1.0E+00	6E-04	1E-03					
	Antimony	Systemic	2.6E-01	1.2E-06	2.7E-06	4.0E-04	3E-03	7E-03					
	Arsenic	Dermal	1.9E+00	8.9E-06	2.0E-05	3.0E-04	3E-02	7E-02	1.1E-06	7.2E-06	1.5E+00	2E-06	1E-05
	Barium	Kidney	5.0E+01	2.3E-04	5.3E-04	2.0E-01	1E-03	3E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	5.4E-02	2.5E-07	5.8E-07	5.0E-04	5E-04	1E-03					
	Chromium	--	3.6E-01	1.7E-06	3.9E-06	3.0E-03	6E-04	1E-03	2.2E-07	1.4E-06	5.0E-01	1E-07	7E-07
	Cobalt	Thyroid	4.1E-01	1.9E-06	4.4E-06	3.0E-04	6E-03	1E-02					
	Copper	--	2.3E+00	1.1E-05	2.4E-05	4.0E-02	3E-04	6E-04					
	Iron	Gastrointestinal	5.1E+02	2.4E-03	5.5E-03	7.0E-01	3E-03	8E-03					
	Manganese	Nervous	3.9E+02	1.8E-03	4.2E-03	2.4E-02	8E-02	2E-01					
	Nickel	Systemic	1.6E+00	7.7E-06	1.8E-05	2.0E-02	4E-04	9E-04					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.3E+00	6.2E-06	1.4E-05	5.0E-03	1E-03	3E-03					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW17	TEQ	Reproductive	6.9E-06	3.3E-11	7.4E-11	7.0E-10	5E-02	1E-01	4.2E-12	2.7E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	--	8.7E-02	4.1E-07	9.3E-07		--	--	5.2E-08	3.3E-07	2.0E+00	1E-07	7E-07
	Aluminum	Nervous	5.0E+02	2.3E-03	5.3E-03	1.0E+00	2E-03	5E-03					
	Antimony	Systemic	1.3E+00	6.3E-06	1.4E-05	4.0E-04	2E-02	4E-02					
	Arsenic	Dermal	5.0E+01	2.4E-04	5.4E-04	3.0E-04	8E-01	2E+00	3.0E-05	1.9E-04	1.5E+00	5E-05	3E-04
	Barium	Kidney	1.4E+02	6.6E-04	1.5E-03	2.0E-01	3E-03	8E-03					
	Beryllium	Gastrointestinal	6.2E-01	2.9E-06	6.7E-06	2.0E-03	1E-03	3E-03					
	Cadmium	Kidney	2.2E-02	1.0E-07	2.4E-07	5.0E-04	2E-04	5E-04					
	Chromium	--	1.6E+01	7.3E-05	1.7E-04	3.0E-03	2E-02	6E-02	9.4E-06	6.0E-05	5.0E-01	5E-06	3E-05
	Cobalt	Thyroid	1.5E+00	7.0E-06	1.6E-05	3.0E-04	2E-02	5E-02					
	Copper	--	1.2E+00	5.6E-06	1.3E-05	4.0E-02	1E-04	3E-04					
	Iron	Gastrointestinal	2.1E+04	9.8E-02	2.2E-01	7.0E-01	1E-01	3E-01					
	Manganese	Nervous	8.9E+03	4.2E-02	9.5E-02	2.4E-02	2E+00	4E+00					
	Nickel	Systemic	1.2E+01	5.4E-05	1.2E-04	2.0E-02	3E-03	6E-03					
	Thallium	Dermal	1.0E-02	4.7E-08	1.1E-07	1.0E-05	5E-03	1E-02					
	Vanadium	Dermal	6.6E+01	3.1E-04	7.1E-04	5.0E-03	6E-02	1E-01					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
SMW17d	TEQ	Reproductive	1.5E-06	7.1E-12	1.6E-11	7.0E-10	1E-02	2E-02	9.2E-13	5.8E-12	1.3E+05	1E-07	8E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	1.8E+01	8.5E-05	1.9E-04	1.0E+00	8E-05	2E-04					
	Antimony	Systemic	8.6E-02	4.0E-07	9.2E-07	4.0E-04	1E-03	2E-03					
	Arsenic	Dermal	3.2E+00	1.5E-05	3.5E-05	3.0E-04	5E-02	1E-01	2.0E-06	1.2E-05	1.5E+00	3E-06	2E-05
	Barium	Kidney	6.3E+01	2.9E-04	6.7E-04	2.0E-01	1E-03	3E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	5.8E-02	2.7E-07	6.2E-07	5.0E-04	5E-04	1E-03					
	Chromium	--	2.9E-01	1.4E-06	3.1E-06	3.0E-03	5E-04	1E-03	1.7E-07	1.1E-06	5.0E-01	9E-08	6E-07
	Cobalt	Thyroid	4.1E-01	1.9E-06	4.4E-06	3.0E-04	6E-03	1E-02					
	Copper	--	2.5E+00	1.2E-05	2.7E-05	4.0E-02	3E-04	7E-04					
	Iron	Gastrointestinal	2.0E+01	9.1E-05	2.1E-04	7.0E-01	1E-04	3E-04					
	Manganese	Nervous	6.9E+02	3.2E-03	7.4E-03	2.4E-02	1E-01	3E-01					
	Nickel	Systemic	3.8E+00	1.8E-05	4.1E-05	2.0E-02	9E-04	2E-03					
	Thallium	Dermal	1.2E-02	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02					
	Vanadium	Dermal	3.0E+00	1.4E-05	3.3E-05	5.0E-03	3E-03	7E-03					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW18	TEQ	Reproductive	2.1E-06	9.7E-12	2.2E-11	7.0E-10	1E-02	3E-02	1.2E-12	7.9E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	3.0E+02	1.4E-03	3.2E-03	1.0E+00	1E-03	3E-03					
	Antimony	Systemic	6.2E-01	2.9E-06	6.7E-06	4.0E-04	7E-03	2E-02					
	Arsenic	Dermal	9.7E+00	4.5E-05	1.0E-04	3.0E-04	2E-01	3E-01	5.8E-06	3.7E-05	1.5E+00	9E-06	6E-05
	Barium	Kidney	8.0E+01	3.7E-04	8.5E-04	2.0E-01	2E-03	4E-03					
	Beryllium	Gastrointestinal	8.3E-02	3.9E-07	8.8E-07	2.0E-03	2E-04	4E-04					
	Cadmium	Kidney	4.8E-02	2.3E-07	5.1E-07	5.0E-04	5E-04	1E-03					
	Chromium	--	5.1E+00	2.4E-05	5.4E-05	3.0E-03	8E-03	2E-02	3.0E-06	1.9E-05	5.0E-01	2E-06	1E-05
	Cobalt	Thyroid	1.1E+00	5.3E-06	1.2E-05	3.0E-04	2E-02	4E-02					
	Copper	--	5.0E+00	2.3E-05	5.4E-05	4.0E-02	6E-04	1E-03					
	Iron	Gastrointestinal	1.8E+03	8.3E-03	1.9E-02	7.0E-01	1E-02	3E-02					
	Manganese	Nervous	5.4E+03	2.5E-02	5.8E-02	2.4E-02	1E+00	2E+00					
	Nickel	Systemic	1.7E+01	7.7E-05	1.8E-04	2.0E-02	4E-03	9E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.3E+01	1.1E-04	2.5E-04	5.0E-03	2E-02	5E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW18d	TEQ	Reproductive	1.8E-06	8.4E-12	1.9E-11	7.0E-10	1E-02	3E-02	1.1E-12	6.9E-12	1.3E+05	1E-07	9E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	7.9E+01	3.7E-04	8.5E-04	1.0E+00	4E-04	8E-04					
	Antimony	Systemic	2.3E-01	1.1E-06	2.5E-06	4.0E-04	3E-03	6E-03					
	Arsenic	Dermal	4.4E+00	2.1E-05	4.8E-05	3.0E-04	7E-02	2E-01	2.7E-06	1.7E-05	1.5E+00	4E-06	3E-05
	Barium	Kidney	5.1E+01	2.4E-04	5.5E-04	2.0E-01	1E-03	3E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	1.1E-01	5.1E-07	1.2E-06	5.0E-04	1E-03	2E-03					
	Chromium	--	6.3E-01	3.0E-06	6.8E-06	3.0E-03	1E-03	2E-03	3.8E-07	2.4E-06	5.0E-01	2E-07	1E-06
	Cobalt	Thyroid	1.2E+00	5.5E-06	1.3E-05	3.0E-04	2E-02	4E-02					
	Copper	--	1.9E+01	8.9E-05	2.0E-04	4.0E-02	2E-03	5E-03					
	Iron	Gastrointestinal	9.5E+01	4.5E-04	1.0E-03	7.0E-01	6E-04	1E-03					
	Manganese	Nervous	1.0E+03	4.8E-03	1.1E-02	2.4E-02	2E-01	5E-01					
	Nickel	Systemic	3.4E+00	1.6E-05	3.7E-05	2.0E-02	8E-04	2E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	7.1E+00	3.3E-05	7.6E-05	5.0E-03	7E-03	2E-02					
	1,4-Dichlorobenzene	Liver	ND	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	ND	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	ND	--	--	2.0E-02	--	--					
SMW19	TEQ	Reproductive	2.0E-06	9.2E-12	2.1E-11	7.0E-10	1E-02	3E-02	1.2E-12	7.5E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	6.6E+01	3.1E-04	7.1E-04	1.0E+00	3E-04	7E-04					
	Antimony	Systemic	3.9E-01	1.8E-06	4.2E-06	4.0E-04	5E-03	1E-02					
	Arsenic	Dermal	3.2E+00	1.5E-05	3.4E-05	3.0E-04	5E-02	1E-01	1.9E-06	1.2E-05	1.5E+00	3E-06	2E-05
	Barium	Kidney	1.7E+02	8.1E-04	1.8E-03	2.0E-01	4E-03	9E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	7.5E-02	3.5E-07	8.0E-07	5.0E-04	7E-04	2E-03					
	Chromium	--	1.3E+00	6.0E-06	1.4E-05	3.0E-03	2E-03	5E-03	7.7E-07	4.9E-06	5.0E-01	4E-07	2E-06
	Cobalt	Thyroid	5.7E+00	2.7E-05	6.1E-05	3.0E-04	9E-02	2E-01					
	Copper	--	2.5E+00	1.2E-05	2.7E-05	4.0E-02	3E-04	7E-04					
	Iron	Gastrointestinal	3.1E+04	1.5E-01	3.3E-01	7.0E-01	2E-01	5E-01					
	Manganese	Nervous	7.3E+03	3.4E-02	7.8E-02	2.4E-02	1E+00	3E+00					
	Nickel	Systemic	7.8E+00	3.7E-05	8.4E-05	2.0E-02	2E-03	4E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	4.3E+00	2.0E-05	4.6E-05	5.0E-03	4E-03	9E-03					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

