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Remedial Action Contract

Final
Human Health Risk Assessment

Matteo & Sons, Inc. Site

Remedial Investigation/Feasibility Study

Thorofare, New Jersey

April 11, 2016

565344

CDM Smith

Table of Contents

Executive Summary ES-1

Section 1 Introduction 1-1

1.1 Overview 1-1
1.2 Report Organization 1-2

Section 2 Site Background and Setting 2-1

2.1 Site Location and Description 2-1
2.2 Site History 2-2
2.3 Site Geology and Hydrogeology 2-3
2.3.1 Site Geology 2-3
2.3.2 Site Hydrogeology 2-3
2.4 Demography and Land Use 2-4

Section 3 Data Evaluation 3-1

3.1 Sample Collection and Analysis 3-1
3.1.1 Soil Sampling 3-1
3.1.2 Groundwater Sampling 3-2
3.1.3 Surface Water and Sediment Sampling 3-2
3.1.4 Fish Sampling 3-2
3.2 Data Usability 3-3
3.2.1 Data Usability Assessment 3-3
3.2.2 Reporting Limits 3-4
3.3 Analytical Data Summary 3-4
3.3.1 Soil 3-5
3.3.1.1 Surface Soil 3-5
3.3.1.2 Surface/Subsurface Soil 3-7
3.3.2 Groundwater 3-8
3.3.3 Surface Water 3-8
3.3.4 Sediment 3-9
3.3.5 Fish 3-9
3.4 Identification of Chemicals of Potential Concern 3-9

Section 4 Exposure Assessment 4-1

4.1 Exposure Pathways 4-1
4.1.1 Conceptual Site Model 4-1
4.1.2 Identification of Exposure Pathways 4-1
4.1.2.1 Soil Exposure Pathways 4-2
4.1.2.2 Groundwater Pathways 4-2
4.1.2.3 Surface Water and Sediment Pathways 4-3
4.1.2.4 Biota Pathways 4-3
4.2 Characterization of Potentially Exposed Populations 4-3

4.2.1 Current Receptors 4-3
4.2.1.1 Site Workers 4-3
4.2.1.2 Trespassers 4-4
4.2.1.3 Recreational Users 4-4
4.2.1.4 Anglers 4-4
4.2.1.5 Residents 4-5
4.2.2 Future Receptors 4-5
4.2.2.1 Site Workers 4-5
4.2.2.2 Trespassers 4-6
4.2.2.3 Recreational Users 4-6
4.2.2.4 Anglers 4-6
4.2.2.5 Residents 4-6
4.2.2.6 Construction Workers 4-7
4.3 Summary of Exposure Pathways and Receptors 4-7
4.4 Calculation of Exposure Point Concentrations 4-9
4.4.1 Exposure Point Concentrations of Samples Collected 4-9
4.4.2 Ambient Air Exposure Point Concentrations 4-10
4.4.3 Shower Model 4-10
4.5 Exposure Parameter Assumptions 4-11
4.5.1 Residents 4-11
4.5.1.1 Soil 4-12
4.5.1.2 Groundwater 4-12
4.5.1.3 Surface Water and Sediment 4-13
4.5.1.4 Fish 4-13
4.5.2 Site Workers 4-14
4.5.3 Trespassers 4-14
4.5.3.1 Soil 4-14
4.5.3.2 Surface Water and Sediment 4-15
4.5.4 Recreational Users 4-15
4.5.5 Anglers 4-16
4.5.6 Construction Workers 4-16

Section 5 Toxicity Assessment 5-1

5.1 Health Effects Criteria for Noncarcinogens 5-1
5.2 Health Effects Criteria for Carcinogens 5-2
5.3 Toxicity Values 5-4

Section 6 Risk Characterization 6-1

6.1 Risk Characterization Methodology 6-1
6.2 Results of Risk Calculations 6-1
6.2.1 Current Receptors 6-2
6.2.1.1 Site Workers 6-2
6.2.1.2 Trespassers 6-2
6.2.1.3 Recreational Users 6-2

6.2.1.4 Residents 6-3
6.2.1.5 Anglers 6-4
6.2.2 Future Receptors 6-4
6.2.2.1 Residents at the Matteo Property 6-5
6.2.2.2 Construction Workers 6-5
6.3 Risk Associated with Exposure to Lead 6-6
6.4 Risks from Background Concentrations 6-7
6.4.1 Arsenic 6-8
6.4.2 Vanadium 6-8
6.4.3 Iron 6-8
6.4.4 Antimony and Lead 6-8
6.4.5 Polycyclic Aromatic Hydrocarbons 6-9
6.4.6 Summary 6-9
6.5 Uncertainty in Risk Assessment 6-9
6.5.1 Environmental Data 6-9
6.5.2 Exposure Parameter Estimation 6-11
6.5.2.1 Selection of Exposure Areas 6-12
6.5.2.2 Exposure Point Concentrations 6-12
6.5.2.3 Exposure Parameters 6-13
6.5.3 Toxicity Values 6-14
6.5.4 Risk Characterization 6-16
6.5.4.1 Evaluation of Risks from Groundwater 6-16
6.5.4.2 Evaluation of Risks from Fish 6-16
6.5.4.3 Evaluation of Lead 6-17

Section 7 Summary and Conclusions 7-1

7.1 Approach 7-1
7.2 Site Risks 7-2
7.2.1 Current Receptors 7-2
7.2.1.1 Cancer Risk 7-2
7.2.1.2 Noncancer Health Hazard 7-3
7.2.1.3 Uncertainty in Current Risk Assessment 7-4
7.2.2 Future Receptors 7-4
7.2.2.1 Cancer Risk 7-4
7.2.2.2 Noncancer Health Hazard 7-5
7.2.2.3 Uncertainty in Future Risk Assessment 7-6
7.3 Risks from Lead 7-6
7.4 Conclusions 7-6

Section 8 References 8-1

List of Tables

Table 3-1	List of Chemicals of Potential Concern
Table 3-2	Lead Worksheet
Table 5-1	Noncancer Toxicity Data – Oral/Dermal
Table 5-2	Noncancer Toxicity Data – Inhalation (Chronic)
Table 5-3	Noncancer Toxicity Data – Inhalation (Subchronic)
Table 5-4	Noncancer Toxicity Data – Inhalation (Acute)
Table 5-5	Cancer Toxicity Data – Oral/Dermal
Table 5-6	Cancer Toxicity Data – Inhalation
Table 6-1	Summary of Cancer Risks and Noncancer Health Hazards for Non-Residential Receptors
Table 6-2	Summary of Cancer Risks and Noncancer Health Hazards for Residents

List of Figures

Figure 2-1	Site Location Map
Figure 2-2	Site Map
Figure 3-1	Soil Sample Location Map
Figure 3-2	Monitoring Well Location Map
Figure 3-3	Surface Water and Sediment Sample Location Map
Figure 4-1	Conceptual Site Model, Current Land-Use Scenario
Figure 4-2	Conceptual Site Model, Future Land-Use Scenario

Appendices

Appendix A	List of Samples Used in the Risk Assessment
Appendix B	RAGS D Tables for RME Scenario
Appendix C	ProUCL Output for Chemicals of Potential Concern (on CD)
Appendix D	Shower Model
Appendix E	RAGS D Tables for CTE Scenarios
Appendix F	Comparison of Reporting Limits for Non-detected Chemicals to Screening Levels

Acronyms

ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
Berger	The Louis Berger Group, Inc.
bgs	below ground surface
BHC	hexachlorocyclohexane
Cal/EPA	California Environmental Protection Agency
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cPAH	carcinogenic polycyclic aromatic hydrocarbon
COPC	chemical of potential concern
CSM	conceptual site model
CTE	central tendency exposure
DCE	dichloroethene
4,4'-DDE	p,p'-dichlorodiphenyldichloroethene
4,4'-DDT	p,p'-dichlorodiphenyltrichloroethane
DO	dissolved oxygen
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
FS	feasibility study
GI	gastrointestinal
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IR	ingestion rate
IRIS	Integrated Risk Information System
IUR	inhalation unit risk
K-M	Kaplan-Meier
MCL	maximum contaminant level
NCEA	National Center for Environmental Assessment
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NOAEL	no-observed-adverse-effect level
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-*p*-dioxin
PCDF	polychlorinated dibenzofuran
PCE	tetrachloroethene
PEF	particulate emission factor
PRM	Potomac-Raritan-Magothy
PPRTV	Provisional Peer Reviewed Toxicity Value

QAPP	Quality Assurance Project Plan
RAC	Remedial Action Contract
RAGS	Risk Assessment Guidance for Superfund
RfC	reference concentration
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
RPF	relative potency factor
RSL	Regional Screening Level
SF	slope factor
the site	the Matteo & Sons, Inc. site
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TCDD	tetrachlorodibenzo-p-dioxin
TEF	toxicity equivalence factor
TEQ	toxicity equivalence
TOC	total organic carbon
UCL	upper confidence limit
VF	volatilization factor
VOC	volatile organic compound

ww	wet weight
cm	centimeter
cm^2	square centimeter
kg	kilogram
g	gram
hr	hour
L	liter
m	meter
m^3	cubic meter
mg	milligram
mL	milliliter
ng	nanogram
µg	microgram

Executive Summary

CDM Federal Programs Corporation (CDM Smith) received Work Assignment 032-RICO-02KD under the Remedial Action Contract to perform a Remedial Investigation/Feasibility Study (RI/FS) for the United States Environmental Protection Agency (EPA) Region 2 at the Matteo & Sons, Inc. site (the site) located in Thorofare, West Deptford Township, Gloucester County, New Jersey. The overall purpose of the work assignment is to evaluate the nature and extent of contamination at the site and to develop and evaluate remedial alternatives, as appropriate.

The human health risk assessment (HHRA), as part of the RI/FS, is developed to characterize potential human health risks associated with impacted portions of the Matteo Study Area in the absence of any remedial action. This includes the Matteo property, the Willow Woods property and the impacted portions of Hessian Run and Woodbury Creek.

The HHRA is conducted in accordance with current EPA guidance outlined in *Risk Assessment Guidance for Superfund* (RAGS), Parts A, D, E, and F and other EPA guidance pertinent to human health risk assessments. The HHRA consists of sections describing site background and setting, data evaluation, exposure assessment, toxicity assessment, risk characterization, and summary of risk assessment.

Site Background and Setting

The site is located at 1708 U.S. Highway 130 (Crown Point Road) in Thorofare, West Deptford Township, Gloucester County, New Jersey. The site occupies two tax parcels (Lot 2, Block 128 and Lot 2, Block 325) as identified on the West Deptford Township Tax Map. The Matteo property consists of 82.5 acres of land and tidal flats located between the confluence of Woodbury Creek and Hessian Run to the west, Belmont Avenue to the east, and U.S. Highway 130 to the south.

The Matteo Study Area is defined as the Matteo property, contaminated portions of two adjacent surface water bodies (Hessian Run and Woodbury Creek), and nearby properties (Willow Woods and Billy-O-Tire). The upland areas of the Matteo property includes the scrapyard area, the open field/waste disposal area and the rental home area.

According to public records, between 1907 and 1947 a portion of the Matteo property was used for farming activities, while the remainder of the property was covered by woodlands. The Matteo family acquired the property in 1947. The Matteo family, under various names, has operated an unregistered landfill and junkyard and a metals recycling facility at the site since 1961. In 1968, the New Jersey Department of Environmental Protection (NJDEP) identified an inactive incinerator at the site. In 1971, NJDEP approved Matteo's request to operate the incinerator to burn copper wire and Matteo submitted a plan to operate a "sweating fire box" to melt lead battery terminals for lead reclamation. This lead melting operation continued until 1985. In 1972, NJDEP observed landfilling of crushed battery casings and household waste in an area of wetlands adjacent to Hessian Run. This operation was apparently performed in conjunction with the lead smelting operation, as there were several reports of battery casing incineration and subsequent onsite ash disposal. In addition to the incineration and landfilling operations, drums of waste were scattered throughout the property.

Subsequently, several investigations led by Matteo & Sons, Inc. under oversight of NJDEP were conducted at the Matteo property and at the adjacent manufactured home community, the Willow Woods property. In June 2005, NJDEP submitted the site for Comprehensive Environmental Response, Compensation, and Liability Act removal action consideration. On September 27, 2006 the site was included on the National Priorities List.

Between May and July 2006, the Matteo & Sons, Inc. conducted soil removal activities, fence installation activities, and installation of crushed aggregate in accordance with the Administrative Settlement Agreement and Order of Consent. This included excavation, removal and off-site disposal of soil exceeding the New Jersey Department of Environmental Protection (NJDEP) residential cleanup standard for lead of 400 parts per million from the Matteo and Willow Woods properties. Following soil removal, a chain- link fence was placed along the southern property line and along the northern property boundary at the alternative entrance on Crown Point Road, and improvements were made to the existing fence at the scrap metal processing areas to restrict unauthorized access to the site. In addition, four inches of recycled crushed aggregate and/or recycled asphalt product were placed over the entire unpaved area of the scrapyard area.

Data Evaluation

CDM Smith conducted a field investigation to define the nature and extent of site-related contamination in soil, sediment, surface water, and groundwater at the site, to support the assessment of risks to ecological and human receptors, and to support the development and evaluation of appropriate remedial alternatives. Investigations included collection and analysis of samples from soil, groundwater, surface water, and sediment. Analytical results generated as part of the current RI are supplemented with NJDEP 2003 fish sampling and analyses results to adequately characterize contamination at the site to support the HHRA.

Chemicals of potential concern (COPCs) are identified based on criteria outlined in RAGS, primarily through comparison to risk-based screening levels. Four volatile organic compounds (VOCs), 9 semi-volatile organic compounds (SVOCs), dioxin/furan, 4 polychlorinated biphenyls (PCBs), 4 pesticide, 17 metals, and cyanide are identified as COPCs for further evaluation in the HHRA.

Exposure Assessment

Potential exposure pathways at the site are defined based on potential source areas, release mechanisms, and current and potential future uses of the site. Potential receptors evaluated in the risk assessment include:

- Current Land-Use Scenario
  - Matteo property - site workers, trespassers, recreational users, anglers, and residents in the rental home area
  - Willow Woods property - residents

- Future Land-Use Scenario
  - Matteo property - site workers, trespassers, recreational users, anglers, residents, and construction workers
  - Willow Woods property – residents and construction workers

Exposure pathways evaluated for soil include incidental ingestion, dermal contact, and inhalation of particulates by site workers, trespassers, recreational users, residents, and construction workers. Exposure pathways evaluated for groundwater include ingestion, dermal contact, and inhalation of vapor released during showering and bathing by current and future residents at the Matteo property. Exposure pathways evaluated for surface water and sediment include incidental ingestion and dermal contact by trespassers and future residents. The exposure pathway evaluated for fish include ingestion by anglers and future residents at the Matteo property.

Exposure point concentrations (EPCs) for the COPCs are used in the exposure assessment calculations to estimate potential chemical intake. The EPC is the lower of the upper confidence limit (UCL) on the mean concentration or the maximum detected concentration.

Quantification of exposure includes evaluation of exposure parameters that describe the exposed population (e.g., contact rate, exposure frequency and duration, and body weight). Each exposure parameter in the equation has a range of values. Daily intakes are calculated based on the reasonable maximum exposure (RME) scenario (the highest exposure reasonably expected to occur at a site). The intent is to estimate a conservative exposure case that is still within the range of possible exposures. Central tendency exposure (CTE) assumptions are also developed, when the estimated risks under RME scenario exceed EPA's threshold risk range. CTE scenarios reflect more typical exposures.

Exposures to lead are not evaluated using the same methods as those described for other COPCs. EPA considers lead to be a special case because of the difficulty in identifying the threshold. The EPCs are based on arithmetic mean lead concentrations in environmental media. Health risks from lead exposure are evaluated qualitatively in this risk assessment.

Toxicity Assessment

COPCs are quantitatively evaluated on the basis of their noncancer and/or cancer potential. The reference dose and reference concentration are the toxicity values used to evaluate noncancer health hazards in humans. Inhalation unit risk and slope factor are the toxicity values used to evaluate cancer health effects in humans. These toxicity values are obtained from various sources following the hierarchy order specified by EPA.

Risk Characterization

Risk characterization integrates the exposure and toxicity assessments into quantitative expressions of risks/health effects. To characterize potential noncancer health effects, comparisons are made between estimated intakes of substances and toxicity thresholds. Potential cancer effects are evaluated by calculating probabilities that an individual will develop cancer over a lifetime exposure based on projected intakes and chemical specific dose-response information. In general, EPA recommends target risk values, (i.e., cancer risk of 10^{-6} [1 in a million] to 10^{-4} [1 in a 10,000] or a

noncancer health hazard index [HI] of unity [1]), as threshold values for potential human health impacts. These target values aid in determining whether remedial action is necessary at the site.

Risks for all receptors are estimated using RME assumptions. Risks are also estimated using CTE assumptions when the RME assumptions result in risk estimates above EPA's thresholds. Risks are summarized below.

Current Receptors

Considering current land use, the estimated total cancer risks for all receptors are below, within, or at EPA's target range of 1×10^{-6} to 1×10^{-4} except for residents at the Matteo property, site workers, and adult anglers. The total cancer risks for current residents (1×10^{-2}), site workers (3×10^{-4}), and adult anglers (2×10^{-4}) exceed EPA's target range. The cancer risk for current residents at the Matteo property is entirely due to the conservative assumption that groundwater is used for drinking water purposes. Major risk drivers are arsenic and vinyl chloride in groundwater. Neither chemical is considered site-related. The risk drivers for anglers are PCBs in fish. The risk driver for site workers is Aroclor 1260 in surface soil.

In the evaluation of noncancer health hazards, the HIs for recreational users and residents at the Willow Woods property are below or at EPA's target threshold of unity. However, residents at the Matteo property have noncancer HIs greater than the EPA threshold for the blood, GI tract, kidney, longevity, and skin. In addition, HIs for the eye, finger nail, and immune system for site workers and both adult and child anglers exceed the EPA threshold. These potential health hazards are due to exposure to antimony, arsenic, iron, and vanadium in groundwater, Aroclor 1260 in soil, and Aroclors 1254 and 1260 in fish.

When a more typical exposure is considered under the CTE scenario, the total cancer risk and noncancer HIs for trespasser and adult anglers are below or at EPA target thresholds. However, the total cancer risk (4×10^{-3}) and noncancer HIs for residents at the Matteo property still exceeds EPA's target thresholds. These estimated risks indicate the potential for unacceptable risks for using groundwater as drinking water.

The mean lead concentrations in soils at the Matteo property, groundwater, and surface water and fish of Hessian Run and Woodbury Creek exceed EPA screening levels. Potential exposure to lead in these media and through consumption of fish caught from Hessian Run and Woodbury Creek may cause adverse health effects to site workers, trespassers, recreational users, residents, and anglers.

Risks for current residents at the Matteo property from potential exposure to groundwater are overestimated because of the conservative assumption that groundwater is used for drinking water purposes, inclusion of soil outlier, the use of site-wide groundwater data and total metal concentrations in risk calculations, and the use of a conservative reference dose for vanadium. Based on analytical data from the RI, antimony, vanadium, and vinyl chloride were not detected in the potable wells while arsenic and lead were only present at levels below federal drinking water standards and state groundwater standards. Thus, exposure to groundwater is not a concern for current residents living in the rental house.

Future Receptors

Estimated risks for future site workers, trespassers, recreational users, anglers, and residents at the Willow Woods property remain the same as those for the current land-use scenarios. The estimated total cancer risks and noncancer hazards for future construction workers at Willow Woods property are below EPA target thresholds, indicating that unacceptable health risks will unlikely occur for future construction workers at the Willow Woods property. The noncancer hazards for future construction workers at the Matteo property are above EPA target thresholds, indicating that unacceptable health risks will likely to occur from future construction worker at the Matteo property. For future residents at the Matteo property, the estimated total cancer risk (6×10^{-3}) exceeds EPA's target range. Cancer risks are due to exposure to carcinogenic polycyclic aromatic hydrocarbons (cPAHs) (61%) and Aroclor 1260 (3%) in soil, cPAHs in surface water (13%), arsenic (10%) and vinyl chloride (7%) in groundwater, and PCBs in fish (4%). With the exception of PCBs, none of these chemicals are considered site-related.

In the evaluation of noncancer health hazards, the future residents at the Matteo property have HIs for the blood, eye, finger nail, GI tract, immune system, kidney, longevity, respiratory system, and the skin exceeding the EPA threshold of unity. Noncancer risk drivers are antimony, arsenic, and iron in groundwater, vanadium in soil, groundwater, and sediment, Aroclor 1260 in soil and fish, and Aroclor 1254 in fish.

When a more typical exposure is considered under the CTE scenario, the total cancer risk for future residents (2×10^{-3}) is still above EPA's target range. The target organ/effect HIs are still greater than one. These estimated risks indicate the potential for unacceptable risks for future residents at the Matteo property.