APPENDIX D. GROUNDWATER RISK CALCULATIONS

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU3 Upland**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02
Cancer	6.03E-04	3.82E-03

Well ID	COPC	Endpoint	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		CSF	CANCER RISK	
			µg/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
TW2R	TEQ	Reproductive	1.9E-06	8.8E-12	2.0E-11	7.0E-10	1E-02	3E-02	1.1E-12	7.1E-12	1.3E+05	1E-07	9E-07
	Aroclor-1260	--	ND	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	8.0E+01	3.7E-04	8.5E-04	1.0E+00	4E-04	9E-04					
	Antimony	Systemic	1.5E-01	7.0E-07	1.6E-06	4.0E-04	2E-03	4E-03					
	Arsenic	Dermal	7.0E+00	3.3E-05	7.4E-05	3.0E-04	1E-01	2E-01	4.2E-06	2.7E-05	1.5E+00	6E-06	4E-05
	Barium	Kidney	6.7E+01	3.2E-04	7.2E-04	2.0E-01	2E-03	4E-03					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	ND	--	--	5.0E-04	--	--					
	Chromium	--	1.9E+00	8.8E-06	2.0E-05	3.0E-03	3E-03	7E-03	1.1E-06	7.2E-06	5.0E-01	6E-07	4E-06
	Cobalt	Thyroid	4.0E-01	1.9E-06	4.2E-06	3.0E-04	6E-03	1E-02					
	Copper	--	2.0E+00	9.3E-06	2.1E-05	4.0E-02	2E-04	5E-04					
	Iron	Gastrointestinal	1.8E+04	8.4E-02	1.9E-01	7.0E-01	1E-01	3E-01					
	Manganese	Nervous	1.6E+03	7.5E-03	1.7E-02	2.4E-02	3E-01	7E-01					
	Nickel	Systemic	1.6E+00	7.3E-06	1.7E-05	2.0E-02	4E-04	8E-04					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	1.8E+01	8.5E-05	1.9E-04	5.0E-03	2E-02	4E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
TW5R	TEQ	Reproductive	1.5E-06	7.1E-12	1.6E-11	7.0E-10	1E-02	2E-02	9.1E-13	5.8E-12	1.3E+05	1E-07	8E-07
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	4.6E+02	2.1E-03	4.9E-03	1.0E+00	2E-03	5E-03					
	Antimony	Systemic	3.0E-01	1.4E-06	3.2E-06	4.0E-04	3E-03	8E-03					
	Arsenic	Dermal	4.6E+00	2.1E-05	4.9E-05	3.0E-04	7E-02	2E-01	2.8E-06	1.7E-05	1.5E+00	4E-06	3E-05
	Barium	Kidney	1.0E+02	4.9E-04	1.1E-03	2.0E-01	2E-03	6E-03					
	Beryllium	Gastrointestinal	5.8E-02	2.7E-07	6.2E-07	2.0E-03	1E-04	3E-04					
	Cadmium	Kidney	3.0E-02	1.4E-07	3.2E-07	5.0E-04	3E-04	6E-04					
	Chromium	--	6.5E-01	3.1E-06	7.0E-06	3.0E-03	1E-03	2E-03	3.9E-07	2.5E-06	5.0E-01	2E-07	1E-06
	Cobalt	Thyroid	6.0E-01	2.8E-06	6.4E-06	3.0E-04	9E-03	2E-02					
	Copper	--	4.6E+00	2.2E-05	4.9E-05	4.0E-02	5E-04	1E-03					
	Iron	Gastrointestinal	3.6E+03	1.7E-02	3.9E-02	7.0E-01	2E-02	6E-02					
	Manganese	Nervous	6.9E+02	3.2E-03	7.4E-03	2.4E-02	1E-01	3E-01					
	Nickel	Systemic	2.0E+00	9.2E-06	2.1E-05	2.0E-02	5E-04	1E-03					
	Thallium	Dermal	ND	--	--	1.0E-05	--	--					
	Vanadium	Dermal	2.9E+00	1.4E-05	3.1E-05	5.0E-03	3E-03	6E-03					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					
Waste Water Clarifier Well	TEQ	Reproductive	1.4E-06	6.7E-12	1.5E-11	7.0E-10	1E-02	2E-02	8.6E-13	5.5E-12	1.3E+05	1E-07	7E-07
	Aroclor-1260	--	NA	--	--		--	--	--	--	2.0E+00	--	--
	Aluminum	Nervous	6.5E+01	3.1E-04	7.0E-04	1.0E+00	3E-04	7E-04					
	Antimony	Systemic	8.2E-01	3.8E-06	8.8E-06	4.0E-04	1E-02	2E-02					
	Arsenic	Dermal	2.8E+01	1.3E-04	2.9E-04	3.0E-04	4E-01	1E+00	1.7E-05	1.1E-04	1.5E+00	2E-05	2E-04
	Barium	Kidney	2.9E+02	1.4E-03	3.1E-03	2.0E-01	7E-03	2E-02					
	Beryllium	Gastrointestinal	ND	--	--	2.0E-03	--	--					
	Cadmium	Kidney	5.8E-01	2.7E-06	6.2E-06	5.0E-04	5E-03	1E-02					
	Chromium	--	2.3E+00	1.1E-05	2.5E-05	3.0E-03	4E-03	8E-03	1.4E-06	8.8E-06	5.0E-01	7E-07	4E-06
	Cobalt	Thyroid	1.3E+01	5.9E-05	1.3E-04	3.0E-04	2E-01	4E-01					
	Copper	--	1.6E+01	7.6E-05	1.7E-04	4.0E-02	2E-03	4E-03					
	Iron	Gastrointestinal	1.1E+04	5.3E-02	1.2E-01	7.0E-01	8E-02	2E-01					
	Manganese	Nervous	2.0E+03	9.3E-03	2.1E-02	2.4E-02	4E-01	9E-01					
	Nickel	Systemic	8.8E+00	4.1E-05	9.4E-05	2.0E-02	2E-03	5E-03					
	Thallium	Dermal	1.7E-01	8.0E-07	1.8E-06	1.0E-05	8E-02	2E-01					
	Vanadium	Dermal	1.6E+01	7.4E-05	1.7E-04	5.0E-03	1E-02	3E-02					
	1,4-Dichlorobenzene	Liver	NA	--	--	7.0E-02	--	--	--	--	5.4E-03	--	--
	Benzene	Immune	NA	--	--	4.0E-03	--	--	--	--	5.5E-02	--	--
	Chlorobenzene	Liver	NA	--	--	2.0E-02	--	--					

NA = not analyzed; NC = not calculated; ND = not detected

APPENDIX D. SURFACE WATER RISK CALCULATIONS

Population Camper
Exposure Area On-Site Creeks
Medium Surface Water
Exposure Route Intentional Ingestion of Surface Water as Drinking Water (Unfiltered)

HIFs	CTE	RME		MMOA	
Noncancer	2.63E-03	6.84E-03	*Child*	CTE	RME
Cancer	2.82E-04	8.12E-04	*TWA*	3.60E-03	1.04E-02

		Non-Cancer					Cancer				
	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	ug/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
Arsenic	3.5E+00	9.2E-06	2.4E-05	3.0E-04	3E-02	8E-02	9.9E-07	2.8E-06	1.5E+00	1E-06	4E-06
Chromium	5.1E-01	1.3E-06	3.5E-06	3.0E-03	4E-04	1E-03	1.8E-06	5.3E-06	5.0E-01	9E-07	3E-06
Total					3E-02	8E-02				2E-06	7E-06

APPENDIX D. SURFACE WATER RISK CALCULATIONS

Population Camper
Exposure Area Clark Fork River
Medium Surface Water
Exposure Route Intentional Ingestion of Surface Water as Drinking Water (Unfiltered)

HIFs	CTE	RME		MMOA	
Noncancer	2.63E-03	6.84E-03	*Child*	CTE	RME
Cancer	2.82E-04	8.12E-04	*TWA*	3.60E-03	1.04E-02

		Non-Cancer					Cancer				
	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	ug/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	8.7E+00	2.3E-05	6.0E-05	3.0E-04	8E-02	2E-01	2.5E-06	7.1E-06	1.5E+00	4E-06	1E-05
Chromium	2.9E-01	7.6E-07	2.0E-06	3.0E-03	3E-04	7E-04	1.0E-06	3.0E-06	5.0E-01	5E-07	2E-06
Total					8E-02	2E-01				4E-06	1E-05