The mean lead concentrations in soils in the Matteo property, groundwater, and surface water and fish of Hessian Run and Woodbury Creek exceed EPA screening levels. Potential exposure to lead in these media and through consumption of fish caught from Hessian Run and Woodbury Creek may cause adverse health effects to future site workers, trespassers, recreational users, residents, anglers, and construction workers, especially future child residents at the Matteo property.

Summary and Conclusions

In conclusion, unacceptable health risks are estimated for current and future residents at the Matteo property and anglers consuming fish caught from Hessian Run and Woodbury Creek. Additionally, the presence of elevated lead concentrations in soil, groundwater, surface water, and fish may cause adverse health effects to site workers, trespassers, recreational users, residents, and anglers, especially future child residents at the Matteo property.

Risks are overestimated for current residents at the Matteo property from potential use of groundwater for drinking water. Based on the RI data, all risk drivers identified in groundwater were either not detected in the potable wells or were present at levels below federal Maximum Contaminant Levels and state groundwater standards in potable wells at the rental house. Thus, current exposure to groundwater is not a concern for residents at the rental house.

Based on the results of the HHRA, lead, antimony, and PCBs are identified as risk drivers related to the Matteo site. Lead and antimony contamination originated from the automotive batteries and recycled wire that were processed and disposed at the site. PCB contamination probably resulted from widespread application of a PCB-containing product. Risks attributable to arsenic, iron, vanadium, cPAHs, and vinyl chloride are most likely related to natural, anthropogenic, or offsite sources that are unrelated to the Matteo site.

Section 1
Introduction

CDM Federal Programs Corporation (CDM Smith) received Work Assignment 032-RICO-02KD under the Remedial Action Contract to perform a Remedial Investigation/Feasibility Study (RI/FS) for the United States Environmental Protection Agency (EPA) Region 2 at the Matteo & Sons, Inc. site (the site) located in Thorofare, West Deptford Township, Gloucester County, New Jersey.

This human health risk assessment (HHRA), as part of the RI/FS, is developed to characterize potential human health risks associated with the site in the absence of any remedial action. This HHRA identifies the potential exposure pathways by which populations may be exposed. Exposure pathways are identified based on considerations of the sources and locations of contaminants related to the site, the likely environmental fate of the contaminants, and the location and activities of the potentially exposed populations. The HHRA describes exposure points and routes of exposure for each exposure pathway, as well as underlying assumptions regarding receptor characteristics and behavior (e.g., body weight, ingestion rate, exposure frequency). The HHRA also identifies chemicals of potential concern (COPCs) for each environmental medium, exposure point concentrations (EPCs) and toxicity values of COPCs. Finally, the HHRA characterizes potential cancer risks and noncancer health hazards associated with each complete exposure pathway.

1.1 Overview

To prepare this HHRA, CDM Smith reviewed the available information pertaining to the site. Potential exposure pathways, exposure routes, and potentially exposed populations under current and future land-use scenarios are identified. Exposure parameters and daily intakes for exposure scenarios and toxicity values for COPCs are presented. The exposure pathways and receptors, exposure parameters, daily intakes, and toxicity values are presented in tabular form in accordance with the standard tables in Risk Assessment Guidance for Superfund (RAGS) Part D (EPA 2001).

This HHRA is developed in accordance with the following EPA guidance documents:

- Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part A (EPA 1989)
- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (EPA 1991a)
- Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part D (EPA 2001)
- Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment (EPA 2004a)
- Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment (EPA 2009a)
- EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites (EPA 2012a)

- ProUCL Version 5.0.00 Technical Guide (EPA 2013)
- Integrated Risk Information System (IRIS) (on-line database of toxicity information) (EPA 2012b)
- Provisional Peer Reviewed Toxicity Values (PPRTV) (on-line database of toxicity values derived for use in the Superfund program when such values are not available from IRIS) (EPA 2012c)

1.2 Report Organization

This HHRA is composed of eight sections, with tables and figures presented at the end of the text. The organization of the report and the contents of each section are described below.

Section 1 Introduction – Provides an overview of the objectives and organization of the HHRA.

Section 2 Site Background and Setting – Briefly describes the site and its location, site history, site geology and hydrogeology, demography and land use.

Section 3 Data Evaluation – Presents sample collection and analysis, an analytical data summary, data usability, and identification of COPCs.

Section 4 Exposure Assessment – Presents a conceptual site model (CSM) and identifies potential exposure pathways and potential receptor populations under both current and future land-use scenarios. Methods for calculating EPCs and exposure parameter assumptions are also presented in this section.

Section 5 Toxicity Assessment – Discusses the relevant toxicity information on the identified COPCs.

Section 6 Risk Characterization – Integrates the toxicity and exposure assessments into quantitative and qualitative expressions of risk, and discusses uncertainties associated with the risk estimates.

Section 7 Summary and Conclusions – Summarizes the results of the risk assessment and presents conclusions based on the results.

Section 8 References – Lists references cited in this report.

Section 2

Site Background and Setting

This section describes the site and its location, site history, geology and hydrogeology, demography and land use. This information is used to develop site-specific information on exposure pathways and receptors associated with the site.

2.1 Site Location and Description

The Matteo Study Area is located at 1708 U.S. Highway 130 (Crown Point Road) in Thorofare, West Deptford Township, Gloucester County, New Jersey (Figure 2-1). The study area consists of the Matteo property, nearby properties (Willow Woods and Billy O Tire) and portions of Hessian Run and Woodbury Creek. The study area has been divided into several areas based on site physical features, historical information, and the locations of samples collected during the RI and previous investigations. These areas are shown in Figure 2-2 and are described below.

- Matteo property (82.5 acres) –The Matteo property (which was once a farm) includes the contiguous upland areas and adjacent mudflats located between the confluence of Woodbury Creek, Hessian Run, and U.S. Highway 130. The property consists of three tax parcels as identified on the West Deptford Township Tax Map. The main portion of the Matteo property on Lot 2, Block 128 and Lot 2, Block 325 includes 80.2 acres of land and tidal mudflats. The third parcel (approximately 2.3 acres) at Lot 2.01, Block 128 is a rental home owned by Matteo. Additionally, two utility lines (Colonial Oil and Public Service Electric & Gas) are located on the northwestern portion of the property. The Matteo property has been subdivided into four general areas: the scrapyard area, the open field/waste disposal area, the rental home area, and the tidal mudflats.
    - Scrapyard area – The scrapyard area (approximately 10 acres) is the southeastern portion of the Matteo property actively supporting the scrap metal recycling business, which remains active. The scrapyard area is largely paved or covered with crushed stone.
    - Open field/waste disposal area – The remaining upland portion (approximately 53 acres) of the western Matteo property is comprised primarily of heavily vegetated, undeveloped land. Within this area there are several distinct waste disposal areas that were delineated during previous NJDEP RI investigations.
    - Rental home area – This 2.3-acre property with a rental home owned by the Matteo is separated from the remainder of the Matteo property by a chain link fence and gate.
    - Tidal mudflats – the Matteo property also includes approximately 17.2 acres of tidal mudflats within Hessian Run that are below water at high tide.
- Willow Woods property (14.5 acres) – Willow Woods is a manufactured home community adjacent to the southwestern border of the Matteo property. The Willow Woods property is

bounded by the Matteo property, U.S. Highway 130, and Woodbury Creek. The 14.5 acre parcel is on Lot 7, Block 325 in West Deptford Township.

- Hessian Run – Hessian Run is a tributary of Woodbury Creek and eventually the Delaware River; this water body is north of the Matteo property with its furthest upstream reaches just east of U.S. Highway 130. Hessian Run is made up primarily of extensive tidal flats (mud flats) with small shallow channels (less than 2 to 3 feet below sea level) extending through the flats. Woodbury Creek – Woodbury Creek is a primary tributary of the Delaware River which is south of the Matteo property. The creek has deep narrow channels (up to 12 feet below sea level) and extensive tidal flats along its northern and southern shores.

2.2 Site History

According to public records, between 1907 and 1947 the Matteo property was owned by Samuel and Bertha Wilkins who used a portion of the property for farming activities, while the remainder of the property was covered by woodlands. The Matteo family acquired the property in 1947. In 1968, the New Jersey Department of Environmental Protection (NJDEP) identified an inactive incinerator at the property. In 1971, NJDEP approved Matteo's request to operate the incinerator to burn copper wire and Matteo submitted a plan to operate a "sweating fire box" to melt lead battery terminals for lead reclamation. This lead melting operation continued until 1985. In 1972, NJDEP observed landfilling of crushed battery casings and household waste in an area of wetlands adjacent to Hessian Run. This operation was apparently performed in conjunction with the lead melting operation, as there were several reports of battery casing incineration and subsequent onsite ash disposal. In addition to the incineration and landfilling operations, drums of waste were scattered throughout the property.

Subsequently, several investigations led by Matteo & Sons, Inc. under oversight of NJDEP and EPA were conducted at the Matteo property and at the adjacent manufactured home community, the Willow Woods property. In June 2005, NJDEP submitted the site for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action consideration. On September 27, 2006 the site was included on the National Priorities List.

Between May and July 2006, the Matteo & Sons, Inc. conducted soil removal activities, fence installation activities, and installation of crushed aggregate in accordance with the Administrative Settlement Agreement and Order of Consent (CERCLA Docket No. 02-2006-2013). The soil removal action included excavation, removal and off-site disposal of soil exceeding the NJDEP residential cleanup standard for lead of 400 parts per million from the Matteo and Willow Woods properties, (Berner Construction 2006a). Following soil removal, a chain-link fence was placed along the southern property line, along the northern property boundary at the alternative entrance on Crown Point Road, and improvements were made to the existing fence at the scrap metal processing areas to restrict unauthorized access to the property. In addition, four inches of recycled crushed aggregate and/or recycled asphalt product were placed over the entire unpaved area of the scrapyard area (Berner Construction 2006b).

2.3 Site Geology and Hydrogeology

This section summarizes the lithologic and hydrogeologic characteristics of the Matteo Study Area. A more detailed description of site geology and hydrogeology can be found in the RI report.

2.3.1 Site Geology

The site is covered by a mantle of Quaternary age (Pleistocene) deposits of the Cape May formation (Stanford 2004). Some Quaternary-age (Holocene) alluvium may also be present adjacent to and within the nearby streams. The Cape May Formation typically consists of yellow or brown medium to coarse-grained quartzose sand with some gravel and trace yellow, brown, black or grey clay. The materials are usually poorly sorted, sand grains are subangular, and its thickness ranges from approximately 15 to 20 feet at the eastern side of the Matteo property to approximately 40 feet on the western side.

Beneath this mantle of Quaternary deposits, are the deposits of the Upper Cretaceous-age Merchantville and Magothy Formations; the contact between the two runs through the Matteo property (Owens et al. 1995). The southern and eastern portions of the property are underlain by the Merchantville Formation.

On the eastern and southern portions of the Matteo property, the Merchantville Formation is approximately 20 feet thick and is generally observed as dark grayish green clays and silts. The Merchantville thins and pinches out in the western portion of the property.

The Potomac-Raritan-Magothy (PRM) Formations underlie the Merchantville/Cape May Formations, and are generally observed as light gray sand with clay and silt lenses. On the western portion of the Matteo property where the Merchantville Formation is not present, the Cape May Formation and the PRM are in direct hydraulic contact.

There appears to have been historical erosion of the Upper Cretaceous surface in the direction of the Woodbury Creek and Hessian Run confluence. What is interpreted as alluvium is encountered near Hessian Run and is observed as a layer of peat and organic sediments underlain by approximately 15 feet of grayish green sand.

2.3.2 Site Hydrogeology

There are two flow systems present at the site, a shallow perched flow system and a deep regional flow system.

The shallow perched flow system is observed in the Cape May Formation, which is a minor aquifer in Gloucester County. Changes in elevation in the shallow groundwater between low tide and high tide are minimal, generally less than 0.1 foot, indicating no significant tidal influence and suggesting the zone is unconfined. The extent of this perched water zone mirrors the extent of the Merchantville formation.

The regional aquifer in the area consists primarily of the Upper Cretaceous Magothy and Raritan Formations of the PRM aquifer. The PRM aquifer system is described as a single hydrologic unit because over large areas the formations are indistinguishable and interconnected. The upper aquifer

of the PRM system is reported to be at least 100 feet thick in the Matteo Study Area. On the eastern portion of the Matteo property the regional potentiometric surface is separated from the shallow groundwater table by the Merchantville formation creating confined conditions in the deep aquifer in this area.

On the eastern portion of the scrapyard and along the northern slope of the Matteo property, the perched groundwater flows north to Hessian Run. The remainder of the perched groundwater flows northwest towards the center of the open field/ waste disposal area where the Merchantville formation is not present and a direct connection between the sands of the Cape May Formation (shallow zone) and the sands of the Magothy Formation (the deep zone) is observed. Consistent with regional observations, data indicate the deeper groundwater flows to the southeast, similar to the regional flow.

2.4 Demography and Land Use

The southern portion of the Matteo property has been used as an active metal recycling facility for over 40 years. The remainder of the Matteo property is unused and vacant. A house currently occupied by a rental tenant is located at the eastern end of the property.

The site is located in Thorofare, West Deptford Township, Gloucester County, New Jersey. West Deptford Township is comprised of 15.9 square miles with a population of 21,677 people (United States Census Bureau 2010). The site vicinity is primarily industrial and commercial; however, the Willow Woods manufactured home community is located south of the site. Twenty-six percent of the land in Gloucester County is zoned residential, commercial or industrial. Approximately 25 percent of the land is used for crops, hay and pasture or orchards. The remainder of the acreage is woodland, wetland or open water (United States Department of Agriculture 2003).

In 2004, there were reportedly three domestic wells, designated as PW-1, PW-2, and PW-3, within a one-mile radius of the site (The Louis Berger Group, Inc. [Berger] 2004a). PW-1 and PW-2 are located at the southeastern portion of the Matteo property (Figure 3-2). The third domestic well, PW-3, is located at the Billy-O-Tire Garage south of the site.

As of July 2012, private well PW-1 in the rental house on the Matteo property is used for domestic purposes such as toilet flushing, washing, laundry, and showering/bathing. Private well PW-2 in the scrapyard area is used for toilet flushing and hand washing. Bottled water is supplied to the rental house and the scrapyard office on a regular basis; thus the well water is not used for drinking or cooking purposes. Both wells are equipped with a water softener system that is regularly maintained and monitored (Matteo 2012). Billy-O-Tire Garage is no longer in business and the building is vacant; thus, private well PW-3 is currently inactive.

The Willow Woods property is currently supplied with potable water from the Township of West Deptford Water and Sewer Department. The public water supply derives 675 million gallons of water from 6 public wells screened in the PRM Aquifer system. Additionally, it receives approximately 350 million gallons of water from the New Jersey American Water Company, which obtains water from both public wells, and the Delaware River.

The closest West Deptford public supply well is located approximately 0.6 miles east/southeast, downgradient of the site. Installed in 1973, this well is 356 feet deep, with a screened interval from approximately 346 to 356 feet below ground surface (bgs) (Berger 2004a).

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Section 3
Data Evaluation

Samples of environmental media including soil, groundwater, surface water, and sediment, as well as fish, have been collected to characterize the nature and extent of contamination from the site. The following subsections describe sample collection and analysis, data usability and the suitability of data for risk assessment purposes, analytical data summary, and the identification of COPCs.

3.1 Sample Collection and Analysis

The site has been the subject of numerous environmental activities dating back to 1984. The investigations performed include a 2003 aquatic biota study in which NJDEP collected fish data from Hessian Run and Woodbury Creek (Berger 2004b).

Under the current RI, CDM Smith conducted a field investigation to define the nature and extent of site-related contamination in soil, sediment, surface water, and groundwater at the site, to support the assessment of risks to ecological and human receptors, and to support the development and evaluation of appropriate remedial alternatives.

As part of the remedial investigation CDM Smith performed soil, sediment, surface water, sediment porewater and seep water sampling from October 2011 to January 2012. Because organic data from these soil and groundwater samples were determined to be of unknown quality, these results are not reported or used in this report. CDM Smith conducted additional soil and groundwater sampling from the same locations from December 2014 to March 2015. These 2015 soil and groundwater samples were analyzed for target compound list (TCL) volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and PCB Aroclors.

Analytical results generated as part of the current RI are supplemented with 2003 fish sampling and analyses results to adequately characterize contamination at the site to support the HHRA. Tables A-1 to A-5 in Appendix A list samples used in this risk assessment. Sampling location maps are presented in Figures 3-1 to 3-3. A brief description of samples used for the risk assessment is provided below. A detailed review of the investigation approach and findings is provided as part of the RI report.

3.1.1 Soil Sampling

Soil samples were collected at the following areas: the scrapyard area, the open field/waste disposal area, the rental home area, and the Willow Woods property.

Scrapyard Area – Seven surface soil and 21 subsurface soil samples were collected from 7 locations at intervals ranging between the ground surface and 16 feet bgs.

Open Field/Waste Disposal Area – Thirty-four surface soil and 35 subsurface soil samples were collected from 41 locations at intervals ranging between the ground surface and 12 feet bgs.

Rental Home Area – Ten surface soil samples were collected in this area from the ground surface to 2 feet bgs.

Willow Woods Property – Ten surface soil and 7 subsurface soil samples were collected from 10 locations at intervals ranging between the ground surface and 4 feet bgs.

Soil samples were analyzed for the full Target Compound List (TCL) which includes volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals plus mercury and cyanide, and polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs).

3.1.2 Groundwater Sampling

One round of groundwater (both filtered and unfiltered) sampling was performed including the collection of grab samples from monitoring wells and potable wells at the site. A total of 35 samples were collected: 33 from monitoring wells and 2 from potable wells. Only unfiltered groundwater samples are used in this risk assessment.

Samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, and TAL metals plus mercury and cyanide. In addition, groundwater samples were analyzed for natural attenuation parameters, including alkalinity, ammonia, bromide, chloride, nitrate/ nitrite, sulfate/sulfide, TOC, total Kjeldahl nitrogen, total suspended solids, and total dissolved solid. Water quality parameters including dissolved oxygen (DO), pH, temperature, conductivity, turbidity, and oxidation-reduction potential were measured in the field and recorded on field data sheets.

3.1.3 Surface Water and Sediment Sampling

Surface water and sediment samples were collected from a total of 16 transects in Hessian Run and Woodbury Creek. Sixty-one sediment samples were collected from the uppermost six inches of sediment. Twenty-seven unfiltered and 27 filtered surface water samples were collected and only unfiltered surface water samples are used in this risk assessment.

Sediment samples were analyzed for pesticides, PCBs, TAL inorganics plus mercury and cyanide, PCDDs, and PCDFs. Surface water samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL inorganics plus mercury and cyanide, chloride, nitrate, nitrite, sulfate, sulfide, TOC, total dissolved solids, total suspended solids, and ammonia. Water quality parameters including DO, pH, temperature, conductivity, turbidity, and oxidation-reduction potential were measured in the field and recorded on field data sheets.

3.1.4 Fish Sampling

In the summer of 2003, Berger, on behalf of NJDEP, conducted an Aquatic Biota Study within and adjacent to the site. Six pumpkinseed (*Lepomis gibbous)* samples were collected for assessment of risk to human health. Due to the small size and limited number of the individuals collected, whole-body rather than fish fillet samples were submitted for analyses of PCBs and lead (Berger 2004b).

Pumpkinseeds are commonly found in fresh water in the northeastern region of the United States. They prefer cool to moderately warm, clear water from 1 to 2 meters deep in areas with generous

vegetation for cover. The average pumpkinseed is approximately 5 to 6 inches in length. They are typically not popular sport fish due to their small size. Pumpkinseed fish remain at the site year-round and have a continuous close association with sediments at the site. Moreover, they have small home ranges of approximately 0.57 to 2.77 acres.

3.2 Data Usability

This section presents a summary of the data usability assessment and a determination of how data are used in the HHRA. All data collected by CDM Smith for the RI and the risk assessment were subjected to a data quality assessment for data usability. These procedures include evaluation of precision, accuracy, representativeness and comparability, completeness, and qualified data. A detailed discussion of data quality for the data collected for the RI and used in the risk assessment is presented in the Data Quality Assessment Summary Report, which is included as an appendix to the RI Report. The data quality assessment pertinent to the HHRA is summarized below.

3.2.1 Data Usability Assessment

Data acquired during the RI were validated by EPA and CDM Smith following procedures in EPA National Functional Guidelines for Inorganic Data Review (EPA 2004b) and EPA National Functional Guidelines for Organic Data Review (EPA 2008). The data generated during the RI investigation are considered definitive data generated under a United States Environmental Protection Agency (EPA) approved QAPP, following EPA methods and validated according to EPA Region 2 Guidelines and standard operating procedures (SOPs).

As part of the RI sampling program, field duplicates, matrix spike/matrix spike duplicates, and trip and rinsate blanks were collected and submitted for analyses. These samples provide information on analytical variability and error, the overall performance of the field sampling effort, and the uncertainty surrounding the analytical results. Field duplicate samples provide an indication of analytical variability and error. Rinsate blanks are indicators of equipment cleanliness and the effectiveness of equipment decontamination procedures. Trip blanks are used to assess whether cross contamination of samples has occurred during container shipment and storage. Analytical results obtained from field duplicates are used for quality assurance/quality control purposes and are not included in the datasets for risk evaluation.

Data from the RI field investigation were determined to be suitable for risk assessment purposes as defined in the data quality objectives included in the Quality Assurance Project Plan (QAPP) (CDM Smith 2011a) and Final RI/FS QAPP Addendum No. 1, Additional RI Sampling Plan (CDM Smith 2014). CDM Smith achieved a goal of 90% data completeness and usability as established in the QAPP.

The 2012 results for approximately 1 percent of VOCs, 3 percent of SVOCs, 14 percent of pesticides, 0.5 percent of PCBs, 16 percent of metals, and 4 percent of mercury data for all media were rejected (qualified with an “R” qualifier). Reasons for rejection included matrix spike criteria, laboratory duplicates, field duplicates, field blanks, instrument serial dilution criteria, percent relative standard deviation, compound identification criteria, response factor criteria, and internal standards criteria. The 2015 results for approximately 5 percent of VOC soil, two percent of SVOC groundwater, 2 percent of pesticide soil, and 0.5 percent of PCBs soil were rejected. Reasons for rejection included

response factor, internal standard criteria, Percent Relative Standard Deviation (%RSD) and Percent Difference (%D) and compound identification. These rejected data are not used for the risk assessment evaluation.

3.2.2 Reporting Limits

One aspect of data quality critical to risk assessment is adequacy of reporting limits for chemical analyses. A comparison of reporting limits to the screening levels for chemicals not detected in the samples used in the risk assessment is conducted. These comparisons are presented in Tables F-1a to F-5 in Appendix F. As shown in these tables, reporting limits for several chemicals are above their respective screening levels.

Appropriate analytical methods, target screening levels, and method detection limits for chemicals were selected to meet the project objectives described in the QAPP (CDM Smith 2011a) and QAPP Addendum No.1 (CDM Smith 2014). Data quality objectives and preferred project quantitation limit goals were provided to the laboratories prior to analysis of samples to ensure that reporting limits would not exceed the respective screening levels to the extent possible and were adequate for risk assessment purposes. However, reporting limits for some chemical analyses were above their respective screening levels as a result of equipment limitations or due to high concentrations of other co-associated chemicals necessitating sample dilution. Uncertainties associated with elevated reporting limits are discussed in Section 6.5.1.

3.3 Analytical Data Summary

The evaluation and summary of analytical results are based on those chemicals that were reported at concentrations higher than the reporting limit in one or more samples. Statistical summaries, comprising the minimum and maximum detected concentrations and detection frequency for chemicals, are presented by medium and exposure area in Tables B-2.1a through B-2.6 in Appendix B. Analytical data results are summarized below.

Dioxins/furans are structurally and toxicologically related halogenated aromatic hydrocarbons. They exhibit similar toxicological properties; however, they differ in the degree of toxicity. The toxicity equivalence factor (TEF) methodology, a component mixture method, is used to evaluate human health risks posed by these mixtures, using 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) as the index chemical (EPA 2010c). TEF values for TCDD and dioxins/furans published by the World Health Organization in 2005 are used (Van den Berg *et al.* 2006). Toxicity equivalences (TEQs) for 2,3,7,8-TCDD are calculated by summing the products of concentrations and congener-specific TEFs for individual congeners. Because dioxin/furan datasets contain at least 10 percent of congener concentrations below the reporting limit and non-detected data are reported with multiple reporting limits, the Kaplan-Meier (K-M) statistical method is implemented to more rigorously address estimated parameters such as mean concentrations. The K-M method is a nonparametric statistical method that does not rely on assumptions about data distributions and does not use parameters such as mean or standard deviation. Instead of assuming a fraction of the reporting limit, the K-M method considers only the relative order (or rank) of the data. This approach is particularly appropriate for dioxin/furan datasets with many non-detects and multiple reporting limits that were reported for the 17 congeners (Michelsen 2008 and Helsel 2010). ProUCL version 5.0.00 (EPA 2013) is used to

implement the K-M method and to estimate average dioxin/furan TEQ concentrations. Total 2,3,7,8-TCDD TEQs are then estimated by multiplying the average TEQ by the number of congeners.

3.3.1 Soil

For soil samples, the summary of analytical results is subdivided by depth range to support risk evaluations. Surface soil is defined as soil present from ground surface to a depth of two feet and is considered available for contact for most receptor populations. Subsurface soil is defined as soil present at depths from 2 to 16 feet and is considered available for contact for construction workers only. Soil analytical data results are summarized below by depth range and area.

3.3.1.1 Surface Soil

Surface soil data are grouped together by area. VOCs, SVOCs, pesticides, PCBs, dioxins/furans, and inorganics were detected in surface soil. Tables B-2.1a to B-2.1e in Appendix B presents statistical summaries of the analytical data for surface soils in the scrapyard area, open field/waste disposal area, rental home area, Willow Woods property, and Matteo property (i.e., scrapyard area, open field/waste disposal area, and rental home area), respectively.

Scrapyard Area

VOCs: Four VOCs were detected in the surface soil. Each VOC was detected once.

SVOCs: Twenty-five SVOCs were detected in the surface soil. Polycyclic aromatic hydrocarbons (PAHs) were the most frequently detected SVOCs (4 of 7 samples).

Dioxins/Furans: Dioxins/furans were detected in all samples at concentrations ranging from 0.74 nanogram per kilogram (ng/kg) to 48.37 ng/kg as 2,3,7,8-TCDD TEQ.

Pesticides: Ten pesticides were detected in the surface soil. 4,4'-DDE, endrin aldehyde, and gamma-chlordane were the most frequently detected pesticides (4 of 7 samples).

PCBs*:* Two PCBs, as Aroclors, were detected in soil. Aroclor 1260 was detected in 5 of 7 samples at concentrations ranging from 20 J µg/kg to 200,000 µg/kg (the "J" qualifier indicates an estimated concentration). Aroclor 1248 was detected in 1 of 7 samples at a concentration of 480 µg/kg.

Inorganics: Twenty-two inorganics were detected in surface soil. Most inorganics were detected in all samples, with the exception of cyanide and sodium (1 of 7 samples), beryllium, potassium, and silver (3 of 7 samples), and antimony, barium, cadmium, and mercury (5 of 7 samples). Lead was detected in all samples at concentrations ranging from 33.5 J to 1,200 J milligrams per kilogram (mg/kg).

Open Field/Waste Disposal Area

VOCs: Four VOCs were detected in the surface soil. Each VOC was detected in 1 of 7 samples.

SVOCs: Twenty-seven SVOCs were detected in the surface soil. PAHs were the most frequently detected SVOCs (6 of 7 samples).

Dioxins/Furans: Dioxins/furans were detected in all samples at concentrations ranging from 0.89 ng/kg to 36.25 ng/kg as 2,3,7,8-TCDD TEQ.

Pesticides: Nine pesticides were detected in the surface soil. 4,4'-DDT was detected three times. 4,4'-DDE, dieldrin, and heptachlor epoxide were detected twice while the rest were each detected once.

PCBs*:* Three PCBs as Aroclors were detected in soil. Aroclor 1248 was only detected once. Aroclor 1254 was detected in 11 of 25 samples at concentrations ranging from 36 µg/kg to 1,200 J µg/kg. Aroclor 1260 was detected in 14 of 25 samples at concentrations of 28 J µg/kg and 3,000 µg/kg.

Inorganics: Twenty-two inorganics were detected in all samples, with the exception of cyanide and sodium (1 of 19 samples), beryllium (3 of 19 samples), silver (5 of 19 samples), mercury (6 of 19 samples), cadmium (7 of 19 samples), antimony (11 of 19 samples), barium (12 of 19 samples), and calcium (15 of 19 samples). Lead was detected in all samples at concentrations ranging from 7.3 J mg/kg to 10,100 J mg/kg.

Rental Home Area

VOCs: No VOCs were detected in surface soils.

SVOCs: Twenty-two SVOCs were detected in the surface soil. PAHs were the most frequently detected SVOCs, with fluoranthene and pyrene detected in all samples.

Pesticides: Nine pesticides were detected in the surface soil. Gamma-chlordane was the most frequently detected pesticide (4 of 10 samples).

PCBs*:* Two PCBs, as Aroclors, were detected. Aroclor 1260 was detected in 4 of 10 samples at a maximum concentration of 180 J µg/kg. Aroclor 1254 was detected in 2 of 10 samples at a maximum concentrations of 210 J µg/kg.

Inorganics: Twenty-two inorganics were detected in all or almost all samples, with the exception of antimony (4 in 10 samples). Lead was detected in all samples at concentrations ranging from 64.5 mg/kg to 763 mg/kg.

Willow Woods Property

VOCs: One VOC, acetone, was detected in the surface soil in 1 in 10 samples.

SVOCs: Nineteen SVOCs were detected in the surface soil. PAHs were the most frequently detected SVOCs, with fluoranthene and pyrene detected in all samples.

Pesticides: Eight pesticides were detected in the surface soil. Gamma-chlordane was the most frequently detected pesticide (3 of 10 samples).

PCBs*:* Aroclor 1260 was detected once at an estimated concentration of 110 µg/kg.

Inorganics: Eighteen inorganics were detected in all or almost all samples, with the exception of mercury (2 of 10 samples), cadmium (4 of 10 samples), and antimony (5 of 10 samples). Lead was detected in 9 of 10 samples at concentrations ranging from 10.3 mg/kg to 75.5 mg/kg.

3.3.1.2 Surface/Subsurface Soil

Surface and subsurface soil data are combined in a data set for evaluating the future construction worker scenario, as these workers would likely be exposed to contaminants in both surface and subsurface soil. Tables B-2.2a and B-2.2.b in Appendix B present statistical summaries of the analytical data for surface and subsurface soil at the Matteo property and Willow Woods property, respectively.

Matteo Property

VOCs: Seven VOCs were detected in soil. With the exception of PCE and TCE which were detected in 2 of 68 samples, all other VOCs were each detected once.

SVOCs: Thirty-three SVOCs were detected in soil. Benzo(a)anthracene, chrysene, fluoranthene, and pyrene were the most frequently detected SVOCs (32 of 66 samples).

Dioxins/Furans: Dioxins/furans were detected in all samples at concentrations ranging from 0.74 ng/kg to 48.37 ng/kg as 2,3,7,8-TCDD TEQ.

Pesticides: Eighteen pesticides were infrequently detected in soil. 4,4'-DDT was the most frequently detected pesticide (22 of 58 samples).

PCBs*:* Four PCBs as Aroclors were detected in soil. Aroclor 1248 was detected in 4 of 89 samples at concentrations of 78 J µg/kg and 3,400 NJ µg/kg (the qualifier "NJ" or "JN" denotes a chemical tentatively identified at an estimated concentration). Aroclor 1254 was detected in 26 of 89 samples at concentrations ranging from 35 J µg/kg to 270,000 J µg/kg. Aroclor 1260 was detected in 48 of 89 samples at concentrations ranging from 20 J µg/kg to 540,000 J µg/kg. Aroclor 1268 was detected in 2 of 89 samples at concentrations ranging from 270 JN µg/kg and 860 J µg/kg.

Inorganics: Twenty-four inorganics were detected in all or almost all samples, with the exception of cyanide (3 of 78 samples), selenium (10 of 78 samples), thallium (11 of 78 samples), silver and sodium (12 of 78 samples), beryllium (24 of 78 samples), mercury (27 of 78 samples), cadmium (34 of 78 samples), antimony (37 of 78 samples), potassium (44 of 78 samples), calcium (50 of 78 samples) and barium (64 of 78 samples), magnesium (73 of 78 samples). Lead was detected in all samples at concentrations ranging from 1.3 J mg/kg to 94,100 J mg/kg.

Willow Woods Property

VOCs: One VOC, acetone, was detected in soil in 2 in 17 samples.

SVOCs: Nineteen SVOCs were detected in soil. PAHs were the most frequently detected SVOCs. Fluoranthene and pyrene were detected in 10 of 17 samples followed by benzo(b)fluoranthene, chrysene, and phenanthrene in 9 of 17 samples. Di-n-butylphthalate was detected in 13 of 17 samples.

Pesticides: Eight pesticides were detected in soil. Gamma-chlordane was the most frequently detected pesticide (3 of 17 samples).

PCBs*:* Aroclor 1260 was detected once at an estimated concentration of 110 µg/kg.

Inorganics: Nineteen inorganics were detected in all or almost all samples, with the exception of beryllium (1 of 17 samples), mercury (2 of 17 samples), cadmium (4 of 17 samples), antimony (5 of 17 samples), potassium (10 of 17 samples), and calcium (13 of 17 samples). Lead was detected in 16 of 17 samples at concentrations ranging from 1.9 J mg/kg to 75.5 mg/kg.

3.3.2 Groundwater

For the current and future use of groundwater as potable water scenario, analytical data collected from all groundwater units at the site are used since water wells may intersect multiple groundwater units and potentially extract groundwater from the site. Table B-2.3 in Appendix B presents statistical summaries of the analytical data for groundwater samples.

VOCs: Nine VOCs were detected in groundwater. 1,4-dioxane was the most frequently detected VOC found in 24 of 34 samples, followed by *cis*-1,2-dichloroethene (DCE) (11 of 34 samples).

SVOCs: Eleven SVOCs were detected in groundwater. Phenanthrene was the most frequently detected SVOC found in 6 of 34 samples.

Pesticides: Nine pesticides were detected in groundwater. 4,4'-DDT was detected most frequently, 5 in 34 samples.

PCBs: No PCBs were detected in groundwater.

Inorganics: Twenty-two inorganics were detected in groundwater. Calcium, iron, lead, manganese, potassium, sodium, and zinc were detected in all samples. Lead was detected in all samples at concentrations ranging from 0.31 J microgram per liter (µg/L) to 573 J µg/L.

3.3.3 Surface Water

Table B-2.4 in Appendix B presents a statistical summary of the analytical data for surface water samples collected from Hessian Run and Woodbury Creek.

VOCs: No VOCs were detected in surface water.

SVOCs: Eight SVOCs were detected in surface water. Bis(2-ethylhexyl)phthalate was the most frequently detected SVOC (6 of 27 samples), followed by pentachlorophenol (4 of 27 samples). Six PAHs were each detected twice in surface water.

Pesticides: Two pesticides, 4,4'-DDD and gamma-chlordane, were each detected once in surface water.

Inorganics: Twenty-four inorganics were detected in surface water. Lead was detected in all samples at concentrations ranging from 1.3 µg/L to 654 µg/L.

3.3.4 Sediment

Table B-2.5 in Appendix B presents a statistical summary of the analytical data for sediment samples collected from Hessian Run and Woodbury Creek.

Dioxins/Furans: Dioxins/furans were detected in 4 of 4 samples at concentrations ranging from 0.89 ng/kg to 4.25 ng/kg as 2,3,7,8-TCDD TEQ.

Pesticides: No pesticides were detected in sediment.

PCBs*:* Three PCBs as Aroclors were detected in sediment. Aroclor 1248 was detected in 13 of 46 samples at concentrations ranging from 10 µg/kg to 340 µg/kg. Aroclor 1254 was detected in 42 of 46 samples at concentrations ranging from 2.1 J µg/kg to 670 J µg/kg. Aroclor 1268 was detected in 22 of 46 samples at concentrations ranging from 4.9 JN µg/kg to 150 J µg/kg.

Inorganics: Twenty-four inorganics were detected in sediment in almost all samples. Cyanide was detected in 16 of 60 samples. Lead was detected in all samples at concentrations ranging from 2.4 J mg/kg to 6,430 J- mg/kg (the "J-" qualifier indicates an estimated concentration biased low).

3.3.5 Fish

A statistical summary of the analytical data for whole-body fish samples is provided in Table B-2.6. Analytical results for fish are expressed on a wet weight (ww) basis, assuming that fish is prepared for consumption via broiling, baking, or frying over such methods as drying or smoking to represent the consumption habits of majority of the potentially exposed populations.

Aroclor 1248, Aroclor 1254, and Aroclor 1260 were detected in all samples at concentrations ranging from 0.035 mg/kg-ww to 0.29 J mg/kg-ww. Lead was detected in all samples at concentrations ranging from 0.17 J mg/kg-ww to 0.61 mg/kg-ww.

3.4 Identification of Chemicals of Potential Concern

Many chemicals have been detected in samples collected at the site. Screening of analytical data is conducted to identify COPCs to be further evaluated, helping to focus the risk assessment on chemicals that could pose a human health risk.

The screening levels are based on Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (EPA 2015). Residential RSLs for soil are used as screening levels for soil and sediment, while tap water RSLs are used as screening levels for groundwater and surface water. RSLs for fish tissue developed by EPA Region 3 (2015) are used as screening levels for fish. To account for exposure to multiple chemicals, RSLs for chemicals based on noncancer health effects are decreased by a factor of 10 to form a target hazard quotient (HQ) of 0.1.

Risk-based RSLs are not available for many chemicals. Based on similarities in chemical structure and physiological activities, surrogate screening levels are used as indicated below:

- Chlordane for alpha-chlordane and gamma-chlordane
- Endosulfan for endosulfan II and endosulfan sulfate
- Hexachlorocyclohexane (BHC) (technical) for delta-BHC

- m-xylene for m,p-xylene
- Anthracene for phenanthrene
- Pyrene for benzo(g,h,i)perylene
- Hexavalent chromium for total chromium

The maximum detected concentrations are compared to screening levels to identify COPCs except lead. Chemicals are considered COPCs if the maximum detected concentration exceeds the respective screening level. Group A carcinogens (i.e., known human carcinogen) are retained as COPCs even when they are present at the site at concentrations below their respective screening levels. Calcium, magnesium, potassium, and sodium are essential nutrients and are not selected as COPCs in health risk assessments. Detection frequency and chemical toxicity are also considered in the identification of COPCs. If a chemical is detected in five percent or less of the samples in a dataset having at least 20 samples, then the chemical is only considered a COPC if it is a Group A carcinogen. The identified COPCs and rationale for identifying COPCs are provided in Tables B-2.1a through B-2.6 in Appendix B. COPCs are summarized in Table 3-1 by exposure area and medium.

Risks from exposure to lead are not quantified following the exposure models for other COPCs. EPA considers lead to be a special case because of the difficulty in identifying the threshold. The screening process for lead is performed separately in the Lead Worksheet presented in Table 3-2. The screening levels for lead for residential and industrial soil are 400 and 800 mg/kg, respectively, reported in EPA RSLs (EPA 2015). For groundwater, the screening level is 5 µg/L, based on the Ground Water Quality Standard for Class IIA (New Jersey Administrative Code [N.J.A.C.] 7:9C). The federal Maximum Contaminant Level (MCL) for drinking water for lead is 15 µg/L, higher than the New Jersey groundwater quality standard (EPA 2009b). The screening level for lead in surface water is 5 µg/L, based on the fresh water criterion for lead for human health (N.J.A.C. 7:9B). The arithmetic mean lead concentrations in environmental media are used in screening.

A screening level of 100 µg/kg for lead in fish is used in this risk assessment. This screening level was developed specifically by EPA Region 2 for Raritan Bay Slag Superfund Site (CDM Smith 2011b). The average dietary intake of lead in children is estimated between 2 and 7 micrograms per day (µg/day) (Pennington 1983; EPA 1994). Using an EPA (2011b) recommended fish ingestion rate (IR) for recreational fishers of 54 grams per day (g/day) and adjusting for the young child by applying a regionally accepted factor of 1/3, results in a fish IR of 18 g/day. Using the most conservative dietary intake of 2 µg /day (the current Integrated Exposure Uptake Biokinetic Model default) and a fish IR of 18 g/day, a screening level for lead in fish is calculated as follows:

$$Screening\ Level\ in\ Fish = \frac{Intake}{IR} = \frac{2\ \mu g/day}{18\ g/day} = 0.111 \mu g/g \cong 100\ \mu g/kg$$

As detailed in Table 3-2, lead is identified as a COPC in surface soil, surface/subsurface soil, groundwater, surface water, and fish.

Section 4
Exposure Assessment

As a component of the HHRA, the exposure assessment strives to predict human exposure to COPCs in affected media at the site and in the vicinity. The exposure assessment describes exposure scenarios in which people may come into contact with site-related COPCs, and provides equations and parameters to quantify exposure. Results of the exposure assessment are integrated with chemical-specific toxicity information to characterize potential risks.