Population Camper
Exposure Area Clark Fork River
Medium Surface Water
Exposure Route Incidental Ingestion while Swimming

HIFs	CTE	RME		MMOA	
Noncancer	1.43E-04	1.05E-03	*Child*	CTE	RME
Cancer	7.62E-06	1.24E-04	*TWA*	1.03E-04	8.05E-04

		Non-Cancer					Cancer				
	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	ug/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	8.7E+00	1.3E-06	9.2E-06	3.0E-04	4E-03	3E-02	6.7E-08	1.1E-06	1.5E+00	1E-07	2E-06
Chromium	2.9E-01	4.1E-08	3.0E-07	3.0E-03	1E-05	1E-04	3.0E-08	2.3E-07	5.0E-01	1E-08	1E-07
Total					4E-03	3E-02				1E-07	2E-06

Population Camper
Exposure Area Clark Fork River
Medium Surface Water
Exposure Route Dermal Contact while Swimming

HIFs	CTE	RME		MMOA	
Noncancer	1.86E+01	5.58E+01	*Child*	CTE	RME
Cancer	2.18E+00	1.40E+01	*TWA*	2.32E+01	6.96E+01

			Non-Cancer					Cancer				
	EPC	Kp	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
COPC	ug/L	cm/hr	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	8.7E+00	1E-03	1.6E-07	4.9E-07	3.0E-04	5E-04	2E-03	3.6E-12	2.3E-11	1.5E+00	5E-12	3E-11
Chromium	2.9E-01	1E-03	5.4E-09	1.6E-08	7.5E-05	7E-05	2E-04	5.0E-12	1.5E-11	2.0E+01	1E-10	3E-10
Total						6E-04	2E-03				1E-10	3E-10

APPENDIX D. SURFACE WATER RISK CALCULATIONS

Population Recreational Fisher
Exposure Area Clark Fork River
Medium Surface Water
Exposure Route Incidental Ingestion while Fishing

HIFs	CTE	RME	MMOA	
			CTE	RME
Noncancer	2.15E-05	2.10E-04		
Cancer	1.76E-06	3.74E-05	1.73E-05	1.80E-04

		Non-Cancer					Cancer				
	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	ug/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	8.7E+00	1.9E-07	1.8E-06	3.0E-04	6E-04	6E-03	1.5E-08	3.3E-07	1.5E+00	2E-08	5E-07
Chromium	2.9E-01	6.2E-09	6.1E-08	3.0E-03	2E-06	2E-05	5.0E-09	5.2E-08	5.0E-01	2E-09	3E-08
Total					6E-04	6E-03				3E-08	5E-07

Population Recreational Fisher
Exposure Area Clark Fork River
Medium Surface Water
Exposure Route Dermal Contact while Fishing

HIFs	CTE	RME	MMOA	
			CTE	RME
Noncancer	1.15E+01	4.60E+01		
Cancer	1.22E+00	9.69E+00	1.03E+01	2.52E+01

			Non-Cancer					Cancer				
	EPC	Kp	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
COPC	ug/L	cm/hr	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	8.7E+00	1E-03	1.0E-07	4.0E-07	3.0E-04	3E-04	1E-03	1.6E-12	1.3E-11	1.5E+00	2E-12	2E-11
Chromium	2.9E-01	1E-03	3.3E-09	1.3E-08	7.5E-05	4E-05	2E-04	1.8E-12	4.4E-12	2.0E+01	4E-11	9E-11
Total						4E-04	2E-03				4E-11	1E-10

APPENDIX D. SURFACE WATER RISK CALCULATIONS

Population Tribal Fisher
Exposure Area Clark Fork River
Medium Surface Water
Exposure Route Incidental Ingestion while Fishing

HIFs	CTE	RME		MMOA	
Noncancer	4.30E-05	3.16E-04	*Child*	CTE	RME
Cancer	3.52E-06	5.61E-05	*TWA*	3.46E-05	2.70E-04

		Non-Cancer					Cancer				
	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	ug/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	8.7E+00	3.8E-07	2.8E-06	3.0E-04	1E-03	9E-03	3.1E-08	4.9E-07	1.5E+00	5E-08	7E-07
Chromium	2.9E-01	1.2E-08	9.1E-08	3.0E-03	4E-06	3E-05	1.0E-08	7.8E-08	5.0E-01	5E-09	4E-08
Total					1E-03	9E-03				5E-08	8E-07

Population Tribal Fisher
Exposure Area Clark Fork River
Medium Surface Water
Exposure Route Dermal Contact while Fishing

HIFs	CTE	RME		MMOA	
Noncancer	2.30E+01	6.90E+01	*Child*	CTE	RME
Cancer	2.43E+00	1.45E+01	*TWA*	2.07E+01	3.77E+01

			Non-Cancer					Cancer				
	EPC	Kp	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
COPC	ug/L	cm/hr	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	8.7E+00	1E-03	2.0E-07	6.0E-07	3.0E-04	7E-04	2E-03	4.9E-12	2.9E-11	1.5E+00	7E-12	4E-11
Chromium	2.9E-01	1E-03	6.6E-09	2.0E-08	7.5E-05	9E-05	3E-04	5.5E-12	1.0E-11	2.0E+01	1E-10	2E-10
Total						8E-04	2E-03				1E-10	2E-10

APPENDIX D. SEDIMENT RISK CALCULATIONS

Population Camper
Exposure Area Clark Fork River
Medium Sediment
Exposure Route Incidental Ingestion while Swimming

HIFs	CTE	RME		MMOA	
Noncancer	2.92E-07	8.77E-07	*Child*	CTE	RME
Cancer	1.60E-08	9.86E-08	*TWA*	2.16E-07	6.47E-07

		Non-Cancer					Cancer				
	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	ug/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	1.2E+01	3.4E-09	1.0E-08	3.0E-04	1E-05	3E-05	1.9E-10	1.2E-09	1.5E+00	3E-10	2E-09
Chromium	8.9E+00	2.6E-09	7.8E-09	3.0E-03	9E-07	3E-06	1.9E-09	5.8E-09	5.0E-01	1E-09	3E-09
Total					1E-05	4E-05				1E-09	5E-09

Population Camper
Exposure Area Clark Fork River
Medium Sediment
Exposure Route Dermal Contact while Swimming

HIFs	CTE	RME		MMOA	
Noncancer	1.49E-06	1.12E-05	*Child*	CTE	RME
Cancer	9.15E-08	1.60E-06	*TWA*	1.01E-06	8.45E-06

			Non-Cancer					Cancer				
	EPC	ABSd	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
COPC	mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	1.2E+01	0.03	5.3E-07	3.9E-06	3.0E-04	2E-03	1E-02	3.2E-08	5.7E-07	1.5E+00	5E-08	8E-07
Chromium	8.9E+00	NV	--	--	7.5E-05	--	--	--	--	2.0E+01	--	--
Total						2E-03	1E-02				5E-08	8E-07

APPENDIX D. SEDIMENT RISK CALCULATIONS

Population Recreational Fisher
Exposure Area Clark Fork River
Medium Sediment
Exposure Route Incidental Ingestion while Fishing

HIFs	CTE	RME		MMOA	
Noncancer	4.38E-07	1.75E-06	*Child*	CTE	RME
Cancer	3.05E-08	2.40E-07	*TWA*	3.24E-07	1.29E-06

		Non-Cancer					Cancer				
	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	ug/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	1.2E+01	5.2E-09	2.1E-08	3.0E-04	2E-05	7E-05	3.6E-10	2.8E-09	1.5E+00	5E-10	4E-09
Chromium	8.9E+00	3.9E-09	1.6E-08	3.0E-03	1E-06	5E-06	2.9E-09	1.2E-08	5.0E-01	1E-09	6E-09
Total					2E-05	7E-05				2E-09	1E-08

Population Recreational Fisher
Exposure Area Clark Fork River
Medium Sediment
Exposure Route Dermal Contact while Fishing

HIFs	CTE	RME		MMOA	
Noncancer	2.30E-07	3.22E-06	*Child*	CTE	RME
Cancer	2.43E-08	6.78E-07	*TWA*	5.84E-07	6.17E-06

			Non-Cancer					Cancer				
	EPC	ABSd	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
COPC	mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	1.2E+01	0.03	8.1E-08	1.1E-06	3.0E-04	3E-04	4E-03	8.6E-09	2.4E-07	1.5E+00	1E-08	4E-07
Chromium	8.9E+00	NV	--	--	7.5E-05	--	--	--	--	2.0E+01	--	--
Total						3E-04	4E-03				1E-08	4E-07

APPENDIX D. SEDIMENT RISK CALCULATIONS

Population Tribal Fisher
Exposure Area Clark Fork River
Medium Sediment
Exposure Route Incidental Ingestion while Fishing

HIFs	CTE	RME		MMOA	
Noncancer	4.38E-07	1.75E-06	*Child*	CTE	RME
Cancer	3.05E-08	2.40E-07	*TWA*	3.24E-07	1.29E-06

		Non-Cancer					Cancer				
	EPC	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	ug/L	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	1.2E+01	5.2E-09	2.1E-08	3.0E-04	2E-05	7E-05	3.6E-10	2.8E-09	1.5E+00	5E-10	4E-09
Chromium	8.9E+00	3.9E-09	1.6E-08	3.0E-03	1E-06	5E-06	2.9E-09	1.2E-08	5.0E-01	1E-09	6E-09
Total					2E-05	7E-05				2E-09	1E-08