4.1 Exposure Pathways

Potential exposure pathways are defined based on current and potential future land uses of the site. Each potential pathway is evaluated considering site-specific conditions to determine if the pathway could be present. The area demography and land use characteristics are taken into consideration when the pathways are developed. If a pathway between the source of contamination and a human receptor could potentially be complete, it is retained for further evaluation.

4.1.1 Conceptual Site Model

The Matteo property has been used as an unregistered landfill and junkyard and a metals recycling facility since 1961. Crushed battery casings were landfilled in an area of wetlands adjacent to Hessian Run. This operation was apparently performed in conjunction with the lead melting operation, as there were several reports of battery casing incineration and subsequent onsite ash disposal. In addition to the incineration and landfilling operations, drums of waste were scattered throughout the property. Over the years, site-related contaminants were released into the soil, groundwater, surface water, and sediment. People recreating, working or living at or adjacent to the site may be exposed to contaminants in soil, groundwater, surface water, sediment, and biota. CSMs, illustrating how chemicals may move from historical release points to locations where human exposure may occur, are developed to provide a roadmap to these possible exposures. The CSMs are presented in Figures 4-1 and 4-2 for current and future land-use scenarios, respectively. The CSMs are described in detail in the following sections.

4.1.2 Identification of Exposure Pathways

As defined in the RAGS Part A (EPA 1989), an exposure pathway is composed of the following elements:

- A source and mechanism of chemical release to the environment
- An environmental transport medium (e.g., groundwater) for the released chemical and/or mechanism to transfer the chemical from one medium to another
- A point of potential contact by humans with the contaminated medium
- A route of exposure (i.e., ingestion, inhalation, or dermal contact)

In the risk assessment, pathways are identified for the No Action alternative to evaluate risk if no site remediation occurs. This assessment also assumes that no additional restrictions to site access or use exist. The goal of this evaluation is to establish whether it is feasible for individuals to engage in activities resulting in exposure to site-related contaminants.

As depicted in the CSMs (Figures 4-1 and 4-2), release and transport of contaminants from wastes might affect soil, groundwater, surface water, sediment, and fish at the site. There are three general routes through which individuals could potentially be exposed to chemical contamination in these media: ingestion, inhalation, and dermal contact. The following sections describe the potential exposure pathways and receptors under both current and potential future land-use conditions. An identified pathway does not imply that exposure is actually occurring, only that the potential exists for the pathway to be complete.

4.1.2.1 Soil Exposure Pathways

Previous sampling and sampling performed under the RI investigation documented soil contamination at the site. People working, visiting, or living adjacent to the site could be exposed to contaminants in soil through incidental ingestion of soil, dermal contact with soil, and inhalation of particulates and/or volatiles released from soil.

4.1.2.2 Groundwater Pathways

The Willow Woods property is currently supplied with potable water from the municipal water supply system. The Matteo property is not connected to the public water system. Potable well PW-1 in the rental house is used to support domestic uses except as drinking water. Potable well PW-2 in the scrapyard area is used for toilet flushing and hand washing purposes. Both wells are equipped with a water softener system that is regularly maintained and monitored (Matteo 2012). Since both the rental house and the scrapyard office are supplied with bottled water on a regular basis, the water from wells PW-1 and PW-2 is not used for drinking or cooking purposes. However, residents in the rental house have access to this water and there are no current restrictions or controls on the use of well water. Thus, current and future residents may be potentially exposed to groundwater via drinking water uses. Potential routes of exposure include ingestion of and dermal contact with water and inhalation of vapors during showering/bathing.

As mentioned in Section 2.3.2, there are two major water-bearing zones beneath the site: a shallow perched groundwater zone and a deep regional groundwater zone, separated by the Merchantville clay. The Merchantville clay is approximately 10 to 23 feet thick across the Matteo property and gradually pinches out to the west. In evaluating vapor intrusion, VOC concentrations in the perched groundwater are typically considered a potential source of vapor partitioning since the rate of vapor diffusion for VOCs in the vadose zone is several orders of magnitude higher than that in water (EPA 2002a). Very low levels of three VOCs, including *trans*-1,2-DCE, PCE, and methyl *tert*-butyl ether, were detected in the shallow groundwater at concentrations below 1 µg/L. These concentrations are below their respective target groundwater concentrations for protection of indoor air (EPA 2012d) and federal MCLs (EPA 2009b). Furthermore, the Merchantville clay can impose significant impedance to upward migration of vapors from underlying deep groundwater. Based on these considerations, the vapor intrusion pathway is considered incomplete and is not evaluated in the risk assessment.

4.1.2.3 Surface Water and Sediment Pathways

Contaminants at the site have been transported to Hessian Run and Woodbury Creek via leaching, weathering, runoff, mixing, and deposition. People visiting Hessian Run and Woodbury Creek may be exposed to contaminants in surface water and sediment. Routes of exposure include incidental ingestion of and dermal contact with surface water and sediment.

4.1.2.4 Biota Pathways

Fish in Hessian Run and Woodbury Creek may have been impacted with site-related contaminants. People who catch and eat fish from the site may be exposed to contaminants through consumption; this also applies to people who share in the consumption of the catch, including young children.

4.2 Characterization of Potentially Exposed Populations

The southern portion of the Matteo property has been used as an active metal recycling facility for over 40 years. The remainder of the Matteo property, where the elevated soil lead levels and battery casings are evident, is unused and vacant. A rental house is located at the eastern end of the property. To restrict unauthorized access to the Matteo property and minimize exposure to contaminated soils and sediments, a chain-link fence was installed in July 2006 along the entire southern property boundary between the Willow Woods property and the Matteo property. To prevent residents in the rental house from accessing the scrapyard area, a fence was installed between the house and the scrapyard area. In addition, a portion of new fence was tied into an existing fence along the northeastern property boundary at the alternative entrance on Crown Point Road. Signs are posted along the property fence line warning people neither to trespass nor hunt on the Matteo property. Signs are present along Hessian Run warning “No trespassing, No Hunting, and No Fishing”.

Based on current and anticipated future land uses, exposed populations include site workers, trespassers, recreational users, anglers, residents, and construction workers. Not all of these populations are expected to be present in all of the areas. The following subsections detail the potential exposure pathways identified for each potentially exposed population.

4.2.1 Current Receptors

Based on current land uses and identified potential exposure pathways, likely current receptors in the study area are identified as follows:

- Site workers at the scrapyard area
- Trespassers at the open field/waste disposal area, Woodbury Creek, and Hessian Run
- Recreational users at the open field/waste disposal area
- Anglers at Woodbury Creek and Hessian Run
- Residents in the rental home area on the Matteo property
- Residents in the Willow Woods property

4.2.1.1 Site Workers

Current workers at the scrapyard area may come in contact with contaminants in surface soil through incidental ingestion of and dermal contact with soil, and inhalation of particulates and/or volatiles

released from surface soil. Site workers are evaluated using default parameters recommended by EPA as described in Section 4.5.

4.2.1.2 Trespassers

Unauthorized access to the Matteo property is restricted by fences and warning signs. However, trespassers are assumed to enter the site without authorization by disregarding the "No Trespassing, No Hunting, and No Fishing" signs posted at the site. When trespassing, these individuals may be exposed to contaminants in surface soil through incidental ingestion of and dermal contact with soil, and inhalation of particulates and/or volatiles released from surface soil. Additionally, trespassers may come into contact with contaminants in surface water and sediment in Woodbury Creek and Hessian Run through incidental ingestion and dermal contact. While trespassers are most likely adults and adolescents, adolescents (6 to 18 years old) generally have higher relative intake rates and lower body weight when compared to adults. The adolescent exposure scenario provides a conservative basis for evaluating potential exposures to adults. Thus, adolescents are selected as potential receptors for quantitative evaluation using default parameters recommended by EPA as described in Section 4.5. Adults are qualitatively evaluated in the risk assessment.

4.2.1.3 Recreational Users

The vacant part of the Matteo property, i.e., the open field/waste disposal area, could be potentially used for recreational purposes such as driving an all-terrain vehicle (ATV). Recreational users are receptors who are permitted by the property owners to use the site for recreational activities. Recreational users could be exposed to contaminants in surface soil through incidental ingestion of and dermal contact with soil, and inhalation of particulates and/or volatiles released from soil. Since there are "No Fishing" signs posted along Hessian Run, recreational users are assumed to obey the warning sign and stay away from the surface water bodies. Therefore, the exposure pathways associated with surface water and sediment are considered incomplete for recreational users. While recreational users are most likely adults and adolescents, adolescents (6 to 18 years old) generally have higher relative intake rates and lower body weight when compared to adults. The adolescent exposure scenario provides a conservative basis for evaluating potential exposures to adults. Thus adolescents are selected as potential receptors for quantitative evaluation using default parameters recommended by EPA as described in Section 4.5.

4.2.1.4 Anglers

People may be exposed to site-specific COPCs through consumption of fish caught from Woodbury Creek and Hessian Run. Young children generally have higher fish intake rates per body weight when compared to older children. Thus, the angler scenario assesses exposure to adult anglers and young children (under 6 years old) who may consume fish caught from the site by anglers. These receptors are considered family members of anglers and as a separate subpopulation. Anglers are evaluated using default parameters recommended by EPA and site-specific considerations as described in Section 4.5.

4.2.1.5 Residents

Matteo Property

To restrict unauthorized access and minimize exposure to contaminated soils, a fence was installed to separate the rental house from the scrapyard area. Thus, current exposure to soil for residents is limited to the rental home area. Residents may be exposed to contaminants in surface soil through incidental ingestion of and dermal contact with soil, and inhalation of particulates and/or volatiles released from surface soil. Although the potable well at the rental house is currently not being used for drinking or cooking purposes, residents have access to this water and may potentially use it as a drinking water source. Residents may be exposed to groundwater via ingestion of and dermal contact with water and inhalation of vapors during showering/bathing. Residents (adult and child [under 6 years old]) are evaluated using default parameters recommended by EPA as described in Section 4.5.

Willow Woods Property

All residents in Willow Woods property are connected to the public water supply system; thus, there is no current exposure to groundwater through potable water uses. As part of the remedy to minimize exposure to residents at Willow Woods property, lead-contaminated soil at the Willow Woods property was excavated and disposed offsite in 2006. The excavated area was backfilled with clean fill followed by the placement of top soil and grass seed (Berner Construction 2006a). Since the remedial effort was focused on lead contamination, residents may be potentially exposed to contaminants other than lead in surface soil through incidental ingestion of and dermal contact with soil, and inhalation of particulates released from surface soil. Residents (adult and child [under 6 years old]) are evaluated using default parameters recommended by EPA as described in Section 4.5.

4.2.2 Future Receptors

All future land uses at the site are assumed to remain the same as those under the current land-use scenario, except the Matteo property. For the Matteo property, which includes the scrapyard area, open field, and the waste disposal area, two scenarios are assumed and evaluated under future land-use conditions: the Matteo property would (1) remain as an industrial/commercial site or (2) become a residential development. Future receptors include the following:

- Matteo Property - site workers, trespassers, recreational users, anglers, residents, and construction workers
- Willow Woods Property – residents and construction workers

4.2.2.1 Site Workers

Future industrial/commercial use of the site is limited to the scrapyard area because it is not expected the scrapyard will expand beyond its current boundary. Thus, future site worker is assumed to be exposed to soils on the scrapyard area only. Similar to current commercial/industrial workers, future workers at the scrapyard area may come into contact with contaminants in surface soil through incidental ingestion of and dermal contact with soil, and inhalation of particulates and/or volatiles released from soil. Future commercial/industrial workers are evaluated using default parameters recommended by EPA as described in Section 4.5.

4.2.2.2 Trespassers

Trespassers could gain access to most or all areas of the Matteo property. When trespassing, these individuals may be exposed to contaminants in surface soil, surface water, and sediment. As stated earlier, adolescents generally have higher intake rates per body weight when compared to adults. Thus, the trespasser scenario assesses exposure to adolescents (6 to 18 years old) who may come into contact with contaminants in surface soil, surface water, and sediment. Exposure pathways include incidental ingestion of and dermal contact with soil, surface water, and sediment, and inhalation of particulates and/or volatiles released from soil. Adolescent trespassers are evaluated using default parameters recommended by EPA as described in Section 4.5.

4.2.2.3 Recreational Users

Similar to current recreational users, future recreational users visiting the open field/waste disposal area may come into contact with contaminants in surface soil through incidental ingestion of and dermal contact with soil, and inhalation of particulates and/or volatiles released from soil. Future recreational users are evaluated using default parameters recommended by EPA as described in Section 4.5.

4.2.2.4 Anglers

As stated in Section 4.2.1.4, young children generally have higher fish intake rates per body weight when compared to older children. Thus, the angler scenario assesses exposure to adult anglers and young children (under 6 years old) who may consume fish and shellfish caught from the site by anglers. Anglers are evaluated using default parameters recommended by EPA and site-specific considerations as described in Section 4.5.

4.2.2.5 Residents

Matteo Property

The Matteo property may be developed into residential properties in the future. Residents may come into contact with contaminants in surface soil, surface water, and sediment, and through consumption of fish caught from Woodbury Creek and Hessian Run. Exposure pathways include incidental ingestion of and dermal contact with soil, surface water, and sediment, inhalation of particulates and/or volatiles released from soil, and ingestion of fish. Additionally, groundwater may be used as drinking water in the future. In this case, residents could be exposed to groundwater for domestic uses. Routes of exposure include ingestion of and dermal contact with groundwater, and inhalation of vapors in groundwater while bathing or showering. Future residents (adult and child [under 6 years old]) are evaluated using default parameters recommended by EPA as described in Section 4.5.

Willow Woods Property

Future residents at the Willow Woods property may be potentially exposed to site-related contaminants in surface soil through incidental ingestion of and dermal contact with soil, and inhalation of particulates released from surface soil. Residents (adult and child [under 6 years old]) are evaluated using default parameters recommended by EPA as described in Section 4.5.

4.2.2.6 Construction Workers

If construction takes place at the Matteo property or Willow Woods property in the future, construction workers could have short-term, high intensity exposure to contaminants in surface and subsurface soil via incidental ingestion of and dermal contact with soil, and inhalation of particulates and/or volatiles released from surface and subsurface soil. Future construction workers are evaluated using default parameters recommended by EPA as described in Section 4.5.

4.3 Summary of Exposure Pathways and Receptors

The following exposure pathways are considered to be potentially complete and are evaluated as part of the assessment of exposure to contaminants at the site. A summary of these exposure pathways is illustrated in Figures 4-1 and 4-2.

Current Land-Use Scenario

- Scrapyard Area
  - Site Workers – Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
- Rental Home Area on the Matteo Property
  - Residents (adults and children [under 6 years old])
    - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
    - Groundwater: ingestion, dermal contact, and inhalation of vapor (showering/bathing)
- Open Field/Waste Disposal Area/Woodbury Creek/Hessian Run
  - Trespassers (adolescents [6 to 18 years old])
    - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
    - Surface Water: incidental ingestion and dermal contact
    - Sediment: incidental ingestion and dermal contact
- Open Field/Waste Disposal Area
  - Recreational Users (adolescents [6 to 18 years old]) - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
- Woodbury Creek/Hessian Run
  - Anglers (adults and children [under 6 years old]) – Fish: ingestion

- Willow Woods Property
  - Residents (adults and children [under 6 years old]) - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles

Future Land-Use Scenario

- Scrapyard Area
  - Site Workers - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
- Open Field/Waste Disposal Area/Woodbury Creek/Hessian Run
  - Trespassers (adolescents [6 to 18 years old])
    - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
    - Surface Water: incidental ingestion and dermal contact
    - Sediment: incidental ingestion and dermal contact
- Matteo Property/Woodbury Creek/Hessian Run
  - Residents (adults and children [under 6 years old])
    - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
    - Groundwater: ingestion, dermal contact, and inhalation of vapor (showering/bathing)
    - Surface Water: incidental ingestion and dermal contact
    - Sediment: incidental ingestion and dermal contact
    - Fish: ingestion
- Matteo Property
  - Construction Workers - Surface and Subsurface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
- Open Field/Waste Disposal Area
  - Recreational Users (adolescents [6 to 18 years old]) - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
- Woodbury Creek/Hessian Run
  - Anglers (adults and children [under 6 years old]) - Fish: ingestion

- Willow Woods Property
  - Residents (adults and children [under 6 years old]) - Surface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles
  - Construction Workers - Surface and Subsurface Soil: incidental ingestion, dermal contact, and inhalation of particulates and/or volatiles

4.4 Calculation of Exposure Point Concentrations

This section presents the methodology that was employed to calculate the EPCs for the COPCs for each medium including ambient air from soil particulates and vapor and indoor air from shower volatilization.

4.4.1 Exposure Point Concentrations of Samples Collected

For each data set, representing a single chemical in an exposure medium, with at least five samples and four detected values, a 95 percent (or higher) UCL on the mean concentration was calculated and compared to the maximum detected concentration for that chemical. The lower value of the UCL and the maximum detected value is selected as the EPC, as recommended by EPA (1992). UCLs are not calculated for data sets with fewer than four detected concentrations. In such cases, maximum detected concentrations are used as the EPCs.

Several statistical methods can be used to estimate the UCL of a data set, depending upon the data distribution. Therefore, two key steps are required to estimate the UCL of a data set.

- Determine the distribution of the data (i.e., normal, lognormal, gamma, or none of these)
- Compute the UCL using the appropriate procedure for the data distribution

In this assessment, both steps were performed with the ProUCL statistical software (EPA 2013). The ProUCL program tests the normal, lognormal, gamma, and non-parametric distributions of each data set and the UCLs are calculated with the statistical procedures recommended by EPA, based on the findings of Singh, Singh, and Engelhardt (1997, 1999) (EPA 2013). ProUCL computes the UCL using 5 parametric and 10 non-parametric methods, depending on the distribution.

- For normal distributions, the Student's t-statistic is used to calculate the UCL.
- For lognormal distributions, one of four different computation methods is used to calculate the UCL depending on the skewedness of the data (as indicated by the standard deviation of the log-transformed data) and the sample size.
- For gamma distributions, one of two computation methods is used to calculate the UCL based on a "k value," which is the shape parameter of a gamma distribution. For values of $k \geq 0.1$, the EPC term is computed using an adjusted gamma UCL of the mean (when $0.1 \leq k \leq 0.5$) or an approximate gamma UCL of the mean (when $k > 0.5$). For values of $k < 0.1$, a UCL is obtained using either the bootstrap-t method or Hall's bootstrap method when the sample size is small (less than 15), or the approximate gamma for larger datasets.

- For data sets that do not fit a normal, lognormal, or gamma distribution, the ProUCL program calculates and recommends a UCL using one of the ten non-parametric methods (EPA 2013).

Tables B 3.1a through B 3.6 in Appendix B present the EPCs for each COPC in each medium. As noted previously, the EPC is the lower value of the UCL and the maximum detected value. ProUCL outputs for COPCs are presented in Appendix C.

4.4.2 Ambient Air Exposure Point Concentrations

Inhalation of contaminants adsorbed to respirable particles is assessed using a particulate emission factor (PEF). The soil-to-air volatilization factor (VF) is used to define the relationship between the concentration of the contaminant in soil and the flux of the volatilized contaminant to air (EPA 2002b).

PEFs are calculated using site-specific data, when available, and EPA default values. The vegetative cover is assumed to be 37% for the scrapyard area, 75% for the open field/waste disposal area, 74% for the rental home area, 20% for the Willow Woods property, and 70% for the Matteo property. Site-specific areal extent of contamination is used for a particular exposure area. The mean annual wind speed is 1.8 meters per second (m/s), based on data collected at the closest weather station located in Sewell, New Jersey in 2011. The equivalent threshold value of wind speed is 11.32 m/s, based on the EPA default value (EPA 2002b). Air dispersion model constants are based on values for Philadelphia, Pennsylvania, the closest major city to the site with dispersion data (EPA 2002b). PEFs are summarized in Table B-4.7 in Appendix B.

Concentration of particulates or volatiles from soil into ambient air is calculated as follows:

$$CA = \frac{CS}{PEF \text{ or } VF}$$

where:

CA	=	concentration in air, µg/m^3
CS	=	concentration in soil, µg/kg
PEF	=	particulate emission factors from soil, m^3/kg
VF	=	volatilization factors for a volatile COPC, m^3/kg

4.4.3 Shower Model

Modeling is used to estimate the indoor air concentrations of VOCs from groundwater while showering or bathing. In this scenario, receptors are assumed to inhale VOCs while showering or bathing and during time spent in the bathroom after showering. Dermal absorption of volatilized VOCs is assumed to be negligible due to low dermal permeabilities. Methodologies for estimating exposure to VOCs in domestic water supplies from the inhalation exposure route are based on a shower model developed by Schaum *et al.* (1994).

The shower model treats the bathroom as one compartment and yields an air concentration averaged over the time of the actual shower and the time spent in the bathroom after the shower. The model was derived by assuming that the chemical contaminant volatilizes at a constant rate, instantly mixes uniformly with the bathroom air, and that ventilation with clean air does not occur. This implies that

the chemical concentration in the air increases linearly from zero to a maximum at the end of the shower, and then remains constant during the time an individual spends in the bathroom immediately after showering.

The air concentration is estimated using the water concentration. The water concentration is a site-specific value that refers to the concentration of a chemical in water as it enters the shower. The UCL value or the maximum detected value is utilized as the water concentration (Table B-3.3 in Appendix B). Chemical-specific fraction volatilized values are calculated from these chemical properties using the equation provided by Schaum *et al.* (1994) (see Tables D-1 and D-2 in Appendix D).

A water flow rate of 1,000 liters (L)/hour is assumed in the model for the RME scenario and 500 L/hour for the CTE scenario (Schaum *et al.* 1994). The bathroom volume of 6 cubic meters (m^3) is assumed in the model for the RME scenario and 16 m^3 for the CTE scenario (Schaum *et al.* 1994). For the RME scenario, the time spent in showering is 0.25 hours and 0.45 hours for adults and children (0 to 6 years old), respectively. For the CTE scenario, the time spent in showering are 0.1 hour for adults and 0.14 hours for children (EPA 2004a). The time spent in the bathroom after showering is assumed to be 0.33 hours and 0.55 hours for adults and young children, respectively, under the RME scenario and 0.15 hours and 0.19 hours under the CTE scenario (EPA 2004a). Exposure point air concentrations from the shower model are presented in Tables D-3 and D-4 in Appendix D.

4.5 Exposure Parameter Assumptions

It is difficult to estimate accurately exposures for individuals in an exposed population because (1) behavior patterns for individuals in these populations change over time; (2) day-to-day behaviors vary among individuals within a population; and (3) individual variation exists in important parameters such as ingestion rate and body weight. In this risk assessment, the exposure assessments address reasonable maximum estimates for exposures that could conceivably occur in a population. RME is defined as exposure above about the 90^{th} percentile of the population distribution. The intent of RME is to estimate a conservative exposure case (well above the average) that is still within the range of possible exposures. CTE parameters are also developed to provide estimates representing average exposures. Risks based on CTE are calculated only if RME risks exceed EPA's threshold risk range (i.e., cancer risk range of 1×10^{-6} to 1×10^{-4} or noncancer hazard index [HI] of 1).

Exposure parameters for each scenario are primarily from EPA documents (EPA 1989, 1991a, 1997, 2002a, 2004a, 2009a, and 2011a) and are consistent with EPA Region 2's risk assessment approach. EPA's standard default assumptions (EPA 1991a) or site-specific values are used where available. When applicable, values from the most recent guidance available are used unless EPA Region 2 has a known preference for a specific value. RME and CTE parameters used in the risk assessment are provided in Tables B-4.1 to B-4.5 in Appendix B.

4.5.1 Residents

All residents are assumed to be exposed for 350 days per year for both the RME and CTE scenarios (EPA 1991a). The total RME duration for residents is assumed to be 30 years (EPA 1991a): 24 years as an adult and 6 years as a young child. The CTE duration for adult residents is 9 years, based on the

50th percentile value for years living in the current home (EPA 1997). The CTE duration is assumed to be 6 years for children.

A life expectancy of 70 years (EPA 1989) is used for all receptor groups as the averaging time for exposure to carcinogenic contaminants. The averaging time for noncancer effects is equal to the exposure duration, or 24 years for adults under the RME scenario and 9 years under the CTE scenario (EPA 2004a), and 6 years for children under both scenarios. A body weight of 70 kilograms (kg) is used for adult residents and 15 kg for children (under 6 years old) (EPA 1991a) under both scenarios.

Carcinogenic exposure estimates throughout a lifetime are impacted by age-dependent intake factors. To take into account the difference in daily ingestion rates, body weights, and exposure durations for young children and adults, age-adjusted intake factors are used for carcinogenic exposure estimates (EPA 1991b). This is accomplished by using factors for a child for the first 6 years of exposure and adult factors for the remaining 24 years of the exposure period.

For noncancer health hazards, the most sensitive receptor is a child (under 6 years of age), because a young child generally has higher relative intake rates when compared to older children and adults. Although noncancer hazards for both adult and child residents are evaluated, only noncancer results for a child are discussed.

4.5.1.1 Soil

The incidental soil ingestion rates are assumed to be 100 milligrams per day (mg/day) and 200 mg/day for adult and child residents, respectively for the RME scenario (EPA 1991a). For the CTE scenario, one-half of the RME ingestion rates, or 50 mg/day for adults and 100 mg/day for children, are assumed. For dermal contact with soil, the adult residents are assumed to wear a short-sleeved shirt, shorts, and shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, and lower legs. The resulting exposed skin surface area is 5,700 square centimeters (cm^2) (EPA 2004a). A dermal adherence factor of 0.07 milligram per square centimeter (mg/cm^2) is assumed for RME scenario and 0.01 mg/cm^2 is assumed for the CTE scenario for adult residents (EPA 2004a). For dermal contact with soil, the child residents are assumed to wear a short-sleeved shirt, shorts, and no shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, lower legs, and feet. The resulting exposed skin surface area is 2,800 cm^2 (EPA 2004a). A dermal adherence factor of 0.2 mg/cm^2 is assumed for the RME scenario and 0.04 mg/cm^2 is assumed for the CTE scenario for child residents (EPA 2004a).

4.5.1.2 Groundwater

For groundwater ingestion exposure parameters, adult residents are assumed to consume 2 liters per day (L/day) for the RME scenario (EPA 1991a) and 1 L/day for the CTE scenario. The CTE value is based on the mean water ingestion rate for adults (EPA 2011a Table 3-1 for age group ≥21 years). A water intake rate of 1 L/day is assumed for young children (EPA 1989) for the RME scenario. The CTE drinking water intake rate for children is assumed to be 0.3 L/day, based on a weighted mean drinking water ingestion rate for children 0 to 6 years of age (EPA 2011a Table 3-1).

Inhalation and dermal exposure of residents to groundwater may occur through showering/bathing and other domestic activities. Shower/bathing duration for adults is assumed to be 0.58 hours and

0.25 hours for the RME and CTE scenarios, respectively (EPA 2004a). Children are assumed to spend 1 hour and 0.33 hours in the bathroom for the RME and CTE scenarios, respective (EPA 2004a). For surface area exposed, the estimate of total body surface area is 18,000 cm^2 for adults, based on the average 50th percentiles for males and females (EPA 2004a). For young children, the total surface area is 6,600 cm^2, based on weighted surface area for children between 0 to 6 years of age (EPA 2004a). Chemical-specific dermal permeability coefficients for COPCs are presented in Table B-4.6 in Appendix B.

4.5.1.3 Surface Water and Sediment

Future residents are evaluated for potential exposure to surface water and sediment in a wading scenario. Residents are assumed to visit Hessian Run and Woodbury Creek for 100 days per year and to spend two hours per visit under the RME scenario (EPA 2009a). One-half of the RME exposure time and frequency are used for the CTE scenario.

The incidental ingestion rate for surface water while swimming is 49 milliliters per hour (mL/hr) for children and 21 mL/hr for adults (EPA 2011a Table 3-5). Incidental ingestion of surface water while wading is unlikely to occur at the same rate as the incidental ingestion rate while swimming. The incidental ingestion rate is thus assumed to be 4.9 mL/hr for children and 2.1 mL/hr for adults under RME and CTE scenarios, or one-tenth the water ingestion rate for a swimming scenario. In the absence of ingestion rates for sediment, exposure assumptions are based on recommended ingestion rates for soil. The incidental ingestion rate for sediment is, therefore, assumed to be 100 mg/day and 200 mg/day for adults and children, respectively, for the RME scenario. One-half of the RME exposure time and frequency are used for the CTE scenario.

For wading in Hessian Run and Woodbury Creek, the resident is assumed to wear a short-sleeved shirt, shorts, and no shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, lower legs, and feet. The exposed skin surface area is 6,925 cm^2 for adults and 2,800 cm^2 for children (EPA 2004a). For adults, the recommended geometric mean soil adherence factor for reed gatherers of 0.3 mg/cm^2 is used under the RME scenario (EPA 2004a). The CTE value of 0.07 mg/cm^2 for adults is based on the geometric mean value for gardeners (EPA 2004a). For children, a sediment adherence factor of 1.8 mg/cm^2 is assumed, based on surface area weighted adherence factor for children aged 0 to 6 years playing in sediment (EPA 2011a Table 7-4). Under the CTE scenario, a dermal adherence factor of 0.2 mg/cm^2 is assumed, based on children playing in wet soil (EPA 2004a). The chemical-specific dermal absorption fractions for COPCs are presented in Table B-4.6.

4.5.1.4 Fish

The exposure frequency for fish ingestion is assumed to be 365 days per year (EPA 2011a). For the Lower Passaic River Study Area HHRA, a fish ingestion rate of 34.6 gram per day (g/day) was used for the RME scenario (EPA Region 2 2012). This ingestion rate was based on fish consumption surveys conducted in the Newark Bay Estuary and the New York Bay Estuary. Connelly et al. (1992) conducted a statewide mail survey of New York State anglers, with applicability to the New York Bay. Burger (2002) studied fishing and fish consumption pattern within the Newark Bay Complex in New Jersey. The RME fish ingestion rate of 34.6 g/day was based on the averaging 90th percentile values from the two studies. The CTE fish ingestion rate of 3.85 g/day was based on the average of the 50th percentile

values from the two studies (EPA Region 2 2012). These fish ingestion rates are used for the Matteo Study Area.

It is assumed that young children would consume fish at 1/3 of rate of an adult, which is 11.5 g/day and 1.28 g/day under the RME and CTE scenarios, respectively.

4.5.2 Site Workers

Site workers are assumed to be exposed to contaminants in surface soil for 250 days per year for the RME scenario (EPA 2004a) and 219 days per year for the CTE scenario (EPA 2004a). The exposure duration for workers is 25 and 9 years, respectively, for the RME and CTE scenarios (EPA 2004a). The exposure time for site workers is 8 hours per day for the RME scenario and 4 hours per day for the CTE scenario. A life expectancy of 70 years (EPA 1989) is used as the averaging time for exposure to carcinogenic contaminants. The averaging time for noncancer effects is equal to the exposure duration, 25 years under the RME scenario and 9 years for the CTE scenario (EPA 1989). A body weight of 70 kg is used for both the RME and CTE scenarios (EPA 2002b).

The incidental soil ingestion rate for workers is assumed to be 100 mg/day (EPA 2002b) for the RME scenario and 50 mg/day for the CTE scenario (EPA 1997). For dermal contact with soil, the worker is assumed to wear a short-sleeved shirt, long pants, and shoes; therefore, the exposed skin surface is limited to the head, hands, and forearms. The resulting exposed skin surface area is 3,300 cm^2, the average of the 50th percentile for males and females older than 18 years of age (EPA 2004a). A dermal adherence factor of 0.2 mg/cm^2 is assumed for the RME scenario and 0.02 mg/cm^2 is assumed for the CTE scenario (EPA 2004a). The chemical-specific dermal absorption fractions for COPCs are presented in Table B-4.6.

4.5.3 Trespassers

Trespassers are assumed to visit the site for 100 days per year and to spend two hours per visit under the RME scenario (EPA 2009a). One-half of the RME exposure time and frequency are used for the CTE scenario. The exposure duration for the trespasser is assumed to be 12 years for adolescents (6 to 18 years old) under both the RME and CTE scenarios. A life expectancy of 70 years (EPA 1989) is used as the averaging time for exposure to carcinogenic contaminants. The averaging time for noncancer effects is equal to the exposure duration, 12 years under both the RME and CTE scenarios. A body weight of 44 kg, based on the weighted average weight for children 6 to <21 years in age, is used for adolescents (EPA 2011a Table 8-1) under both scenarios.

4.5.3.1 Soil

The incidental soil ingestion rate for the trespasser is assumed to be 100 mg/day for the RME scenario, based on the central tendency soil/dust ingestion rate for children 6 to <21 years in age (EPA 2008). One-half of the RME ingestion rate is used for the CTE scenario. The trespasser is assumed to wear a short-sleeved shirt, shorts, and shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, and lower legs. The exposed skin surface area is 4,200 cm^2, based on the weighted average surface area for children ages 6 to 18 years (EPA 2011a Table 7-2). The adherence factors of 0.07 mg/cm^2 and 0.04 mg/cm^2 are assumed for the RME and CTE scenarios, respectively, based on the child weighted adherence factors on soil activity for RME scenario and daycare for CTE

scenario (EPA 2011a Table 7-4). The chemical-specific dermal absorption fractions for COPCs are presented in Table B-4.6.

4.5.3.2 Surface Water and Sediment

Trespassers are evaluated for potential exposure to surface water and sediment in a wading scenario. The incidental ingestion rate recommended by EPA (2011a) for surface water for children while swimming is 49 mL/hr. Incidental ingestion of surface water while wading is unlikely to occur at the same rate as incidental ingestion rate while swimming. The incidental ingestion rate is thus assumed to be 4.9 mL/hr, or one-tenth the water ingestion rate for a swimming scenario for adolescent trespassers under RME and CTE scenarios. In the absence of ingestion rates for sediment, exposure assumptions are based on recommended ingestion rates for soil. The incidental ingestion rate for sediment is, therefore, assumed to be 100 mg/day for the RME scenario and 50 mg/day for the CTE scenario.

For wading in Hessian Run and Woodbury Creek, the trespasser is assumed to wear a short-sleeved shirt, shorts, and no shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, lower legs, and feet. The exposed skin surface area is 5,200 cm^2, based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages 6 to 21 years (EPA 2011a Table 7-2). A sediment adherence factor of 4.4 mg/cm^2 is assumed, based on surface area weighted adherence factor for children aged 6 to <21 years playing in sediment (EPA 2011a Table 7-4). Under the CTE scenario, a dermal adherence factor of 0.2 mg/cm^2 is assumed, based on children playing in wet soil (EPA 2004a). The chemical-specific dermal absorption fractions for COPCs are presented in Table B-4.6.

4.5.4 Recreational Users

Recreational users are assumed to visit 100 days per year and to spend two hours per visit under the RME scenario. One-half of the RME exposure time and frequency are used for the CTE scenario. The exposure duration for the recreational user is assumed to be 12 years for adolescents (6 to 18 years old) under both the RME and CTE scenarios. A life expectancy of 70 years (EPA 1989) is used as the averaging time for exposure to carcinogenic contaminants. The averaging time for noncancer effects is equal to the exposure duration, 12 years under both the RME and CTE scenarios. A body weight of 44 kg, based on the weighted average weight for children 6 to <21 years in age, is used for adolescents (EPA 2011a Table 8-1) under both scenarios.

The incidental soil ingestion rate for the recreational user is assumed to be 100 mg/day for the RME scenario, based on the EPA-recommended soil ingestion rate for the age group older than 6 years old (EPA 1989). One-half of the RME ingestion rate is used for the CTE scenario. The recreational user is assumed to wear a short-sleeved shirt, shorts, and shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, and lower legs. The exposed skin surface area is 4,200 cm^2, based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages 6 to 18 years (EPA 2011a Table 7-2). The adherence factors of 0.07 mg/cm^2 and 0.04 mg/cm^2 are assumed for the RME and CTE scenarios, respectively, based on the weighted adherence factors for children on soil activity for RME scenario and daycare for CTE scenario (EPA 2011a Table 7-4). The chemical-specific dermal absorption fractions for COPCs are presented in Table B-4.6.

4.5.5 Anglers

The exposure frequency for fish and shellfish ingestion is assumed to be 365 days per year (EPA 2011a). The exposure duration is assumed to be 6 years for young children (under 6 years old) under both RME and CTE scenarios and 24 years for adults under RME scenario and 9 years under CTE scenario (EPA 1997).

A life expectancy of 70 years (EPA 1989) is used for anglers as the averaging time for exposure to carcinogenic contaminants. The averaging time for noncancer effects is equal to the exposure duration, or 24 years for adults under the RME scenario, 9 years for adults under the CTE scenario and 6 years for children under both scenarios. A body weight of 70 kg is used for adults (EPA 1991a) and 15 kg for children (under 6 years old) (EPA 1991a) under both scenarios.

Based on the Lower Passaic River Study Area HHRA, the fish ingestion rates are assumed to be 34.6 g/day for the RME scenario and 3.85 g/day for the CTE scenario for adult anglers. It is assumed that young children would consume fish at 1/3 of rate of an adult, which are 11.5 g/day and 1.28 g/day under RME and CTE scenarios, respectively.

4.5.6 Construction Workers

Construction workers are assumed to be exposed to soils for 8 hours per day, for 5 months (100 workdays) per year for a total duration of 1 year for the RME scenario. The CTE scenario is not evaluated for construction workers. A life expectancy of 70 years (EPA 1989) is used as the averaging time for exposure to carcinogenic contaminants. The averaging time for noncancer effects is equal to the exposure duration, 365 days for construction workers. A body weight of 70 kg is used for construction workers (EPA 2002b).

For the soil ingestion exposure pathway, construction workers are assumed to ingest 330 mg of soil per day (EPA 2002b). For dermal contact with soil, construction workers are assumed to wear a short-sleeved shirt, long pants, and shoes; therefore, the exposed skin surface is limited to the head, hands, and forearms. The exposed skin surface area for construction workers is estimated at 3,300 cm^2, the average of the 50th percentile for males and females older than 18 years of age (EPA 2004a). A dermal adherence factor of 0.3 mg/cm^2 is assumed (EPA 2004a), corresponding to the 95^{th} percentile value that has been measured for construction workers. The chemical-specific dermal absorption factors for COPCs are presented in Table B-4.6.

Section 5
Toxicity Assessment

Health criteria used in this risk assessment are obtained from a variety of toxicological sources according to a hierarchy established in the OSWER directive 9285.7-53 (EPA 2003). The toxicity value hierarchy is as follows:

- Tier 1—EPA's IRIS
- Tier 2—EPA's PPRTVs: The Office of Research and Development/National Center for Environmental Assessment (NCEA)/Superfund Health Risk Technical Support Center develops PPRTVs on a chemical-specific basis when requested by EPA's Superfund program.
- Tier 3—Other Toxicity Values: Tier 3 includes additional EPA and non-EPA sources of toxicity information, such as the California Environmental Protection Agency (Cal/EPA) and the Agency for Toxic Substances and Disease Registry (ATSDR). 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.

5.1 Health Effects Criteria for Noncarcinogens

For chemicals that exhibit noncancer (e.g., systemic) effects, many authorities consider organisms to have repair and detoxification capabilities that must be exceeded by some critical concentration (threshold) before the health effect is manifested. This threshold view holds that a range of exposures from just above zero to some finite value can be tolerated by the organism without an appreciable risk of adverse effects.

Health criteria for chemicals exhibiting noncancer effects for use in risk assessment are generally EPA-derived reference doses (RfDs) and reference concentrations (RfCs). The RfD or RfC is an estimate of average daily exposure of an individual (including sensitive individuals) to a given chemical that is likely to be without appreciable risk of deleterious effects during a lifetime. The RfD is expressed in units of mg chemical per kg body weight per day (mg/kg-day), while the RfC is expressed in units of mg chemical per cubic meter of air (mg/m^3).

RfDs and RfCs are usually derived either from human studies involving work-place exposures or from animal studies, and are adjusted using uncertainty factors to ensure that they are unlikely to underestimate the potential for adverse noncancer effects to occur. The uncertainty factors reflect scientific judgment regarding the various types of data used to estimate the RfD/RfC and range between 1 and 10. For example, a factor of 10 may be introduced to account for possible differences in response between humans and animals in prolonged exposure studies. Other factors may be used to account for variation in susceptibility among individuals in the human population, use of data from a study with less-than-lifetime exposure, and/or use of data from a study that did not identify a no-observed-adverse-effect level (NOAEL).

RfDs and RfCs provide benchmarks against which estimated doses (i.e., those projected from human exposures to various environmental conditions) might be compared. Doses that are significantly higher than the RfD/RfC may indicate an increased potential of hazard from the exposure, while doses that are lower than the RfD/RfC are not likely to be associated with adverse health effects. Note that an exceedance of a reference dose or concentration does not predict a specific disease.

5.2 Health Effects Criteria for Carcinogens

For chemicals that exhibit cancer effects, EPA and other scientific authorities recognize that one or more molecular events can evoke changes in a single cell or a small number of cells that can lead to malignancy. This non-threshold theory of carcinogenesis purports that any level of exposure to a carcinogen can result in some finite possibility of causing cancer. Generally, regulatory agencies assume the non-threshold hypothesis for carcinogens in the absence of information concerning the mechanisms of cancer action for the chemical. The slope factor (SF) [in units of (mg/kg body weight-day)$^{-1}$] is a number which, when multiplied by the lifetime average daily dose of a potential carcinogen (in mg/kg body weight-day), yields the upper-bound lifetime excess cancer risk associated with exposure at that dose. The SF is developed for exposure through the oral route.