Population Tribal Fisher
Exposure Area Clark Fork River
Medium Sediment
Exposure Route Dermal Contact while Fishing

HIFs	CTE	RME		MMOA	
Noncancer	2.30E-07	3.22E-06	*Child*	CTE	RME
Cancer	2.43E-08	6.78E-07	*TWA*	5.84E-07	6.17E-06

			Non-Cancer					Cancer				
	EPC	ABSd	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
COPC	mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
Arsenic	1.2E+01	0.03	8.1E-08	1.1E-06	3.0E-04	3E-04	4E-03	8.6E-09	2.4E-07	1.5E+00	1E-08	4E-07
Chromium	8.9E+00	NV	--	--	7.5E-05	--	--	--	--	2.0E+01	--	--
Total						3E-04	4E-03				1E-08	4E-07

APPENDIX D. SEDIMENT RISK CALCULATIONS

Population: Hypothetical Future Resident
Exposure Area: On-site Ponds
Medium: Sediment/Soil (assumed ponds dried out; represents exposure as surface soil)
Exposure Route: Incidental Ingestion

HIFs	CTE	RME		MMOA HIFs CTE	MMOA HIFs RME
Noncancer	4.68E-06	1.28E-05	*Based on Child HIFs*	3.45E-06	9.44E-06
Cancer	2.57E-07	1.44E-06	*Based on TWA HIFs*		

COPC	EPC mg/kg	RBA	Non-Cancer DI (mg/kg-d) CTE	Non-Cancer DI (mg/kg-d) RME	RfD mg/kg-d	HQ CTE	HQ RME	Cancer DI (mg/kg-d) CTE	Cancer DI (mg/kg-d) RME	SF (mg/kg-d)-1	Risk CTE	Risk RME
$TEQ_{D/F}$ (ND=1/2DL)	6.12E-05	1E+00	2.9E-10	7.8E-10	7.00E-10	4E-01	1E+00					
Aluminum	1.27E+04	1E+00	5.92E-02	1.62E-01	1.00E+00	6E-02	2E-01					
Arsenic	1.01E+01	6E-01	2.82E-05	7.71E-05	3.00E-04	9E-02	3E-01	1.55E-06	8.67E-06	1.50E+00	2E-06	1E-05
Chromium	2.14E+01	1E+00	1.00E-04	2.73E-04	3.00E-03	3E-02	9E-02	7.38E-05	2.02E-04	5.00E-01	4E-05	1E-04
Cobalt	4.42E+00	1E+00	2.07E-05	5.65E-05	3.00E-04	7E-02	2E-01					
Iron	1.11E+04	1E+00	5.20E-02	1.42E-01	7.00E-01	7E-02	2E-01					
Manganese	1.51E+03	1E+00	7.04E-03	1.92E-02	2.40E-02	3E-01	8E-01					
Mercury	1.60E+00	1E+00	7.46E-06	2.04E-05	3.00E-04	2E-02	7E-02					
Thallium	2.10E-01	1E+00	9.82E-07	2.68E-06	1.00E-05	1E-01	3E-01					
Vanadium	3.68E+01	1E+00	1.72E-04	4.70E-04	5.00E-03	3E-02	9E-02					
					Total HI	1E+00	3E+00			Total Risk	4E-05	1E-04

Population: Recreational Visitor
Exposure Area: On-site Ponds
Medium: Sediment/Soil (assumed ponds dried out; represents exposure as surface soil)
Exposure Route: Incidental Ingestion

HIFs	CTE	RME		MMOA HIFs CTE	MMOA HIFs RME
Noncancer	8.77E-07	3.51E-06	*Based on Child HIFs*	6.47E-07	2.59E-06
Cancer	6.10E-08	4.80E-07	*Based on TWA HIFs*		

COPC	EPC mg/kg	RBA	Non-Cancer DI (mg/kg-d) CTE	Non-Cancer DI (mg/kg-d) RME	RfD mg/kg-d	HQ CTE	HQ RME	Cancer DI (mg/kg-d) CTE	Cancer DI (mg/kg-d) RME	SF (mg/kg-d)-1	Risk CTE	Risk RME
$TEQ_{D/F}$ (ND=1/2DL)	6.12E-05	1E+00	5.4E-11	2.9E-11	7.00E-10	8E-02	4E-02					
Aluminum	1.27E+04	1E+00	1.11E-02	6.08E-03	1.00E+00	1E-02	6E-03					
Arsenic	1.01E+01	6E-01	5.29E-06	2.89E-06	3.00E-04	2E-02	1E-02	3.68E-07	2.89E-06	1.50E+00	6E-07	4E-06
Chromium	2.14E+01	1E+00	1.88E-05	1.03E-05	3.00E-03	6E-03	3E-03	1.38E-05	5.54E-05	5.00E-01	7E-06	3E-05
Cobalt	4.42E+00	1E+00	3.88E-06	2.12E-06	3.00E-04	1E-02	7E-03					
Iron	1.11E+04	1E+00	9.74E-03	5.33E-03	7.00E-01	1E-02	8E-03					
Manganese	1.51E+03	1E+00	1.32E-03	7.22E-04	2.40E-02	5E-02	3E-02					
Mercury	1.60E+00	1E+00	1.40E-06	7.66E-07	3.00E-04	5E-03	3E-03					
Thallium	2.10E-01	1E+00	1.84E-07	1.01E-07	1.00E-05	2E-02	1E-02					
Vanadium	3.68E+01	1E+00	3.22E-05	1.76E-05	5.00E-03	6E-03	4E-03					
					Total HI	2E-01	1E-01			Total Risk	7E-06	3E-05

APPENDIX D. FISH RISK CALCULATIONS

Population	Current/Hypothetical Future Recreational Fishers
Exposure Area	CFR adjacent to and downstream of the Site (sampling reaches FRN and STR)
Medium	Fish Tissue
Exposure Route	Ingestion

HIFs	CTE	RME	
Noncancer	4.00E-04	1.43E-03	*Child*
Cancer	5.98E-05	4.16E-04	*TWA*

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NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.4E-07	0.00	2.5E-10	9.1E-10	7.0E-10	4E-01	1E+00	3.8E-11	2.6E-10	1.3E+05	5E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	3.6E-06	0.00	1.4E-09	5.2E-09	7.0E-10	2E+00	7E+00	2.2E-10	1.5E-09	1.3E+05	3E-05	2E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	4.1E-06	0.00	1.6E-09	5.8E-09	7.0E-10	2E+00	8E+00	2.4E-10	1.7E-09	1.3E+05	3E-05	2E-04
Total PCBs	6.5E-02	0.00	--	--	--	--	--	3.9E-06	2.7E-05	2.0E+00	8E-06	5E-05

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.3E-07	0.00	2.5E-10	9.0E-10	7.0E-10	4E-01	1E+00	3.8E-11	2.6E-10	1.3E+05	5E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	2.0E-06	0.00	8.0E-10	2.9E-09	7.0E-10	1E+00	4E+00	1.2E-10	8.3E-10	1.3E+05	2E-05	1E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	2.6E-06	0.00	1.0E-09	3.7E-09	7.0E-10	1E+00	5E+00	1.5E-10	1.1E-09	1.3E+05	2E-05	1E-04
Total PCBs	2.3E-02	0.00	--	--	--	--	--	1.4E-06	9.5E-06	2.0E+00	3E-06	2E-05

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NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.5E-07	0.00	2.2E-10	7.8E-10	7.0E-10	3E-01	1E+00	3.3E-11	2.3E-10	1.3E+05	4E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	3.0E-06	0.00	1.2E-09	4.3E-09	7.0E-10	2E+00	6E+00	1.8E-10	1.3E-09	1.3E+05	2E-05	2E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.1E-06	0.00	1.2E-09	4.5E-09	7.0E-10	2E+00	6E+00	1.9E-10	1.3E-09	1.3E+05	2E-05	2E-04
Total PCBs	4.4E-02	0.00	--	--	--	--	--	2.7E-06	1.9E-05	2.0E+00	5E-06	4E-05

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.8E-07	0.00	2.3E-10	8.3E-10	7.0E-10	3E-01	1E+00	3.5E-11	2.4E-10	1.3E+05	5E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	1.4E-06	0.00	5.6E-10	2.0E-09	7.0E-10	8E-01	3E+00	8.4E-11	5.8E-10	1.3E+05	1E-05	8E-05
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	1.9E-06	0.00	7.6E-10	2.7E-09	7.0E-10	1E+00	4E+00	1.1E-10	7.9E-10	1.3E+05	1E-05	1E-04
Total PCBs	2.1E-02	0.00	--	--	--	--	--	1.3E-06	8.8E-06	2.0E+00	3E-06	2E-05

APPENDIX D. FISH RISK CALCULATIONS

Population	Current/Hypothetical Future Recreational Fishers
Exposure Area	CFR adjacent to and downstream of the Site (sampling reaches FRN and STR)
Medium	Fish Tissue (cooking loss assumed)
Exposure Route	Ingestion

HIFs	CTE	RME	
Noncancer	4.00E-04	1.43E-03	*Child*
Cancer	5.98E-05	4.16E-04	*TWA*

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NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.4E-07	0.54	2.5E-10	9.1E-10	7.0E-10	2E-01	6E-01	3.8E-11	2.6E-10	1.3E+05	2E-06	2E-05
TEQ_{PCB} (ND = 1/2 DL)	3.6E-06	0.54	1.4E-09	5.2E-09	7.0E-10	9E-01	3E+00	2.2E-10	1.5E-09	1.3E+05	1E-05	9E-05
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	4.1E-06	0.54	1.6E-09	5.8E-09	7.0E-10	1E+00	4E+00	2.4E-10	1.7E-09	1.3E+05	1E-05	1E-04
Total PCBs	6.5E-02	0.30	--	--	--	--	--	3.9E-06	2.7E-05	2.0E+00	5E-06	4E-05