The inhalation unit risk (IUR) is the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to a chemical at a concentration of 1 microgram per cubic meter (µg/m^3 in air). Upper-bound is a term used by EPA to reflect the conservative nature of the SFs and IURs—risks estimated using SFs and IURs are considered unlikely to underestimate actual risks and may overestimate risks for a given exposure. Excess lifetime cancer risks are generally expressed in scientific notation and are probabilities. An excess lifetime cancer risk of 1×10^{-6} (one in one million), for example, represents the incremental probability that an individual will develop cancer as a result of exposure to a carcinogen over a 70-year lifetime under specified exposure conditions.

In practice, SF and IUR estimates are derived from the results of human epidemiology studies or chronic animal bioassays. The animal studies are conducted for a range of doses, including a high dose, in order to detect possible adverse effects. Since humans are expected to be exposed at lower doses than those used in animal studies, the data are adjusted via mathematical models. The data from animal studies are typically fitted to the linearized multistage model to obtain a dose-response curve. EPA evaluates a range of possible models based on the available data before conducting the extrapolation. The most appropriate model to reflect the data is selected based on an analysis of the data set.

The 95% UCL slope of the dose-response curve, subject to various adjustments and an inter-species scaling factor, is applied to derive the health protective SF and IUR estimate for humans. Dose-response data from human epidemiological studies are fitted to dose-time-response curves. These models provide rough, but reasonable, estimates of the upper limits on lifetime risk. SF and IUR estimates based on human epidemiological data are also derived using health protective assumptions and, as such, they too are considered unlikely to underestimate risks.

Therefore, while the actual risks associated with exposures to potential carcinogens are unlikely to be higher than the risks calculated using SF and IUR estimates, they could be considerably lower. In addition, there are varying degrees of confidence in the weight of evidence for the carcinogenicity of

any given chemical. EPA (1986) has proposed a system for characterizing the overall weight of evidence based on the availability of animal, human, and other supportive data. The weight-of-evidence classification is an attempt to determine the likelihood that an agent is a human carcinogen and thus qualitatively affects the estimation of potential health risks. Three major factors are considered in characterizing the overall weight of evidence for human carcinogenicity:

- The availability and quality of evidence from human studies
- The availability and quality of evidence from animal studies
- Other supportive information that is assessed to determine whether the overall weight of evidence should be modified

Under EPA's risk assessment guidelines (EPA 1986, 1996, 1999), classification of the overall weight of evidence includes the following five categories:

- Group A - Human Carcinogen: There is at least sufficient evidence from human epidemiological studies to support a causal association between an agent and cancer.
- Group B - Probable Human Carcinogen: There is at least limited evidence from epidemiological studies of carcinogenicity in humans (Group B1), or, in the absence of adequate human data, there is sufficient evidence of carcinogenicity in animals (Group B2).
- Group C - Possible Human Carcinogen: There is inadequate evidence of carcinogenicity in humans.
- Group D - Not Classified: There is inadequate data or no existing data for the chemical.
- Group E - No Evidence of Carcinogenicity in Humans: There is no evidence for carcinogenicity based on at least two adequate animal tests in different species, or on both human epidemiological and animal studies.

The 2005 (EPA 2005a) Cancer Guidelines provide an update to the EPA's Cancer Guidelines (EPA 1986, 1996, 1999). The 2005 Cancer Guidelines emphasize the value of understanding the biological changes that a chemical can cause and how these changes might lead to the development of cancer. They also discuss methods to evaluate and use such information, including information about an agent's postulated mode of action, or the series of steps and processes that lead to cancer formation. Mode-of-action data, when available and of sufficient quality, may be useful to draw conclusions about the potency of an agent, its potential effects at low doses, whether findings in animals are relevant to humans, and which populations or life stages may be particularly susceptible. In the absence of mode-of-action information, default options are available to allow the risk assessment to proceed.

The 2005 Guidelines recommend that an agent's human cancer potential be described in a weight-of-evidence narrative rather than using the previously identified letter categories (A = known, B = probable, C = possible, D = not classifiable, and E = non-human carcinogen). The narrative summarizes the full range of available evidence and describes any conditions associated with conclusions about an agent's hazard potential. For example, the narrative may explain that an agent appears to be

carcinogenic by some routes of exposure but not others (e.g., by inhalation but not ingestion). Similarly, a hazard may be attributed to exposures during sensitive life stages of development but not at other times. The narrative also summarizes uncertainties and key default options that have been invoked.

The following are the five recommended standard hazard descriptors:

- Carcinogenic to humans
- Likely to be carcinogenic to humans
- Suggestive evidence of carcinogenic potential
- Inadequate information to assess carcinogenic potential
- Not likely to be carcinogenic to humans

EPA is evaluating the carcinogenic weight of evidence of chemicals through the IRIS chemical process. In this process, chemicals are nominated, and all chemicals are evaluated consistent with the 2005 Guidelines and a narrative developed describing the Weight of Evidence. The IRIS chemical file is then reviewed, first through internal EPA consensus review and then external peer-review. The requirements for in-depth analysis of mode-of-action data and the review process do not allow for the equating of a chemical evaluated under the old system with the letter classification using the 2005 Classification narrative; rather, a full analysis of the data is required.

The 2005 Cancer Guidelines also include Supplemental Guidance on the evaluation of early lifetime exposures including the mutagenic mode of action for carcinogenesis. The Supplemental Guidance provides procedures for evaluating chemicals that are carcinogens and either using the data in the development of the potency factors or using age dependent adjustment factors. For chemicals with a mutagenic mode of action, the following age dependent adjustment factors are applied to the chronic daily intake (EPA 2005b):

- Age 0 to less than 2 years: 10
- Age 2 to less than 16 years: 3
- Age greater than or equal to 16 years: 1

The Supplemental Guidance also provides for the evaluation of data on early lifetime exposures where children may be more susceptible. The application of these adjustments for specific chemicals is noted in the risk assessment and, where appropriate, in the presentation of calculated risks.

5.3 Toxicity Values

Table 5-1 summarizes the chronic RfDs and Tables 5-2 through 5-4 summarize chronic, subchronic, and acute RfCs used to estimate noncancer effects. In accordance with the inhalation guidance (EPA 2009a), the RfC based on the next longer duration of exposure duration is used as a conservative estimate where the subchronic or acute RfC is not available. Tables 5-5 and 5-6 summarize the cancer SFs and IURs used to estimate cancer risks. These criteria are the most current data, obtained from the July 2012 on-line version of IRIS and PPRTVs, the July 2009 on-line version of the Cal/EPA Office of Environmental Health Hazard Assessment Toxicity Criteria Database, and the ATSDR Minimal Risk

Levels table dated February 2012 (ATSDR 2012). The use of surrogate toxicity values is noted in Tables 5-1 through 5-6.

Seven PAHs have been classified by EPA as Group 2, probable human carcinogens. Toxicity values are currently available only for benzo(a)pyrene. Five of the seven carcinogenic PAHs (cPAHs) are identified as COPCs in this risk assessment. These cPAHs are assessed using the PAH-specific relative potency factor (RPF) that expresses the potency relative to benzo(a)pyrene (EPA 1993). The RPFs are applied to derive oral SFs and IURs for cPAHs. The cPAHs and vinyl chloride have been identified as having mutagenic mode of action and may have a greater cancer impact if exposure occurs during childhood (EPA 2005b). Dose estimates for the cPAHs and vinyl chloride are adjusted upward to include both early-life exposures that may result in the occurrence of cancer during childhood and early-life exposures that may contribute to cancers later in life.

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Section 6
Risk Characterization

In this section of the risk assessment, the human health risks potentially associated with the complete human exposure pathways identified in Section 4 are assessed. Potential risks due to exposures to COPCs in soil, groundwater, surface water, sediment, and fish from the site are evaluated by integrating toxicity and exposure assessments into quantitative expressions of cancer risk and noncancer health hazards.

6.1 Risk Characterization Methodology

Cancer risks and noncancer health effects are evaluated separately because of fundamental differences in their critical toxicity values.

The potential for noncancer health effects is evaluated by comparing an exposure level over a specified time period with an RfD or RfC derived for a similar exposure period. This ratio of exposure to toxicity is referred to as an HQ. The hazard index (HI) is the sum of the HQs from individual chemicals and exposure routes. If the HI exceeds unity (1), HQs for individual COPCs with similar toxicological effects or mechanism of action are summed to yield a target organ/effect-specific HI (EPA 1989). If the HI is less than one, no target organ/effect-specific HIs are calculated because they would not exceed one. The HI assumes that there is a level of exposure below which it is unlikely even for sensitive populations to experience adverse health effects. However, this value should not be interpreted as a probability; generally, the greater the HI is above unity, the greater the level of concern.

Cancer risks are estimated as the incremental probability of an individual to develop cancer over a lifetime as a result of exposure to a potential carcinogen. The upper-bound excess lifetime cancer risk is estimated by multiplying the lifetime exposure estimated in the exposure assessment (Section 4) by the SF or IUR identified in the toxicity assessment (Section 5). Excess lifetime cancer risks are generally expressed in scientific notation and are probabilities. An excess lifetime cancer risk of 1×10^{-6} (one in one million), for example, represents the incremental probability that an individual will develop cancer as a result of exposure to a cancer chemical over a 70-year lifetime under specified exposure conditions.

In general, EPA recommends a target HI value of 1 and a target cancer risk range of 1×10^{-6} to 1×10^{-4} as threshold values for potential human health impacts. The results presented in Tables 6-1 and 6-2 and in the Table B-7, B-9, and B-10 series in Appendix B are compared to these target values. These values aid in determining whether additional response action is necessary at the site.

6.2 Results of Risk Calculations

Risks for all receptors are estimated using RME assumptions. Cancer risk and noncancer hazard calculations for all COPCs are presented in RAGS Part D Tables B-7.1 through B-7.9 and summarized in RAGS Part D Tables B-9.1 through B-9.9 and B-10.1 through B-10.9 in Appendix B.

Risks are also estimated using CTE assumptions when the RME assumptions resulted in risk estimates above EPA's thresholds. The comparison of RME and CTE risks provides information about the degree to which variability in, and uncertainty associated with, receptor behavior (e.g., amount of water a child ingests per day) influence the risk estimates. CTE risks represent typical exposure patterns rather than the highest possible exposure that is reasonably expected to occur. CTE calculations are presented in Tables E-1.1 to E-3.5b in Appendix E.

Cancer risk and noncancer health hazard estimates for each receptor by exposure area are summarized in Tables 6-1 and 6-2.

6.2.1 Current Receptors

Under current land-use scenarios at the site, the receptor populations evaluated in the risk assessment include site workers, trespassers, recreational users, anglers, and residents.

6.2.1.1 Site Workers

Current site workers may come into contact with contaminants in surface soil at the scrapyard area. For the RME scenario, the total estimated excess cancer risk for current site workers (3×10^{-4}) is slightly above EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}, primarily due to exposure to Aroclor 1260 in soil. However, under the CTE scenario, the total estimated cancer risk (3×10^{-5}) is within EPA's target cancer risk range.

The total noncancer HIs for the site worker (20) exceed EPA's threshold of unity. The target organ/effect HIs for the eye (19), finger nail (19), and immune system (19) are also greater than one, due to exposure to Aroclor 1260 in soil (Table 6-1). When a more typical exposure is considered under the CTE scenario, the total noncancer HI (5) is still above EPA's threshold of unity. The target organ/effect HIs for the eye (5), finger nail (5), and immune system (5) are still greater than one (Table 6-1).

6.2.1.2 Trespassers

Trespassers may come into contact with contaminants in surface soil, surface water, and sediment while trespassing on the site. Under the RME scenario, the total estimated excess cancer risk (1×10^{-4}) is at the upper bound of the EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. The total HI exceeds EPA's threshold of unity under the RME scenario (2), but below EPA's threshold under the CTE scenario (0.5) (Table 6-1).

6.2.1.3 Recreational Users

Recreational users at the open field and waste disposal area may come into contact with contaminants in surface soil while visiting the site. Under the RME scenario, the total estimated excess cancer risk (3×10^{-6}) is within EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. The total noncancer HI for trespassers (0.6) is below EPA's threshold of unity (Table 6-1).

6.2.1.4 Residents

Willow Woods Property

Residents may come into contact with contaminants in surface soil at the Willow Woods property. For the RME scenario, the total estimated excess cancer risk for residents (7×10^{-5}) is within EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. The total HI (0.5) is below EPA's threshold of unity (Table 6-2).

Matteo Property

Residents of the rental home on the Matteo property may be exposed to contaminants in surface soil at the rental home area and in groundwater through domestic use of water. For the RME scenario, the total estimated excess cancer risk for current residents (1×10^{-2}) is above EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. Cancer risks are attributed to cPAH in soil (89% of total cancer risk), arsenic (6% of total cancer risk) and vinyl chloride (4%) in groundwater (Table 6-1). The dataset for groundwater evaluated at the Matteo property includes data from monitoring wells and two potable wells (PW-1 and PW-2). The risk is most likely overestimated. See discussion on these potable wells below.

The total noncancer HI for residents (28) is above EPA's threshold of unity. The target organ/effect HIs for the blood (15), gastrointestinal (GI) tract (2), kidney (4), longevity (15), and skin (6) are greater than one (Table 6-2). The potential health hazards to longevity and the blood are the result of exposure to antimony in groundwater, while the potential adverse health effects to the kidney are the result of exposure to vanadium in groundwater. The potential adverse health effects to the skin are the result of exposure to arsenic in groundwater. Potential adverse health effects to the GI tract are due to exposure to iron in groundwater. As discussed in Section 6.4, iron is naturally present in the groundwater and is not site-related. In addition, risks associated with arsenic and vanadium in groundwater are most likely attributable to background concentrations.

When a more typical exposure is considered under the CTE scenario, the total estimated excess cancer risk for residents (4×10^{-3}) is still above EPA's target cancer risk range. The total noncancer HI (9) is above EPA's threshold of unity. The target organ/effect HIs for the blood (4), longevity (4), and skin (2) are still greater than one (Table 6-2).

As stated in Section 2.4, groundwater is currently not used for drinking or cooking purposes at the rental house in the Matteo property. It is noted that vinyl chloride is present in the deep aquifer with the highest levels offsite to the southeast. Vinyl chloride is not site-related. Additionally, several of the chemicals identified as risk drivers in groundwater, such as antimony, vanadium, and vinyl chloride, were not detected in any of the potable wells (PW-1 and PW-2). Arsenic was detected only in one of the potable wells (PW-2) at a concentration of 0.48 µg/L, below the federal MCL of 10 µg/L and the New Jersey Groundwater Quality Standard for Class IIA Water of 3 µg/L. The arsenic concentration in PW-2 was also much lower than the groundwater EPC of 26.7 µg/L used in risk calculations. Similarly, iron was detected at much lower concentrations in the potable wells (38.3 µg/L and 110 µg/L) than the EPC of 19,505 µg/L used in risk calculations. Thus, risks for current residents in the rental house are most likely overestimated.

If the maximum concentrations of PW-1 and PW-2 were used to estimate risks from groundwater for current residents at the rental house, they would yield a cancer risk of 1×10^{-5} and a noncancer HI of

0.4. However, the total cumulative risk to residents (9×10^{-3}) is still above EPA target thresholds due to exposure to contaminants in soil.

As discussed in Section 6.5.1, RHA-SS-10 is a potential outlier. If this surface soil sample is excluded from the EPC calculation, the estimate risks from soil for current residents would yield a cancer risk 4×10^{-5} and a noncancer HI of 0.8. However, the total cumulative risk to residents (3×10^{-3}) and HI (28) are still above EPA target thresholds due to exposure to contaminants in groundwater as discussed above.

If maximum concentrations of PW-1 and PW-2 were used to estimate risks from groundwater for current residents at the rental house and RHA-SS-10 was excluded from the EPC to estimate soil risk, they would yield a total cumulative cancer risk of 6×10^{-5} and a noncancer HI of 1.

6.2.1.5 Anglers

Anglers may be exposed to contaminants through consumption of fish caught at Hessian Run or Woodbury Creek.

Adults

Under the RME scenario, the total estimated excess cancer risk for the adult angler (2×10^{-4}) is above EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. Cancer risks are attributed to PCBs in fish (Table 6-1). The total noncancer HIs for the adult angler (11) exceed EPA's threshold of unity. The target organ/effect HIs for the eye (11), finger nail (11), and immune system (11) are greater than one, due to exposure to Aroclor 1254 in fish (Table 6-1).

When a more typical exposure is considered under the CTE scenario, the estimated cancer risk (8×10^{-6}) is within the EPA's target range and the total noncancer HI (1) is at the EPA's threshold of unity.

Children

Children may consume fish caught at Woodbury Creek or Hessian Run by adult anglers. Under the RME scenario, the total estimated excess cancer risk for the child angler (7×10^{-5}) is within the EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. The total noncancer HIs for the child angler (17) exceed EPA's threshold of unity. The target organ/effect HIs for the eye (17), finger nail (17), and immune system (17) are greater than one, due to exposure to Aroclor 1254 in fish (Table 6-1). When a more typical exposure is considered under the CTE scenario, the total noncancer HI (2) is above the EPA's threshold of unity. The target organ/effect HIs for the eye (2), finger nail (2), and immune system (2) are greater than one, due to exposure to Aroclor 1254 in fish.

6.2.2 Future Receptors

Under future land-use conditions, the receptor populations evaluated in the risk assessment include the following:

- Matteo Property – site workers, trespassers, recreational users, anglers, residents, and construction workers
- Willow Woods Property – residents and construction workers

Risk characterization results for future site workers, trespassers, recreational users, anglers, and residents at the Willow Woods property are the same as those under current land use scenarios (Section 6.2.1). Cancer risk and noncancer health hazard estimates for future residents at the Matteo property and future construction workers are presented below.

6.2.2.1 Residents at the Matteo Property

Residents at the Matteo property may be exposed to contaminants in surface soil, groundwater, surface water, sediment, and through consumption of fish caught from Woodbury Creek or Hessian Run.

For the RME scenario, the total estimated excess cancer risk for future residents (6×10^{-3}) is above EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. Cancer risks are due to exposure to cPAHs (61%) and Aroclor 1260 (3%) in surface soil, cPAHs in surface water (13%), arsenic (10%) and vinyl chloride (7%) in groundwater, and PCBs in fish (4%) (Table 6-1).

The total noncancer HI for residents (94) is above EPA's threshold of unity. The target organ/effect HIs for the blood (16), liver (3), eye (50), finger nail (50), GI tract (3), immune system (51), kidney (15), longevity (15), respiratory system (6), and the skin (6) are greater than one (Table 6-1). The potential health hazards to longevity and the blood are the result of exposure to antimony in groundwater, while the potential adverse health effects to the kidney and respiratory system are the result of exposure to vanadium in soil, groundwater, and sediment. The potential adverse health effects to the skin are the result of exposure to arsenic in groundwater. The potential adverse health effects to the eye, finger nail, and immune system are the result of exposure to Aroclor 1254 in fish and Aroclor 1260 in soil and fish. Potential adverse health effects to the GI tract are due to exposure to iron in groundwater. The potential adverse health effects to the liver are the result of exposure to multiple chemicals with individual HI of less than one.

When a more typical exposure is considered under the CTE scenario, the total estimated excess cancer risk for future residents (2×10^{-3}) is still above EPA's target cancer risk range. The total noncancer HI (30) is still above EPA's threshold of unity. The target organ/effect HIs for the blood (5), eye (16), finger nail (16), immune system (16), kidney (5), longevity (4), respiratory system (3), and skin (2) are still greater than one (Table 6-1).

As discussed in Section 6.5.1, RHA-SS-10 is a potential outlier. If this sample was excluded from the EPC calculation, the estimate risks from soil for current residents would yield a cancer risk 8×10^{-5} and a noncancer HI of 8. However, the total cumulative risk to residents (2×10^{-3}) and HI (60) are still above EPA target thresholds due to exposure to contaminants in groundwater and fish.

6.2.2.2 Construction Workers

Future construction workers may come into contact with contaminants in surface/subsurface soil while engaging in excavation activities. Risks for future construction workers are presented below by area.

Willow Woods Property

For the RME scenario, the total estimated excess cancer risk for future construction workers at the Willow Woods property (3×10^{-7}) is below EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. The total noncancer HI for future construction workers (0.04) is below EPA's threshold of unity (Table 6-1).