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.3E-07	0.54	2.5E-10	9.0E-10	7.0E-10	2E-01	6E-01	3.8E-11	2.6E-10	1.3E+05	2E-06	2E-05
TEQ_{PCB} (ND = 1/2 DL)	2.0E-06	0.54	8.0E-10	2.9E-09	7.0E-10	5E-01	2E+00	1.2E-10	8.3E-10	1.3E+05	7E-06	5E-05
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	2.6E-06	0.54	1.0E-09	3.7E-09	7.0E-10	7E-01	2E+00	1.5E-10	1.1E-09	1.3E+05	9E-06	6E-05
Total PCBs	2.3E-02	0.30	--	--	--	--	--	1.4E-06	9.5E-06	2.0E+00	2E-06	1E-05

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NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.5E-07	0.54	2.2E-10	7.8E-10	7.0E-10	1E-01	5E-01	3.3E-11	2.3E-10	1.3E+05	2E-06	1E-05
TEQ_{PCB} (ND = 1/2 DL)	3.0E-06	0.54	1.2E-09	4.3E-09	7.0E-10	8E-01	3E+00	1.8E-10	1.3E-09	1.3E+05	1E-05	8E-05
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.1E-06	0.54	1.2E-09	4.5E-09	7.0E-10	8E-01	3E+00	1.9E-10	1.3E-09	1.3E+05	1E-05	8E-05
Total PCBs	4.4E-02	0.30	--	--	--	--	--	2.7E-06	1.9E-05	2.0E+00	4E-06	3E-05

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.8E-07	0.54	2.3E-10	8.3E-10	7.0E-10	2E-01	5E-01	3.5E-11	2.4E-10	1.3E+05	2E-06	1E-05
TEQ_{PCB} (ND = 1/2 DL)	1.4E-06	0.54	5.6E-10	2.0E-09	7.0E-10	4E-01	1E+00	8.4E-11	5.8E-10	1.3E+05	5E-06	3E-05
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	1.9E-06	0.54	7.6E-10	2.7E-09	7.0E-10	5E-01	2E+00	1.1E-10	7.9E-10	1.3E+05	7E-06	5E-05
Total PCBs	2.1E-02	0.30	--	--	--	--	--	1.3E-06	8.8E-06	2.0E+00	2E-06	1E-05

APPENDIX D. FISH RISK CALCULATIONS

Population	Current/Hypothetical Future Tribal Fishers
Exposure Area	CFR adjacent to and downstream of the Site (sampling reaches FRN and STR)
Medium	Fish Tissue
Exposure Route	Ingestion

HIFs	CTE	RME	
Noncancer	7.67E-04	3.10E-03	*Child*
Cancer	1.15E-04	9.00E-04	*TWA*

2019 FISH ONLY

NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.4E-07	0.00	4.9E-10	2.0E-09	7.0E-10	7E-01	3E+00	7.3E-11	5.7E-10	1.3E+05	9E-06	7E-05
TEQ_{PCB} (ND = 1/2 DL)	3.6E-06	0.00	2.8E-09	1.1E-08	7.0E-10	4E+00	2E+01	4.1E-10	3.2E-09	1.3E+05	5E-05	4E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	4.1E-06	0.00	3.1E-09	1.3E-08	7.0E-10	4E+00	2E+01	4.6E-10	3.6E-09	1.3E+05	6E-05	5E-04
Total PCBs	6.5E-02	0.00	--	--	--	--	--	7.5E-06	5.9E-05	2.0E+00	1E-05	1E-04

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.3E-07	0.00	4.8E-10	1.9E-09	7.0E-10	7E-01	3E+00	7.2E-11	5.7E-10	1.3E+05	9E-06	7E-05
TEQ_{PCB} (ND = 1/2 DL)	2.0E-06	0.00	1.5E-09	6.2E-09	7.0E-10	2E+00	9E+00	2.3E-10	1.8E-09	1.3E+05	3E-05	2E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	2.6E-06	0.00	2.0E-09	7.9E-09	7.0E-10	3E+00	1E+01	2.9E-10	2.3E-09	1.3E+05	4E-05	3E-04
Total PCBs	2.3E-02	0.00	--	--	--	--	--	2.6E-06	2.0E-05	2.0E+00	5E-06	4E-05

NORTHERN PIKE - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	9.3E-07	0.00	7.1E-10	2.9E-09	7.0E-10	1E+00	4E+00	1.1E-10	8.4E-10	1.3E+05	1E-05	1E-04
TEQ_{PCB} (ND = 1/2 DL)	8.6E-06	0.00	6.6E-09	2.7E-08	7.0E-10	9E+00	4E+01	9.9E-10	7.7E-09	1.3E+05	1E-04	1E-03
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	9.4E-06	0.00	7.2E-09	2.9E-08	7.0E-10	1E+01	4E+01	1.1E-09	8.4E-09	1.3E+05	1E-04	1E-03
Total PCBs	1.7E-01	0.00	--	--	--	--	--	2.0E-05	1.6E-04	2.0E+00	4E-05	3E-04

RAINBOW TROUT - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	7.0E-07	0.00	5.3E-10	2.2E-09	7.0E-10	8E-01	3E+00	8.0E-11	6.3E-10	1.3E+05	1E-05	8E-05
TEQ_{PCB} (ND = 1/2 DL)	2.9E-06	0.00	2.2E-09	8.9E-09	7.0E-10	3E+00	1E+01	3.3E-10	2.6E-09	1.3E+05	4E-05	3E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.8E-06	0.00	2.9E-09	1.2E-08	7.0E-10	4E+00	2E+01	4.4E-10	3.4E-09	1.3E+05	6E-05	4E-04
Total PCBs	3.2E-02	0.00	--	--	--	--	--	3.6E-06	2.9E-05	2.0E+00	7E-06	6E-05

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NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.5E-07	0.00	4.2E-10	1.7E-09	7.0E-10	6E-01	2E+00	6.2E-11	4.9E-10	1.3E+05	8E-06	6E-05
TEQ_{PCB} (ND = 1/2 DL)	3.0E-06	0.00	2.3E-09	9.4E-09	7.0E-10	3E+00	1E+01	3.5E-10	2.7E-09	1.3E+05	5E-05	4E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.1E-06	0.00	2.4E-09	9.6E-09	7.0E-10	3E+00	1E+01	3.6E-10	2.8E-09	1.3E+05	5E-05	4E-04
Total PCBs	4.4E-02	0.00	--	--	--	--	--	5.1E-06	4.0E-05	2.0E+00	1E-05	8E-05

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.8E-07	0.00	4.5E-10	1.8E-09	7.0E-10	6E-01	3E+00	6.7E-11	5.2E-10	1.3E+05	9E-06	7E-05
TEQ_{PCB} (ND = 1/2 DL)	1.4E-06	0.00	1.1E-09	4.3E-09	7.0E-10	2E+00	6E+00	1.6E-10	1.3E-09	1.3E+05	2E-05	2E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	1.9E-06	0.00	1.5E-09	5.9E-09	7.0E-10	2E+00	8E+00	2.2E-10	1.7E-09	1.3E+05	3E-05	2E-04
Total PCBs	2.1E-02	0.00	--	--	--	--	--	2.4E-06	1.9E-05	2.0E+00	5E-06	4E-05

NORTHERN PIKE - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	1.1E-06	0.00	8.8E-10	3.6E-09	7.0E-10	1E+00	5E+00	1.3E-10	1.0E-09	1.3E+05	2E-05	1E-04
TEQ_{PCB} (ND = 1/2 DL)	7.8E-06	0.00	6.0E-09	2.4E-08	7.0E-10	9E+00	3E+01	9.0E-10	7.0E-09	1.3E+05	1E-04	9E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	6.3E-06	0.00	4.8E-09	2.0E-08	7.0E-10	7E+00	3E+01	7.2E-10	5.7E-09	1.3E+05	9E-05	7E-04
Total PCBs	1.2E-01	0.00	--	--	--	--	--	1.3E-05	1.0E-04	2.0E+00	3E-05	2E-04

RAINBOW TROUT - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.9E-07	0.00	4.5E-10	1.8E-09	7.0E-10	6E-01	3E+00	6.8E-11	5.3E-10	1.3E+05	9E-06	7E-05
TEQ_{PCB} (ND = 1/2 DL)	2.8E-06	0.00	2.2E-09	8.8E-09	7.0E-10	3E+00	1E+01	3.2E-10	2.5E-09	1.3E+05	4E-05	3E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.4E-06	0.00	2.6E-09	1.1E-08	7.0E-10	4E+00	2E+01	3.9E-10	3.1E-09	1.3E+05	5E-05	4E-04
Total PCBs	3.2E-02	0.00	--	--	--	--	--	3.6E-06	2.8E-05	2.0E+00	7E-06	6E-05

APPENDIX D. FISH RISK CALCULATIONS

Population	Current/Hypothetical Future Tribal Fishers
Exposure Area	CFR adjacent to and downstream of the Site (sampling reaches FRN and STR)
Medium	Fish Tissue (cooking loss assumed)
Exposure Route	Ingestion

HIFs	CTE	RME	
Noncancer	7.67E-04	3.10E-03	*Child*
Cancer	1.15E-04	9.00E-04	*TWA*

2019 FISH ONLY

NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.4E-07	0.54	4.9E-10	2.0E-09	7.0E-10	3E-01	1E+00	7.3E-11	5.7E-10	1.3E+05	4E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	3.6E-06	0.54	2.8E-09	1.1E-08	7.0E-10	2E+00	7E+00	4.1E-10	3.2E-09	1.3E+05	2E-05	2E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	4.1E-06	0.54	3.1E-09	1.3E-08	7.0E-10	2E+00	8E+00	4.6E-10	3.6E-09	1.3E+05	3E-05	2E-04
Total PCBs	6.5E-02	0.30	--	--	--	--	--	7.5E-06	5.9E-05	2.0E+00	1E-05	8E-05

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.3E-07	0.54	4.8E-10	1.9E-09	7.0E-10	3E-01	1E+00	7.2E-11	5.7E-10	1.3E+05	4E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	2.0E-06	0.54	1.5E-09	6.2E-09	7.0E-10	1E+00	4E+00	2.3E-10	1.8E-09	1.3E+05	1E-05	1E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	2.6E-06	0.54	2.0E-09	7.9E-09	7.0E-10	1E+00	5E+00	2.9E-10	2.3E-09	1.3E+05	2E-05	1E-04
Total PCBs	2.3E-02	0.30	--	--	--	--	--	2.6E-06	2.0E-05	2.0E+00	4E-06	3E-05

NORTHERN PIKE - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	9.3E-07	0.54	7.1E-10	2.9E-09	7.0E-10	5E-01	2E+00	1.1E-10	8.4E-10	1.3E+05	6E-06	5E-05
TEQ_{PCB} (ND = 1/2 DL)	8.6E-06	0.54	6.6E-09	2.7E-08	7.0E-10	4E+00	2E+01	9.9E-10	7.7E-09	1.3E+05	6E-05	5E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	9.4E-06	0.54	7.2E-09	2.9E-08	7.0E-10	5E+00	2E+01	1.1E-09	8.4E-09	1.3E+05	6E-05	5E-04
Total PCBs	1.7E-01	0.30	--	--	--	--	--	2.0E-05	1.6E-04	2.0E+00	3E-05	2E-04

RAINBOW TROUT - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	7.0E-07	0.54	5.3E-10	2.2E-09	7.0E-10	4E-01	1E+00	8.0E-11	6.3E-10	1.3E+05	5E-06	4E-05
TEQ_{PCB} (ND = 1/2 DL)	2.9E-06	0.54	2.2E-09	8.9E-09	7.0E-10	1E+00	6E+00	3.3E-10	2.6E-09	1.3E+05	2E-05	2E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.8E-06	0.54	2.9E-09	1.2E-08	7.0E-10	2E+00	8E+00	4.4E-10	3.4E-09	1.3E+05	3E-05	2E-04
Total PCBs	3.2E-02	0.30	--	--	--	--	--	3.6E-06	2.9E-05	2.0E+00	5E-06	4E-05

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NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.5E-07	0.54	4.2E-10	1.7E-09	7.0E-10	3E-01	1E+00	6.2E-11	4.9E-10	1.3E+05	4E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	3.0E-06	0.54	2.3E-09	9.4E-09	7.0E-10	2E+00	6E+00	3.5E-10	2.7E-09	1.3E+05	2E-05	2E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.1E-06	0.54	2.4E-09	9.6E-09	7.0E-10	2E+00	6E+00	3.6E-10	2.8E-09	1.3E+05	2E-05	2E-04
Total PCBs	4.4E-02	0.30	--	--	--	--	--	5.1E-06	4.0E-05	2.0E+00	7E-06	6E-05

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.8E-07	0.54	4.5E-10	1.8E-09	7.0E-10	3E-01	1E+00	6.7E-11	5.2E-10	1.3E+05	4E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	1.4E-06	0.54	1.1E-09	4.3E-09	7.0E-10	7E-01	3E+00	1.6E-10	1.3E-09	1.3E+05	1E-05	8E-05
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	1.9E-06	0.54	1.5E-09	5.9E-09	7.0E-10	1E+00	4E+00	2.2E-10	1.7E-09	1.3E+05	1E-05	1E-04
Total PCBs	2.1E-02	0.30	--	--	--	--	--	2.4E-06	1.9E-05	2.0E+00	3E-06	3E-05

NORTHERN PIKE - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	1.1E-06	0.54	8.8E-10	3.6E-09	7.0E-10	6E-01	2E+00	1.3E-10	1.0E-09	1.3E+05	8E-06	6E-05
TEQ_{PCB} (ND = 1/2 DL)	7.8E-06	0.54	6.0E-09	2.4E-08	7.0E-10	4E+00	2E+01	9.0E-10	7.0E-09	1.3E+05	5E-05	4E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	6.3E-06	0.54	4.8E-09	2.0E-08	7.0E-10	3E+00	1E+01	7.2E-10	5.7E-09	1.3E+05	4E-05	3E-04
Total PCBs	1.2E-01	0.30	--	--	--	--	--	1.3E-05	1.0E-04	2.0E+00	2E-05	1E-04

RAINBOW TROUT - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	5.9E-07	0.54	4.5E-10	1.8E-09	7.0E-10	3E-01	1E+00	6.8E-11	5.3E-10	1.3E+05	4E-06	3E-05
TEQ_{PCB} (ND = 1/2 DL)	2.8E-06	0.54	2.2E-09	8.8E-09	7.0E-10	1E+00	6E+00	3.2E-10	2.5E-09	1.3E+05	2E-05	2E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.4E-06	0.54	2.6E-09	1.1E-08	7.0E-10	2E+00	7E+00	3.9E-10	3.1E-09	1.3E+05	2E-05	2E-04
Total PCBs	3.2E-02	0.30	--	--	--	--	--	3.6E-06	2.8E-05	2.0E+00	5E-06	4E-05

APPENDIX D. FISH RISK CALCULATIONS

Population	Current/Hypothetical Future Tribal Fishers
Exposure Area	CFR adjacent to and downstream of the Site (sampling reaches FRN and STR)
Medium	Fish Tissue
Exposure Route	Ingestion (higher IR assumed)

HIFs	CTE	RME	
Noncancer	3.28E-03	1.15E-02	*Child*
Cancer	4.90E-04	3.34E-03	*TWA*

2019 FISH ONLY

NORTHERN PIKE - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.4E-07	0.00	2.1E-09	7.3E-09	7.0E-10	3E+00	1E+01	3.1E-10	2.1E-09	1.3E+05	4E-05	3E-04
TEQ_{PCB} (ND = 1/2 DL)	3.6E-06	0.00	1.2E-08	4.1E-08	7.0E-10	2E+01	6E+01	1.8E-09	1.2E-08	1.3E+05	2E-04	2E-03
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	4.1E-06	0.00	1.3E-08	4.7E-08	7.0E-10	2E+01	7E+01	2.0E-09	1.4E-08	1.3E+05	3E-04	2E-03
Total PCBs	6.5E-02	0.00	--	--	--	--	--	3.2E-05	2.2E-04	2.0E+00	6E-05	4E-04

RAINBOW TROUT - FILLET

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	6.3E-07	0.00	2.1E-09	7.2E-09	7.0E-10	3E+00	1E+01	3.1E-10	2.1E-09	1.3E+05	4E-05	3E-04
TEQ_{PCB} (ND = 1/2 DL)	2.0E-06	0.00	6.5E-09	2.3E-08	7.0E-10	9E+00	3E+01	9.8E-10	6.7E-09	1.3E+05	1E-04	9E-04
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	2.6E-06	0.00	8.4E-09	2.9E-08	7.0E-10	1E+01	4E+01	1.3E-09	8.5E-09	1.3E+05	2E-04	1E-03
Total PCBs	2.3E-02	0.00	--	--	--	--	--	1.1E-05	7.6E-05	2.0E+00	2E-05	2E-04

NORTHERN PIKE - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	9.3E-07	0.00	3.0E-09	1.1E-08	7.0E-10	4E+00	2E+01	4.6E-10	3.1E-09	1.3E+05	6E-05	4E-04
TEQ_{PCB} (ND = 1/2 DL)	8.6E-06	0.00	2.8E-08	9.9E-08	7.0E-10	4E+01	1E+02	4.2E-09	2.9E-08	1.3E+05	5E-04	4E-03
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	9.4E-06	0.00	3.1E-08	1.1E-07	7.0E-10	4E+01	2E+02	4.6E-09	3.1E-08	1.3E+05	6E-04	4E-03
Total PCBs	1.7E-01	0.00	--	--	--	--	--	8.5E-05	5.8E-04	2.0E+00	2E-04	1E-03

RAINBOW TROUT - WHOLE BODY

			Non-Cancer					Cancer				
	EPC	Cooking	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
COPC	mg/kg	Loss	CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
$TEQ_{D/F}$ (ND = 1/2 DL)	7.0E-07	0.00	2.3E-09	8.0E-09	7.0E-10	3E+00	1E+01	3.4E-10	2.3E-09	1.3E+05	4E-05	3E-04
TEQ_{PCB} (ND = 1/2 DL)	2.9E-06	0.00	9.4E-09	3.3E-08	7.0E-10	1E+01	5E+01	1.4E-09	9.5E-09	1.3E+05	2E-04	1E-03
$TEQ_{D/F/PCB}$ (ND = 1/2 DL)	3.8E-06	0.00	1.3E-08	4.4E-08	7.0E-10	2E+01	6E+01	1.9E-09	1.3E-08	1.3E+05	2E-04	2E-03
Total PCBs	3.2E-02	0.00	--	--	--	--	--	1.6E-05	1.1E-04	2.0E+00	3E-05	2E-04

APPENDIX E

TRIBAL FISH CONSUMPTION RATE SUMMARY

Smurfit-Stone/Frenchtown Mill Site
OU3 Human Health Risk Assessment

The USEPA Exposure Factors Handbook (USEPA 2011) summarizes available data from several Native American studies including several tribes in Washington, 4 Columbia River Tribes in Oregon, and North Dakota (Table 10-6 of USEPA 2011). However, USEPA (2011) does not provide recommended values for Native American fish intake because available data are limited to certain geographic areas and/or tribes and cannot be readily generalized.