Matteo Property

For the RME scenario, the total estimated excess cancer risk for future construction workers at the Matteo property (8×10^{-6}) is within EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4}. The total noncancer HI for future construction workers (9) is above EPA's threshold of unity (Table 6-1). The target organ/effect HIs for eye (9), finger nail (9), and immune system (9) are greater than one, due to exposure to Aroclors 1254 and 1260 in surface and surface soil.

6.3 Risk Associated with Exposure to Lead

Lead is identified as a COPC in soil at the Matteo property and the open field/waste disposal area, groundwater, surface water, and fish (Table 3-1). Exposures to lead are not evaluated using the same methods as those described for other COPCs. EPA considers lead to be a special case because of the difficulty in identifying the threshold. As shown in Table 3-2, health risks from lead exposure are evaluated qualitatively by comparing the arithmetic mean lead concentrations in environmental media to EPA soil screening levels, New Jersey Ground Water Quality Standard for Class IIA, New Jersey Surface Water Quality Criteria, and EPA Region 2 screening level for fish (CDM Smith 2011).

Surface Soil - At the Matteo property, the mean lead concentration in surface soil is 767 mg/kg, above the EPA screening level of 400 mg/kg for residential soil and but below the 800 mg/kg screening level for industrial soil. If the Matteo property is developed into residential properties in the future, potential exposure to lead in soil may cause adverse health effects to residents.

The mean lead concentration in surface soil in the open field/waste disposal area is 1,153 mg/kg, exceeding the EPA screening level of 400 mg/kg for residential soil and 800 mg/kg for industrial soil. Although trespassers and recreational users are not expected to have the same magnitude of exposure as residents (i.e., less exposure frequency and duration and a lower soil intake rate), the presence of elevated lead levels in the open field/waste disposal area may cause potential adverse health effects to trespassers and recreational users.

Surface/Subsurface Soil - The mean lead concentration in surface/subsurface soil at the Matteo property is 1,707 mg/kg, exceeding the EPA screening level of 800 mg/kg for industrial soil. Thus, potential exposure to lead at the Matteo property may cause potential adverse health effects to future construction workers.

Groundwater – The mean lead concentration in groundwater of 18.5 µg/L exceeds the New Jersey Groundwater Quality Standard for Class IIA Water of 5 µg/L and the federal MCL of 15 µg/L. Although potable wells at the site are not currently used for drinking water purposes, residents have access to this water and may potentially use it as a drinking source. This potential exposure to lead in groundwater may cause adverse health effects to residents, especially future child residents at the Matteo property.

The high lead concentrations in groundwater are present only in shallow perched groundwater in the vicinity of the battery casing disposal areas north of the scrapyard. In the vicinity of the rental house and the office building where the potable wells (PW-1 and PW-2) are located, lead was present in deep regional groundwater (potable wells are screened in this zone) at concentrations below the New Jersey Groundwater Quality Standard for Class IIA Water of 5 µg/L. As a result, exposure to lead in groundwater is not a concern for current residents at the rental house.

Surface Water – The mean lead concentration in surface water in Woodbury Creek/Hessian Run is 27.4 µg/L, above the New Jersey fresh water criterion of 5 µg/L for the protection of human health. Although trespassers and future residents at the Matteo property are not expected to use the surface water as drinking water sources, the presence of elevated lead levels in surface water may cause potential adverse health effects to these receptor populations.

Fish – The mean lead concentration in fish from Woodbury Creek/Hessian Run is 0.44 mg/kg in wet weight. This concentration exceeds the screening level of 0.1 mg/kg developed by EPA Region 2 for the Raritan Bay Slag Superfund Site (CDM Smith 2011).

The lead concentration in fish was obtained by analyzing whole-body (including bones and organs) fish due to the small size and limited number of the individual fish collected. Lead mainly accumulates in bones and organs. Hence, the lead concentration in the whole-body fish sample is expected to be higher than that in fish fillet tissues, which are typically consumed by the potentially exposed populations. Furthermore, the screening level was based on a fish ingestion rate of 18 g/day for a child aged under 6 years. In the proximity of the site, Hessian Run and Woodbury Creek are made up primarily of extensive tidal flats with small channels. It is unlikely that these water bodies are able to sustain such a high fish yield on a daily basis. Thus, the fish screening level is considered very conservative for the site.

In summary, the presence of elevated lead concentrations in soil at the Matteo property and the open field/waste disposal area, groundwater, surface water, and fish may cause adverse health effects to trespassers, recreational users, anglers, residents and construction workers at the Matteo property, especially future residents at the Matteo property. However, lead concentrations in the potable wells were below the federal MCL and the state groundwater standard. Thus, exposure to lead in groundwater is not a concern for current residents in the rental house.

6.4 Risks from Background Concentrations

Arsenic, antimony, lead, iron, vanadium, and PAHs are identified as risk drivers at the site. Metals occur naturally in the environment and are commonly present in all environmental samples. PAHs are ubiquitous and consistently present in the environment. Background soil samples were not collected as part of this RI. State and regional background metal levels in soils have been published by NJDEP (Sanders 2003 and N.J.A.C 7:26D). The 90th percentile metal concentrations for the urban coastal plain province values (Sanders 2003) are used as background soil concentrations for the site. Risks from background concentrations are discussed below.

6.4.1 Arsenic

The arsenic UCL concentration in soils at the Matteo property is 9.7 mg/kg (Table B-3.2a in Appendix B). This arsenic concentration is below the 90th percentile concentration for the urban coastal plain province value of 13.6 mg/kg (Sanders 2003) and the natural soil background level of 19 mg/kg in New Jersey (N.J.A.C 7:26D). Thus, all risks associated with arsenic in soil and groundwater are most likely attributable to background concentrations.

6.4.2 Vanadium

The vanadium UCL concentration in soils is 46.2 mg/kg (Table B-3.2a in Appendix B). This vanadium concentration is comparable to the 90th percentile concentration for the urban coastal plain province value of 35.5 mg/kg (Sanders 2003). However, the vanadium UCL concentration in sediment (90.3 mg/kg) is much higher than the 90th percentile value. The higher level of vanadium in sediment is probably due to the presence of glauconite in the Merchantville Formation, which is present under most of the site and makes up the substrate of portions of both creeks (CDM Smith 2012). According to a study by Dooley (2001), vanadium is naturally present in glauconite with a mean concentration of 222 mg/kg. Thus, all risks associated with vanadium in soil, groundwater, and sediment are most likely attributable to background concentrations.

6.4.3 Iron

Iron is a risk driver in groundwater. The elevated iron concentrations are due to the anaerobic conditions of the deep regional aquifer and the presence of glauconitic clays in the Merchantville Formation. The shallow wells with elevated iron are screened just above or within the upper portion of this iron-rich formation.

Iron oxyhydroxide is typically stable or insoluble in water. It becomes soluble under reducing conditions while ferric iron is reduced to the more soluble ferrous iron. The high levels of iron in groundwater are attributable to the anaerobic conditions in the regional PRM aquifer, under which iron in glauconitic clays is reduced to the soluble ferrous iron. A U.S. Geological Survey study (Sloto 2003) documented elevated iron concentrations in the PRM aquifer in Gloucester County, adjacent Camden County, and Philadelphia area. The reducing environment in the PRM aquifer results from oxygen depletion by organic wastes and other chemicals decomposed within the aquifer. Under reducing conditions, iron becomes soluble by reductive dissolution of the aquifer matrix. As a matter of factor, the PRM aquifer is no longer usable as a source of water supply in Philadelphia because of highly elevated iron concentrations (up to 429 mg/L) (Sloto 2003). Thus, the presence of elevated iron concentrations in groundwater at the site is related to the glauconitic soils and the geochemistry of the regional groundwater.

6.4.4 Antimony and Lead

Antimony and lead are predominant site contaminants; they are present in soil, groundwater, surface water, and sediment at elevated concentrations.

Antimony occurs in natural soil and rock in very low concentrations ranging from less than 1 to 8.8 mg/kg, with a mean concentration of 0.48 mg/kg (ATSDR 1992). In soils from the New Jersey urban

coastal plain province, the 90th percentile concentration for lead is 144 mg/kg while antimony was not detected (Sanders 2003).

The UCL concentration in soils at the Matteo property were 34 mg/kg and 6,999 mg/kg for antimony and lead, respectively (Table B-3.2a in Appendix B). These concentrations are much higher than background concentrations. The presence of elevated antimony and lead levels at the site apparently originated from the variable types of metal wastes that were processed.

6.4.5 Polycyclic Aromatic Hydrocarbons

PAHs are among the diverse products of the incomplete oxidation of organic fuels, such as coal, oil, wood, and organic wastes. They are also present in the exhaust gases emitted from diesel and internal combustion engines of vehicles. PAHs are risk drivers in surface water because they were detected in two surface water samples (T1-SW-01 and T31-SW-01) collected in a portion of Hessian Run adjacent to New Jersey Interstate Highway 295 (I-295). The principal sources of PAHs in soils along roads are vehicular exhausts, emissions from tire wear, and asphalt (ATSDR 1995). The PAHs in surface water are most likely attributable to surface runoff from I-295.

Carcinogenic PAHs were detected in soils at the Matteo property (excluding sample at RHA-SS-10) at concentrations comparable to concentrations of cPAHs detected at the Willow Woods property. Sample at RHA-SS-10 is a potential outlier as discussed in Section 6.5.1.

6.4.6 Summary

The presence of arsenic and vanadium in soil, sediment, and groundwater, cPAHs in soil and surface water, and iron in groudnwater are most likely related to natural or anthropogenic sources that are not related to the Matteo site. Potential risks attributable to these chemicals are not site-related.

6.5 Uncertainty in Risk Assessment

As in any risk assessment, the estimates of potential health threats (cancer risks and noncancer health hazards) have numerous associated uncertainties. The primary areas of uncertainty and limitations are qualitatively discussed here. The main areas of uncertainty in this HHRA include environmental data, exposure parameter assumptions, toxicity values, and risk characterization.

6.5.1 Environmental Data

Uncertainty is often associated with the estimation of chemical concentrations. Errors in the analytical data may stem from errors inherent in sampling and/or laboratory procedures. One of the most effective methods to minimize procedural or systematic error is to subject the data to a strict QC review. The QC review procedure helps to eliminate many laboratory errors. However, even with all data rigorously validated, it must be realized that error is inherent in all laboratory procedures.

Samples were collected from known and suspected areas of contamination (biased sampling) to delineate the nature and extent of contamination. Although this sampling methodology provided a reasonable estimation of the level of confidence at known or suspected contaminated areas within the site, the possibility exists that the data sets formed by these samples do not accurately represent

the level of overall contamination at the site. The large number of samples collected at the site reduces uncertainty to an acceptable level in most cases.

Nondetected Chemicals

Uncertainty is associated with nondetected chemicals. As shown in Tables F-1a to F-5 in Appendix F, there were few chemicals not detected in any samples, but reporting limits exceeded screening levels in some of these samples. When a chemical is not detected and the reporting limit exceeds the screening level, some degree of uncertainty exists regarding the presence or absence of the chemical.

Soil - Reporting limits for cyanide and thallium exceeded their screening level for all soil samples from the Willow Woods property. Thallium was mostly in surface/subsurface soil samples in the Matteo property. Cyanide was also detected in surface/subsurface soil samples in the Matteo property. Since reporting limits for cyanide and thallium are above the screening level, it is unknown whether the lack of detection of cyanide and thallium in soil samples from the other areas with elevated reporting limits truly indicates the absence of these metals.

Groundwater and Surface Water – Reporting limits for many chemicals, including 16 VOCs, 25 SVOCs, 11 pesticides, 9 PCBs, and 1 metal, exceeded their respective groundwater and/or surface water screening levels in all samples. These chemicals, except for PCBs, are unlikely to be related to releases from the site. The uncertainty surrounding the presence of these undetected chemicals in groundwater and surface water is low. PCBs are major contaminants at the site. They were present in soil and sediment at elevated concentrations. PCBs have low solubility and strong affinities for soil and sediment. They are relatively immobile and not likely to leach from soil into groundwater. Despite their low solubility, PCBs, especially lower Aroclors such as Aroclor 1016 and Aroclor 1248, do dissolve in water. Since reporting limits for PCBs were two to six times the screening levels, it is unknown whether the lack of detection of PCBs in groundwater with elevated reporting limits truly indicates the absence of PCBs.

Screening levels for surface water are based on RSLs for tap water, which are the chemical concentrations in drinking water below which any impacts to human health are negligible or absent (EPA 2015). Potential exposures associated with surface water are anticipated to be much less than those associated with domestic use of groundwater. Thus, using tap water RSLs as screening levels for surface water is a very conservative approach.

Fish Data

The concentration in fish was obtained by analyzing whole-body fish rather than fish fillets due to the small size of the fish and limited number of the individual fish caught. Lead mainly accumulates in bones and PCBs accumulate in organs and fat tissue. In addition, the guts most likely contained contaminated sediment. Thus, lead and PCB concentrations in whole-body fish samples are expected to be higher than those in fish fillet tissues, which are typically consumed by the majority of the potentially exposed populations. The use of whole-body fish data in the risk assessment overestimates risks associated with fish consumption for anglers and future residents at the Matteo property.

On the other hand, the fish samples were analyzed for lead and PCBs only. Other site-related metals such as antimony, copper, and zinc may accumulate in fish tissues. The lack of antimony, copper, and zinc data may underestimate risks associated with fish consumption for anglers and future residents.

Total and Dissolved Concentrations

In this risk assessment, results of total metal concentrations from unfiltered groundwater and surface water samples were used in risk calculations. At the site, total metal concentrations in groundwater and surface water were generally higher than dissolved concentrations. For example, 3 of 17 total lead samples exceeded the New Jersey Groundwater Quality Standard for Class IIA Water of 5 µg/L in the shallow wells, compared to only one dissolved lead sample that exceeded the criterion. The highest total lead concentration in groundwater (573 J µg/L) was over 10 times the dissolved lead concentration (43.3 µg/L) from the same location (MW-05). Similarly, the highest total vanadium concentration in groundwater (10.5 µg/L) was 7 times the dissolved vanadium concentration (1.4 J µg/L) at the same location (MW-06D). The differences between total and dissolved metal concentrations are attributable to high suspended solids in the well. These suspended solids are left over from drilling operations and are not related to transport in the groundwater. Since suspended particles are not transported in groundwater, the use of total concentrations in risk calculations is very conservative and overestimate risks associated with potable water uses for current and future residents at the Matteo property.

Outliers

The concentrations of cPAHs were higher in the surface soil samples at the rental home area than that at the rest of the Matteo property. The cPAHs concentrations at RHA-SS-10 are around 300 to 600 times higher than the cPAHs concentrations at the rest of the rental home area. This may be due to the sample being collected adjacent to paved roadways, unlike the majority of the samples collected on site. Thus, this sample may be a potential outlier, and including this result in the soil EPC calculation most likely overestimates risks associated with current and future residents. The ProUCL outlier tests and outputs for the dataset excluding the RHA-SS-10 sample are provided in Appendix C, and the risk estimates excluding this outlier are provided in Table 6-2.

The Aroclor 1260 concentration at SB-107 of 200,000 µg/kg is much higher than the rest of Aroclor 1260 concentrations in the scrapyard area (ranged from 20 to 290 µg/kg) and at the Matteo property (ranged from 20 to 3,000 µg/kg). The outlier test indicates that SB-107 may be a potential outlier. Including SB-107 sample in the EPC calculation most likely overestimates risks associated with current and future site workers and future residents at Matteo property. The ProUCL outlier tests and outputs for dataset excluding the SB-107 sample are provided in Appendix C.

6.5.2 Exposure Parameter Estimation

There are three major areas of uncertainty associated with exposure assessment, including: 1) selection of exposure areas; 2) calculation of EPCs; and 3) exposure parameter values used to estimate chemical intake.

6.5.2.1 Selection of Exposure Areas

The study area has been divided into several exposure areas for evaluation of human health risks based on considerations of physical features, historical information, and the locations of samples collected during the RI and previous investigations. Current active use of the Matteo property is limited to the scrapyard area and the rental home area. Since the scrapyard is not expected to expand beyond its current boundary, the evaluation of the future industrial/commercial land use scenario is limited to the scrapyard area. The possibility exists that the entire Matteo property is developed for industrial/commercial purposes in the future. Concentrations of site-related contaminants such as lead and vanadium are higher in the waste disposal/open field area. Thus, potential exposure to contaminants in soil in these areas may cause potential health effects to future workers. A more conservative future residential scenario is evaluated for the Matteo property; the residential scenario should provide health-protective estimates of the risks to future workers if the entire Matteo property is developed into industrial/commercial property.

6.5.2.2 Exposure Point Concentrations

A baseline risk assessment evaluates mean concentrations over an exposure unit, considering all exposures within that area as equally possible. Risks associated with exposures are then assessed by evaluating those average or mean concentrations with exposure factors and the appropriate exposure/toxicity values. In accordance with ProUCL recommendation (EPA 2013), when 5 or more samples are collected with at least 4 samples are detected, the EPC for a specific chemical in a particular medium is based on the 95 percent or higher UCL on the mean or the maximum detected concentration, whichever is less. Use of a 95 percent or higher UCL of the mean is simply to ensure that the average concentration is not underestimated.

When calculating EPCs from sampling data, any approach dealing with non-detected chemical concentrations is associated with some degree of uncertainty. This is because the non-detected result does not indicate whether the chemical is absent from the medium, present at a concentration just above zero, or present at a concentration just below the reporting limit. For chemicals that are infrequently detected, many of the values used to estimate the EPCs are based on reporting limits. High reporting limits for non-detects can lead to overestimation of risk if the actual concentrations are well below the reporting limits. However, reporting limits for the COPCs were generally toward the lower end of the detected concentrations, so the 95 percent or higher UCLs on the mean were minimally influenced by the reporting limits.

Based on the recently released OSWER Directive 9283.1-42 *Determining Groundwater Exposure Point Concentrations* (EPA 2014a), one of the recommendations for calculating groundwater EPC is to use the samples from the monitoring wells in the core of the plume. Thus, the groundwater EPC calculated based on this Directive would be higher than the groundwater EPC used in this report which uses all of the monitoring well data. Subsequently, the resultant estimated risks would be higher than the estimated risks presented in this report. Thus, the reported risks via groundwater exposure pathways and total cumulative risks in this report would be underestimated.

6.5.2.3 Exposure Parameters

Uncertainty is associated with the exposure parameter values used; however, assumptions are chosen to be conservative so not to underestimate risk. For example, assumptions are made for the exposure time, frequency, and duration of potential chemical exposures, as well as for the quantity of material ingested, inhaled, or absorbed. In general, assumptions are made based on reasonable maximum exposures and, in most cases, values are specified by EPA Region 2, EPA guidance documents, or site-specific information.

EPA released OSWER Directive 9200.1-120 *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* (2014b) after initial preparation of this HHRA report. The updated values for body weight, ingestion and dermal contact rates, and exposure time, frequency, and duration are specified in this Directive. These values for exposure factors are based on the results of studies deemed to be the most-up-to-date and scientifically sound to reduce variability and uncertainty in the exposure assumption. Most of the values for adult receptors are higher than the default exposure factors used in this report, while most of the recommended values for child receptors are lower. Even though the recommended values for adult receptors are higher, the effect on the risk estimates would be minimal since both the numerator (i.e., ingestion and dermal contact rates and exposure duration) and denominator (i.e., body weight) increase. However, the risk estimates for child receptors might be slightly decreased since the body weight remains the same. Subsequently, for age-adjusted residential exposure, using the updated standard default values would result in a slight decrease in estimated risks.

The choices made for exposure parameters are protective and are unlikely to underestimate risks. Cancer risks and health hazards could be overestimated based on use of conservative exposure parameters in estimating risks. Certainly, the goal of estimating risks well above the average and at the upper end of possible risks was likely achieved. Such estimates typically form the basis for risk management.

In the case of the dermal absorption factor, chemical-specific values based on EPA guidance are not available for the VOCs, pesticides, and most metals. Therefore, dermal risk associated with these chemicals cannot be quantitatively evaluated for the risk assessment, which introduces some uncertainty in total risk and total hazard estimates. However, for most chemicals, ingestion is expected to be the primary exposure pathway of concern.

The fish ingestion rates assumed in the HHRA are consistent with those used for the Lower Passaic River Study Area (EPA Region 2 2012). Hessian Run and Woodbury Creek are much smaller water bodies than the Passaic River. In the proximity of the site, Hessian Run and Woodbury Creek are made up primarily of extensive tidal flats with small channels. Hessian Run is privately owned and can be accessed only through boats. The site vicinity is primarily industrial and commercial and is sparsely populated. Consequently, anglers are unlikely to visit Hessian Run and Woodbury Creek frequently on a regular basis.

Furthermore, Hessian Run and Woodbury have limited quantity and quality of fish to support the estimated level of ingestion of fish. The lack of adequate quantity and quality of fish at these waterways was evidenced by an Aquatic Biota Study conducted by NJDEP (Berger 2004).