Recently, two fish consumption survey reports were published characterizing the current and heritage fish consumption rates of the Nez Perce Tribe (USEPA 2016a) and the Shoshone-Bannock Tribes (USEPA 2016b) in Idaho. In both reports, heritage rates were estimated based on a comprehensive review and evaluation of literature, including historical accounts and modern studies of heritage consumption. Current rates were calculated using survey data by two methods: 1) a food frequency questionnaire (FFQ) which involved questions about consumption over the past year to support fish consumption estimates, and 2) two 24-hour recall interviews which were used to calculate fish consumption estimates using the National Cancer Institute (NCI) method. Fish consumption rates for total consumers were higher based on the FFQ method compared to rates based on the NCI method (Table S3 in the fish survey reports). For both surveys, seven species groups were identified[1] (USEPA 2016a,b). Fish consumption rates based on the FFQ method were calculated for each of the individual species groups. Fish consumption rates calculated by the NCI method are available for groups 1 and 2. Group 1 included all finfish and shellfish. Group 2 included near coastal, estuarine, freshwater, and anadromous species. Fish consumption rates were not calculated using the NCI method for Groups 3 through 7. Group 2 is defined in the studies to include salmon and steelhead species (Group 3), resident trout (Group 4) and other freshwater finfish and shellfish (Group 5), as well as other freshwater and marine shellfish (e.g., lobster, crab, shrimp, oysters, scallops, etc). The study authors indicated that the marine species in Group 2 were considered likely to be near coastal or estuarine. For this memo, Group 2 was considered more representative of freshwater species likely consumed from Idaho waters than Group 1. The USEPA prefers the NCI method for estimating fish consumption rates when data are adequate because 24-hour recall data are generally more accurate and covariates can be used to improve estimates (USEPA 2016c). This is supported by the tribal fish survey study authors who asserted that the rates based on the NCI method are likely closer to the actual fish consumption rates of the individual populations due to less challenge to a respondent's memory (USEPA 2016a,b).

For the Nez Perce Tribe survey, 460 adult tribal members (age 18 or older) were interviewed and provided sufficient information to classify them as fish consumers or non-consumers. For the

[1]Group 1 = all finfish and shellfish (all species in groups 3-7); Group 2 = near coastal/estuarine/freshwater/ anadromous finfish and shellfish (includes all species in groups 3-5); Group 3 = all salmon and steelhead; Group 4 = resident trout; Group 5 = other freshwater finfish and shellfish; Group 6 = marine finfish and shellfish; Group 7 = unspecified finfish and shellfish.

Shoshone-Bannock Tribes survey, 257 adult tribal members (age 18 or older) were interviewed and provided sufficient information to classify them as fish consumers or non-consumers. Group 2 fish consumption rates calculated by the NCI method were reported for total consumers, as well as for consumers identified as fishers and non-fishers. These include fish consumed regardless of source. Each report provides estimated percentages of select species consumed from different sources including bought from a store or restaurant, and caught in waters within and outside of Idaho. However, Group 2 fish consumption rates are not reported specific to fish caught in Idaho waters. Although some respondents identified as "non-fishers" may actually participate in fishing activities (but whose names were not included in the Department of Fisheries Resources Management list), it is assumed that respondents identified as "fishers" likely best represent those individuals consuming fish caught from local waters. Thus, fish consumption rates calculated using the NCI method for Group 2 fishers were identified as the preferred rates for use in risk estimates in the OU3 HHRA.

Of the 446 Group 2 Nez Perce consumers, 138 were identified as fishers. Of the 225 Group 2 Shoshone-Bannock consumers, 134 were identified as fishers. Fish consumption rates calculated by the NCI method for "Group 2" consuming fishers are presented in the table below.

Tribe	Mean (g/d)	Percentiles (g/d)		
		50%	90%	95%
Nez Perce	98.4	55.2	238.6	345.0
Shoshone-Bannock	23.3	10.2	61.5	92.6

As reported in USEPA (2016a,b) Table S2 (raw weight, edible portion).

The study authors of the survey reports asserted that a likely reason for the NCI-based consumption rates being lower among the Shoshone-Bannock than among the Nez Perce are that the Shoshone-Bannock Tribes have less access to the more abundant fisheries than the Nez Perce Tribe (USEPA 2016a,b). The USEPA recommends using the 95th percentile fish consumption rate of 93 g/day and mean fish consumption rate of 23 g/day for the Shoshone-Bannock Tribes (calculated using the NCI method) for the adult/older child RME and CTE CSKT fishers, respectively. Although these values are lower than the consumption rates for the Nez Perce Tribe, the Shoshone-Bannock Tribe may better represent inland tribes with limited access to abundant fisheries as expected within the stretch of the CFR included in the OU3 study area. These fish consumption rates are roughly two times higher than that of the fish consumption rates assumed for the general recreational fisher being evaluated in the OU3 HHRA.

The fish surveys for the Nez Perce and Shoshone-Bannock Tribes were specific to adults. Data on the fish consumption rates of CSKT children are not available. The child fish consumption rate used in the OU3 HHRA was estimated by multiplying the adult fish consumption rate by a ratio of child-to-adult estimated energy requirements (EER) equal to 0.5. Values for EER were

calculated based on regression models reported in Institute of Medicine (IOM 2005). This methodology is described in detail in SRC (2019) provided as Attachment E-1.

REFERENCES

SRC. 2019. Proposed approach to calculate food consumption rates in children from adult consumption rates in the Upper Columbia River (UCR) Human Health Risk Assessment (HHRA). SRC. Memorandum to David Charters, EPA ERT dated August 5, 2019.

USEPA. 2011. Exposure Factors Handbook: 2011 Edition. United States Environmental Protection Agency, Office of Research and Development. EPA/600/R-090/052F. September.

USEPA. 2016a. A Fish Consumption Survey of the Nez Perce Tribe. December. Available online at: https://www.epa.gov/sites/production/files/2017-01/documents/fish-consumption-survey-nez-perce-dec2016.pdf

USEPA. 2016b. A Fish Consumption Survey of the Shoshone-Bannock Tribes. December. Available online at: https://www.epa.gov/sites/production/files/2017-01/documents/fish-consumption-survey-shoshone-bannock-dec2016.pdf

ATTACHMENT E-1

Approach for Calculating Food Consumption Rates in Children

SRC (2019) provided as an attachment

Memorandum

To: David Charters, EPA ERT

Cc: Robert Tan, Marc Stifelman, and Monica Tonel, EPA Region 10

From: Gary Diamond, Mark Follansbee, Julie Rothrock, Bill Thayer and Karen Kracko

Date: August 5, 2019

Re: Proposed approach to calculate food consumption rates in children from adult consumption rates in the Upper Columbia River (UCR) Human Health Risk Assessment (HHRA)

Calculation of Food Consumption Rates in Children from Adult Consumption Rates

Food consumption rates for the Confederated Tribes of the Colville Reservation (CCT) exposure scenario in the Upper Columbia River (UCR) Human Health Risk Assessment (HHRA) were derived from a survey of CCT residents (the "Tribal Survey;" Westat, 2012). The survey included a 24-hour dietary recall and a food frequency questionnaire and was intended to yield estimates of consumption for children (ages 0-6 years) and other ages. For most foods, a sufficient number of adult subjects reported eating the food to provide a reliable estimate of adult consumption rates. However, for some foods, the number of children who consumed the food was insufficient for estimating consumption rates for children.

In the HHRA, if a rate of consumption of a specific food could not be estimated for children from the Tribal Survey (or other credible sources), consumption rates for children were calculated from the adult consumption rate using the following equation (Equation 1):

$$CR_{child} = CR_{adult} \cdot \frac{EER_{child}}{EER_{adult}} \qquad \text{Eq. (1)}$$

where CR is the consumption rate (grams [g]/day) for children or adults, and EER is the Estimated Energy Requirement for children and adults. Values for EER were calculated based on regression models for EER reported in IOM (2005). Based on the EERs calculated from IOM (2005), a value of 0.5 was used in Equation 1 to represent the EER_{child}/EER_{adult} ratio. The basis for this child/adult ratio of 0.5 is described below.

Calculation of Estimated Energy Requirement (EER) for children and adults:

Estimates of EER reported in IOM (2005) were based on clinical studies of clearance of doubly labeled water. Measurement of clearance of doubly labeled water provides an estimate of the metabolic production of carbon dioxide, from which estimates of oxygen consumption and energy expenditure can be derived. IOM (2005) reports values for the EER, which is the sum of basal energy expenditure, thermal effect of food (energy expended as a result of consumption of food), and energy expenditures from physical activity, thermal regulation and growth of tissue including pregnancy and production of milk (energy deposition). Doubly labeled water studies are cross-sectional measurements of energy expenditure and, therefore, do not measure energy deposition. Values for energy deposition reported in IOM (2005) were based on estimates of the energy content of protein and adipose added to body mass during growth. Energy deposition varies with age; being highest during infancy 175 kilocalories [kcal]/day at age ≤3 months) and decreasing to 20 kcal/day at age ≥13 months). After cessation of growth, total energy expenditure and EER converge (energy balance).

Values for EER for specific ages were estimated from regression equations reported in IOM (2005) that related EER to body size (body mass and length). The regression equations used to calculate EER within specific age ranges are described below.

EER for ages 1 – 35 months (Equation 2):

$$\mathrm{EER} = (89 \cdot \mathrm{BW} - 100) + \mathrm{ED} \qquad \text{Eq. (2)}$$

where EER is expressed in units of kcal/day, BW is body weight (kilograms [kg]) and ED is energy deposition (kcal/day). Age-range values for ED were as follows:

ED 0–3 months: 175 kcal

ED 4–6 months: 56 kcal

ED 7–12 months: 22 kcal

ED 13–36 months: 20 kcal

EER for ages 3-18 years (Equations 3 and 4):

$$\mathrm{EER(male)} = 88.5 - (61.9 \cdot \mathrm{age}) + \mathrm{PA} \cdot (26.7 \cdot \mathrm{BW} + 903 \cdot \mathrm{HT}) + \mathrm{ED} \qquad \text{Eq. (3)}$$

$$\mathrm{EER(female)} = 135.3 - (30.8 \cdot \mathrm{age}) + \mathrm{PA} \cdot (10.0 \cdot \mathrm{BW} + 934 \cdot \mathrm{HT}) + \mathrm{ED} \qquad \text{Eq. (4)}$$

where age is in years, PA is a physical activity coefficient and HT is body height (meters [m]). Age range values for ED were as follows:

ED ages 3-8 years: 20 kcal/day

ED for ages 9-18 years: 25 kcal/day

Values for PA used in the regression equations were as follows:

PA Level	Males	Females
sedentary	1.00	1.00
low active	1.13	1.16
active	1.26	1.31
very active	1.42	1.56

The bases for physical activity coefficients of children are described in detail in IOM (2005). Physical activity levels in children are approximately equivalent exertion from the following activities:

sedentary: lying awake, sitting

low active: walking at a pace of 2.5 miles/hour for 2 hours

active: walking at a pace of 2.5 miles/hour for 4 hours

very active: walking at a pace of 2.5 miles/hour for 6 hours

EER for ages 19 years and older (Equations 5 and 6):

$$\mathrm{EER(male)} = 662 - (9.53 \cdot \mathrm{age}) + \mathrm{PA} \cdot (15.91 \cdot \mathrm{BW} + 539.6 \cdot \mathrm{HT}) \qquad \text{Eq. (5)}$$

$$\mathrm{EER(female)} = 354 - (6.91 \cdot \mathrm{age}) + \mathrm{PA} \cdot (9.36 \cdot \mathrm{BW} + 726 \cdot \mathrm{HT}) \qquad \text{Eq. (6)}$$

Values for PA used in the adult regression equations were as follows:

PA Level	Males	Females
sedentary	1.00	1.00
low active	1.11	1.12
active	1.25	1.27
very active	1.48	1.45

The bases for physical activity coefficients for adults are described in detail in (IOM, 2005). Physical activity levels in adults are approximately equivalent to exertion from the following activities:

sedentary: physical activities required for independent living

low active: walking 2.2 miles/day at a rate of 3-4 miles/hour

active: walking 7 miles/day at a rate of 3-4 miles/hour

very active: walking 17 miles/day at a rate of 3-4 miles/hour

The above regression equations require values for body height and/or weight. Reference values for body weight and height used in the regression equations are presented in Table 1 (IOM, 2005).

Estimates of energy requirement in children and adults:

Figure 1 shows EERs calculated from regression equations and reference body weights and heights for children and adults. The EERs shown in Figure 1 are the average values for three physical activity categories: low active, active or very active (sedentary was not included in the average). The discontinuities in the age profiles shown in Figure 1 result from three different regression models for subjects in specific age ranges (i.e., 1-35 months, 3-18 years, ≥19 years). Table 2 summarizes EER estimates for adults and children (HHRA age range category 0-6 years) for the four physical activity levels represented in the IOM (2005) regression equations. Child/adult ratios (male female average) for EER ranged from 0.48 (very active) to 0.53 (sedentary). The average for the non-sedentary activity levels was 0.50. This value was selected for use in Equation 1 for calculating food consumption rates for children from adult consumption rates.

References

IOM. 2005. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acid (2005). Institute of Medicine. National Academy Press, Washington, DC.

Westat, Inc. 2012. Upper Columbia River Site Remedial Investigation and Feasibility Study. Tribal Consumption and Resource Use Survey. Final Report. Prepared for U.S. Environmental Protection Agency, Region 10 by Westat, Inc.: Rockville, MD. April. http://www.colvilletribes.com/final_report_june_2012_.php

Table 1. Body Weights and Heights Used in Regression Equations for Estimated Energy Requirement

		Males		Females	
Age	**Unit**	**Weight (kg)**	**Height (m)**	**Weight (kg)**	**Height (m)**
1	month	4.4	--	4.2	--
2	month	5.3	--	4.9	--
3	month	6.0	--	5.5	--
4	month	6.7	--	6.1	--
5	month	7.3	--	6.7	--
6	month	7.9	--	7.2	--
7	month	8.4	--	7.7	--
8	month	8.9	--	8.1	--
9	month	9.3	--	8.5	--
10	month	9.7	--	8.9	--
11	month	10.0	--	9.2	--
12	month	10.3	--	9.5	--
15	month	11.1	--	10.3	--
18	month	11.7	--	11.0	--
21	month	12.2	--	11.6	--
24	month	12.7	--	12.1	--
27	month	13.1	--	12.5	--
30	month	13.5	--	13.0	--
33	month	13.9	--	13.4	--
35	month	14.2	--	13.7	--
3	year	13.9	0.94	14.3	0.95
4	year	15.8	1.01	16.2	1.02
5	year	17.9	1.08	18.4	1.09
6	year	20.2	1.15	20.7	1.15
7	year	22.8	1.21	23.1	1.22
8	year	25.6	1.28	25.6	1.28
9	year	29.0	1.33	28.6	1.34
10	year	32.9	1.38	31.9	1.39
11	year	37.2	1.44	35.9	1.44
12	year	41.6	1.51	40.5	1.49
13	year	45.8	1.57	45.6	1.56
14	year	49.4	1.60	51.0	1.64
15	year	52.0	1.62	56.3	1.70
16	year	53.9	1.63	60.9	1.74
17	year	55.1	1.63	64.6	1.75
18	year	56.2	1.63	67.2	1.76
≥19	year	70.0	1.80	60.0	1.50

Based on IOM (2005)

Table 2. Energy Expenditure in Children and Adults

Physical Activity Level	Age Category	Energy Requirement (kcal/day)		
		Male	Female	Male and Female
Sedentary	Child	1084	1014	1049
	Adult	2289	1673	1981
	Child/Adult	0.47	0.61	0.53
Low active	Child	1180	1109	1145
	Adult	2519	1871	2195
	Child/Adult	0.47	0.59	0.52
Active	Child	1275	1199	1237
	Adult	2811	2119	2465
	Child/Adult	0.45	0.57	0.50
Very active	Child	1393	1347	1370
	Adult	3290	2416	2853
	Child/Adult	0.42	0.56	0.48
Mean for low active, active and very active	Child	1283	1218	1251
	Adult	2873	2135	2504
	Child/Adult	0.45	0.57	0.50

Child age range: 0-6 years
Adult age: 48 years (median for Tribal survey)
EER, estimated energy requirement

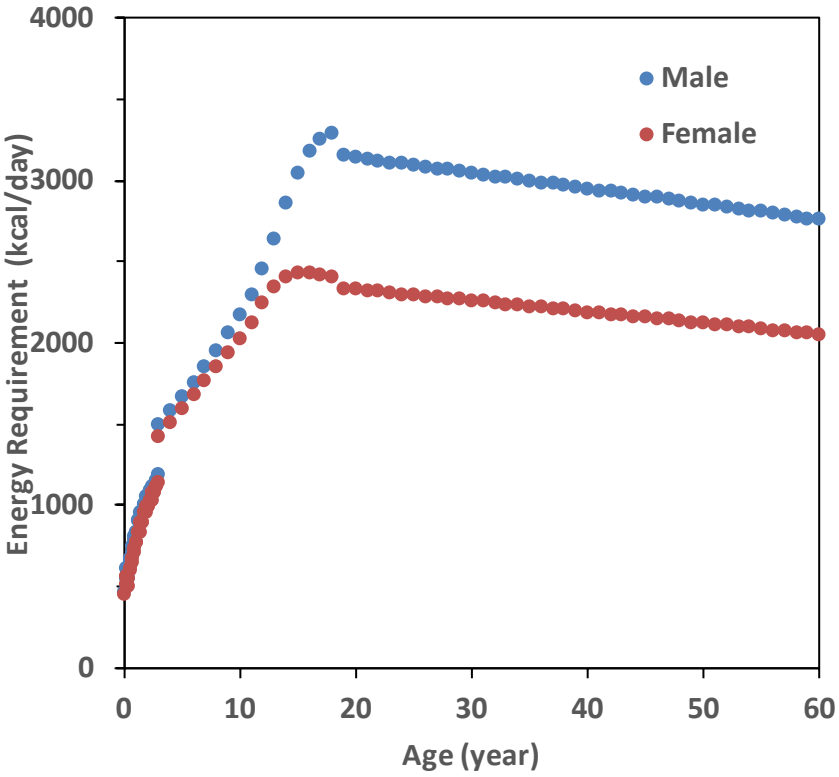


Figure 1. Energy requirement estimated from age-category regression models reported in IOM (2005). Values shown are averages for physical activity categories low active, active and very active.