Pumpkinseed, a small fish approximately 5 to 6 inches in length, was the only fish caught for assessment of risk to human health during the study. Due to the small size and limited number of the individuals collected, whole-body rather than fish fillet samples were submitted for analyses. Thus, the fish ingestion assumptions are conservative and could overestimate risks to anglers and future residents from consumption of fish.

6.5.3 Toxicity Values

A potentially large source of uncertainty is inherent in the derivation of the EPA toxicity values (i.e., RfDs, RfCs, SFs, and IURs). In many cases, data are extrapolated from animals to sensitive humans by the application of uncertainty factors to an estimated NOAEL or lowest-observed-adverse-effect level for noncancer health effects. While designed to be protective, it is likely in many cases that uncertainty factors overestimate the magnitude of differences that may exist between humans and animals, and among humans.

In addition, derivation of cancer SFs often involves linear extrapolation of effects at high doses to potential effects at lower doses commonly seen in environmental exposure settings. Currently, it is not known whether linear extrapolation is appropriate. It is probable that the shape of the dose response curve for carcinogenesis varies with different chemicals and mechanisms of action. It is not possible at this time, however, to describe such differences in quantitative terms. It is likely that the assumption of linearity is conservative and yields SFs that are unlikely to lead to underestimation of risks. Yet, for specific chemicals, current methodology could cause SFs and, hence, risks to be underestimated.

Furthermore, toxicity values are often based on observed dose-response relationships when the chemical is dissolved in water or is in some other readily soluble form. For instance, the oral SF for arsenic is based on exposure of a large Taiwanese population to dissolved arsenic in drinking water. However, chemicals in soil may exist in forms that are not readily absorbed. In this risk assessment, intakes from metals such as antimony, lead, and vanadium, organics such as PAHs, and pesticides from soil are not adjusted for relative bioavailability, which most likely overestimate risks. The only exception was arsenic, where a relative bioavailability of 60% was used for ingestion of soil and sediment (EPA 2012e).

Another important source of uncertainty associated with toxicity is using chronic toxicity values for acute or subchronic exposure. Inhalation RfCs are derived for acute, subchronic, and chronic exposures, based on the exposure duration and exposure pattern (EPA 2009). Chronic exposure is generally used for continuous or near-continuous inhalation exposures that occur for 7 years or longer, such as for resident and site worker exposure. Subchronic exposure refers to repeated exposures for more than 30 days up to 7 years, such as for the construction worker exposure. Acute exposure includes exposures lasting 24 hours or less or intermittent exposures that occur for a series of short periods (e.g., 4 hours) separated by several days of no exposure, such as for trespassers and recreational users. Subchronic or acute RfCs are not available for some metals. In accordance with RAGS Part F (EPA 2009), the RfC based on the next longer exposure duration is used as a conservative estimate that would be protective for the shorter exposure duration. This source of uncertainty may overestimate the potential inhalation hazard for construction workers, trespassers, and recreational users.

Uncertainties associated with toxicity values for specific chemicals are discussed below for chromium and vanadium.

Chromium

Chromium can exist in several oxidation states ranging from chromium (II) to hexavalent chromium (VI). Only two oxidation states, chromium (III) and chromium (VI), are widely studied because of their predominance and stability in the ambient environment and their toxicological characteristics. Chromium (III) is poorly absorbed, regardless of the route of exposure, whereas chromium (VI) is more readily absorbed. Toxicological studies show that chromium (VI) is generally more toxic than chromium (III). Chromium (VI) is classified as a Group A - known human carcinogen by the inhalation route of exposure (EPA 2012a). EPA is in the process of evaluating toxicities of hexavalent chromium from the oral route of exposure. EPA released an external review draft of the *Toxicological Review of Hexavalent Chromium* in September 2010 (EPA 2010c). The draft document derived an oral SF of 0.5 per mg/kg-day. At the time of preparing the HHRA, the draft document has not been finalized by EPA. This risk assessment utilized an oral SF of 0.5 per mg/kg-day for chromium (VI) developed by the NJDEP.

Total chromium, not valence-specific, data was collected from the site. In the absence of valence-specific data, total chromium is evaluated using the chromium (VI) toxicity criteria. This assumption is very conservative since chromium in soil is generally dominated by the much less toxic trivalent form. Thus the use of chromium (VI) toxicity values overestimates the risk attributed to total chromium.

Vanadium

Vanadium is a transition metal which exists in several oxidation states from -2 to +5. The chemistry of vanadium is complex; the valence state of vanadium can shift depending on pH, oxidation-reduction potential, and other factors in the environment or in the human body. In the body, there is an inter-conversion of two oxidation states of vanadium, the tetravalent form, vanadyl (V^{4+}), and the pentavalent form, vanadate (V^{5+}). Generally, the V^{3+} and V^{4+} valence states predominate in body tissues while V^{5+} predominates in plasma (EPA 2011c).

Total vanadium, not valence-specific, data was reported from laboratory analysis. The RfD of 7×10^{-5} mg/kg-day used in the risk assessment is based on a PPRTV for soluble inorganic vanadyl and vanadate compounds other than vanadium pentoxide (EPA 2009c). The RfD is based on a NOAEL of 0.22 mg/kg-day with a combination uncertainty of 3,000. EPA IRIS has developed an RfD of 9×10^{-3} mg/kg-day for vanadium pentoxide. As discussed in Section 6.4.2, risks associated with vanadium are predominately attributable to insoluble vanadium-containing suspended solids in groundwater and vanadium in soil and sediment. Thus, the approach of using the PPRTV RfD for soluble inorganic vanadyl and vanadate compounds is very conservative.

If the IRIS RfD for vanadium pentoxide were used to estimate risks, it would yield a total noncancer HI of 0.3, compared to a total HI of 15, for future residents in the Matteo property from combined exposure to vanadium in soil, groundwater, surface water, and sediment. Hence, risks associated with vanadium are most likely overestimated.

PCB Aroclors

There are currently no RfD for Aroclors 1260 and 1268. The RfD for Aroclor 1254 is used as a surrogate for Aroclors with more chlorines (i.e., Aroclors 1260 and 1268). Thus, using RfD for Aroclor 1254 in absence of RfD values for Aroclor 1260 and 1268 in the risk calculation may overestimate the noncancer HIs. Similar to no RfD for Aroclors 1260 and 1268, cancer slope factor and inhalation unit risk for PCB are used as surrogates in absence of cancer toxicity values for all Aroclors. The cancer toxicity values is based on PCB mixtures and, therefore, the cancer risk may be overestimated.

6.5.4 Risk Characterization

There is also uncertainty in assessing risks associated with a mixture of chemicals. In this assessment, the effects of exposure to each contaminant present have initially been considered separately. However, these substances occur together at the site, and individuals may be exposed to mixtures of the chemicals. Predictions of how these mixtures of chemicals will interact must be based on an understanding of the mechanisms of such interactions. Individual chemicals may interact in the body, yielding a new toxic component or causing different effects at different target organs. Suitable data are not currently available to rigorously characterize the effects of chemical mixtures. Consequently, as recommended by EPA (1989), chemicals present at the site are assumed to act additively, and potential health risks are evaluated by summing excess lifetime cancer risks and calculating HIs for noncancer health effects.

This approach to assessing risk associated with mixtures of chemicals assumes that there are no synergistic or antagonistic interactions among the chemicals and that all chemicals have the same toxic endpoint and mechanisms of action. To the extent that these assumptions are correct, the actual risks could be underestimated or overestimated.

As a result of the uncertainties described above, this risk assessment should not be construed as presenting absolute risks or hazards. Rather, it is a conservative analysis intended to indicate the potential for adverse impacts to occur based on the RME and the CTE scenarios.

6.5.4.1 Evaluation of Risks from Groundwater

Groundwater is currently not used for drinking or cooking purposes by residents at the rental house at the Matteo property. Additionally, several of the risk drivers in groundwater, such as antimony, chromium, vanadium, and vinyl chloride, were not detected in the potable wells. Concentrations of other risk drivers such as arsenic and iron were much lower in the potable wells than in the monitoring wells. If the maximum concentrations of PW-1 and PW-2 were used to estimate risks for exposure to groundwater for current residents at the rental house, they would yield risks within or below EPA target thresholds. Similarly, lead was present in potable wells at concentrations below the federal MCL and the state groundwater standard. As a result, unacceptable risks are unlikely to occur to current residents in the rental house from exposure to groundwater.

6.5.4.2 Evaluation of Risks from Fish

Chemical concentrations in fish were obtained by analyzing whole-body fish rather than fish fillets due to the small size and limited number of the individual fish that were caught. Lead mainly accumulates in bones and PCBs accumulate in organs and fat tissue. In addition, the guts most likely contained

contaminated sediment. Thus, the lead and PCB concentrations in the whole-body fish samples are expected to be higher than those in fish fillet tissues, which are typically consumed by a majority of the potentially exposed populations. The use of whole-body fish data in the risk assessment overestimates risks associated with fish consumption for anglers and future residents at the Matteo property.

On the other hand, fish samples were analyzed for lead and PCBs only. Other site-related metals such as antimony, copper, and zinc may accumulate in fish tissues. The lack of antimony, copper, and zinc data may underestimate risks associated with fish consumption for anglers and future residents.

Because of high uncertainty associated with the fish data, risk estimates for anglers and future residents associated with consumption of fish are highly uncertain.

6.5.4.3 Evaluation of Lead

Risks from exposure to lead are not quantified following the exposure models for other COPCs. The lead residential screening level is used as screening level for trespassers and recreational users. Although trespassers and recreational users are not expected to have the same magnitude of exposure as residents, i.e., less exposure frequency and duration and less soil intake rate, the presence of elevated lead levels in the open field/waste disposal area may still cause adverse health effects to trespassers and recreational users.

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Section 7
Summary and Conclusions

7.1 Approach

COPCs are identified based on criteria outlined in RAGS (EPA 1989), primarily through comparison to risk-based screening levels. COPCs identified for further quantitative evaluation in the HHRA are VOCs, SVOCs, dioxins/furans, PCBs, pesticides, and inorganics, as listed in Table 3-1.

In the HHRA, contaminants in soil, groundwater, surface water, sediment, and fish at the site are evaluated for potential health threats to the following receptors:

- Current Land-Use Scenarios
  - Matteo Property – site workers, trespassers, recreational users, anglers, and residents in the rental home area
  - Willow Woods Property – residents
- Future Land-Use Scenarios
  - Matteo Property – site workers, trespassers, recreational users, anglers, residents, and construction workers
  - Willow Woods Property – residents and construction workers

Exposure routes and human receptor groups are identified, and quantitative estimates of the magnitude, frequency, and duration of exposure are made. Exposure point concentrations are estimated using the lower of the UCL and the maximum detected concentration. Daily intakes are calculated based on the RME scenario (the highest exposure reasonably expected to occur at a site). The intent is to estimate a conservative exposure case that is still within the range of possible exposures. CTE assumptions are also developed, which reflect more typical exposures.

In the toxicity assessment, current toxicological human health data (i.e., RfDs, RfCs, SFs, and IURs) are obtained from various sources and are utilized in the order specified by EPA (2003).

Risk characterization involves integrating the exposure and toxicity assessments into quantitative expressions of risks/health effects. Specifically, daily intakes are compared with concentrations known or suspected to present health risks or hazards. The estimates of cancer risk and noncancer health hazards, and the greatest chemical contributors to these estimates, are identified.

In general, EPA recommends target values or ranges (i.e., cancer risk of 10^{-6} to 10^{-4} or HI of 1) as threshold values for potential human health impacts (EPA 1989). These target values aid in determining whether additional response action is necessary at the site.

7.2 Site Risks

This section presents a summary of the cancer risks and noncancer health hazards for exposures to contaminants in soil at the site that are quantitatively evaluated for potential health threats.

7.2.1 Current Receptors

Risk characterization results are summarized below for cancer and noncancer health effects for each receptor population by exposure area.

7.2.1.1 Cancer Risk

The total incremental lifetime cancer risk estimates for current land-use receptors are listed below.

- Site Workers
  - Scrapyard Area:
    - RME: 3×10^{-4}
    - CTE: 3×10^{-5}
- Trespassers
  - Open Field/Waste Disposal Area, Hessian Run and Woodbury Creek:
    - RME: 1×10^{-4}
- Recreational Users
  - Open Field/Waste Disposal Area:
    - RME: 3×10^{-6}
- Residents
  - Willow Woods Property:
    - RME: 7×10^{-5}
  - Matteo Property:
    - RME: 1×10^{-2}
    - CTE: 4×10^{-3}
- Anglers
  - Hessian Run and Woodbury Creek:
    - Adults: RME 2×10^{-4} ; CTE 8×10^{-6}
    - Children: RME 7×10^{-5}

Under the RME scenario, the estimated cancer risks for trespassers, recreational users, and residents at the Willow Woods property, and child anglers are below, within, or at EPA's target range of 1×10^{-6} to 1×10^{-4}. The estimated cancer risk for current site workers (3×10^{-4}), residents at the Matteo property (1×10^{-2}), and adult anglers (2×10^{-4}) exceeds EPA's target range. Cancer risks for current residents are attributed to cPAH (89%) in soil and vinyl chloride (4%) and arsenic (6%) in groundwater. These chemicals are not site-related. Cancer risks for current adult anglers are attributable to PCBs in fish.

When a more typical exposure is considered under the CTE scenario, cancer risk for current residents (4×10^{-3}) is still above EPA's target range. Estimated cancer risk for current site workers (3×10^{-5}) and adult anglers (8×10^{-6}) are within the EPA's target range.

7.2.1.2 Noncancer Health Hazard

HIs greater than 1 indicate the potential for noncancer health hazards. The estimated HIs are listed below.

- Site Workers
  - Scrapyard Area:
    - RME: Total 20; eye 19, finger nail 19, immune system 19
    - CTE: Total 5; eye 5, finger nail 5, immune system 5
- Trespassers
  - Open Field/Waste Disposal Area, Hessian Run, and Woodbury Creek:
    - RME: Total 2; kidney 2
    - CTE: Total 0.5
- Recreational Users
  - Open Field/Waste Disposal Area:
    - RME: Total 0.6
- Residents
  - Willow Woods Property:
    - RME: Total 0.5
  - Matteo Property:
    - RME: Total 28; blood 15, GI tract 2, kidney 4, longevity 15, skin 6
    - CTE: Total 9; blood 4, kidney 1, longevity 4, skin 2
- Anglers
  - Hessian Run and Woodbury Creek:
    - Adults
      - RME: Total 11; eye 11, finger nail 11, immune system 11
      - CTE: Total 1
    - Children
      - RME: Total 17; eye 17, finger nail 17, immune system 17
      - CTE: Total 2; eye 2, finger nail 2, immune system 2

Under the RME scenario, the noncancer HIs for recreational users and residents at the Willow Woods property are below or at EPA's threshold of unity. The noncancer HIs for site workers for eye, finger nail, and immune system exceed the EPA threshold of unity due to exposure to Aroclor 1260. The noncancer HIs for kidney for current trespasser exceed the EPA threshold of unity. Residents at the Matteo property have noncancer HIs greater than the EPA threshold for blood, GI tract, kidney,

longevity, and skin. The potential adverse health effects are due to antimony, arsenic, iron, and vanadium in groundwater. The noncancer HIs for the eye, finger nail, and immune system for both adult and child anglers exceed the EPA threshold of unity. These potential health hazards for anglers are due to exposure to Aroclor 1254 in fish.

When a more typical exposure is considered under the CTE scenario, the noncancer HIs for trespasser and adult anglers are below or at the EPA's threshold of unity. However, site workers, child anglers, and residents at the Matteo property still have noncancer HIs above EPA's threshold.

7.2.1.3 Uncertainty in Current Risk Assessment

Risks are overestimated for current residents at the Matteo property from potential exposure to soil and groundwater because of the following considerations:

- Groundwater is currently not used for drinking water or cooking purposes by residents at the rental house.
- Concentrations of cPAH were much higher due to a potential outlier (sample RHA-SS-10). Concentrations of Aroclor 1260 were much higher due to a potential outlier (sample SB-107).
- Several of the risk drivers in groundwater, such as antimony, vanadium, and vinyl chloride, were not detected in the potable wells.
- Concentrations of other risk drivers such as arsenic, iron, and lead were much lower in the potable wells than those in the monitoring wells.
- Using the PPRTV RfD for soluble inorganic vanadium compounds is very conservative and overestimates risks attributable to vanadium.
- Using Aroclor 1254 as surrogate is very conservative and overestimates risks attributable to Aroclor 1260.

7.2.2 Future Receptors

Risk characterization results for future receptors are summarized below. Risk results for site workers, trespassers, recreational users, anglers, and residents in the Willow Woods property remain the same as those for the current receptors (Section 7.2.1). Risk estimates for future residents at the Matteo property and future construction workers are summarized below.

7.2.2.1 Cancer Risk

The total incremental lifetime cancer risk estimates are listed below.

- Residents
  - Matteo Property:
    - RME: 6×10^{-3}
    - CTE: 2×10^{-3}

- Construction Workers
  - Willow Woods Property:
    - RME: 3×10^{-7}
  - Matteo Property:
    - RME: 8×10^{-6}

Under the RME scenario, the estimated cancer risks for trespassers, recreational users, residents at the Willow Woods property, construction workers, and child anglers are below, within, or at EPA's target range of 1×10^{-6} to 1×10^{-4}. The estimated cancer risk for future residents at the Matteo property (6×10^{-3}) exceeds EPA's target range. Cancer risks are due to exposure to cPAHs (61%) and Aroclor 1260 (3%) in soil, cPAHs in surface water (13%), arsenic (10%) and vinyl chloride (7%) in groundwater, and PCBs in fish (4%). With the exception of PCBs, none of these chemicals are site-related. Cancer risks for current adult anglers are attributable to PCBs in fish.

When a more typical exposure is considered under the CTE scenario, cancer risk for future residents (2×10^{-3}) is above EPA's target range. Estimated cancer risk for current site workers (3×10^{-5}) and adult anglers (8×10^{-6}) are within the EPA's target range.

7.2.2.2 Noncancer Health Hazard

HIs greater than 1 indicate the potential for noncancer health hazards. The estimated HIs are listed below.

- Residents
  - Matteo Property:
    - RME: Total 94; blood 16, liver 3, eye 50, finger nail 50, GI tract 3, immune system 51, kidney 15, longevity 15, respiratory 6, skin 6
    - CTE: Total 30; blood 5, liver 1, eye 16, finger nail 16, GI tract 1, immune system 16, kidney 5, longevity 4, respiratory 3, skin 2
- Construction Workers
  - Willow Woods Property:
    - RME: 0.04
  - Matteo Property:
    - RME: 9; eye 9, finger nail 9, immune system 9

Under the RME scenario, the noncancer HIs for recreational users, residents and construction workers at the Willow Woods property are below or at EPA's threshold of unity. Future trespasser have noncancer HIs greater than the EPA threshold for kidney. The noncancer HIs for future site workers for eye, finger nail, and immune system exceed the EPA threshold of unity due to exposure to Aroclor 1260. Future residents at the Matteo property have noncancer HIs greater than the EPA threshold for blood, liver, eye, finger nail, GI tract, immune system, kidney, longevity, respiratory, and skin. The potential health hazards are due to antimony, arsenic, and iron in groundwater; vanadium in

groundwater, surface soil, and sediment; Aroclor 1260 in soil and fish; and Aroclor 1254 in fish. The noncancer HIs for eye, finger nail, and immune system for both adult and child anglers at Woodbury Creek and Hessian Run exceed the EPA threshold of unity. The potential health hazards for anglers are due to Aroclor 1254 in fish and Aroclor 1260 in soil and fish. Future construction workers at the Matteo property have noncancer HIs greater than the EPA threshold for eye, finger nail, and immune system.

When a more typical exposure is considered under the CTE scenario, the noncancer HIs for trespasser and adult anglers are below or at the EPA's threshold of unity. However, site workers, child anglers, and residents at the Matteo property have noncancer HIs above EPA's threshold of unity.

7.2.2.3 Uncertainty in Future Risk Assessment

Risks are most likely overestimated for future residents at the Matteo property from exposure to soil due to a potential outlier (RHA-SS-10 and SB-107) included in calculating EPCs of cPAH and Aroclor 1260 resulting much higher EPCs in risk estimations.

7.3 Risks from Lead

The mean lead concentrations in soils at the Matteo property, groundwater, and surface water and fish of Hessian Run and Woodbury Creek exceed EPA screening levels. Potential exposure to lead in these media and through consumption of fish caught from Hessian Run and Woodbury Creek may cause adverse health effects to site workers, trespassers, recreational users, residents, and anglers, especially future child residents at the Matteo property.

It is noted that lead was present in potable wells at concentrations below the federal MCL and the state groundwater standard. As a result, exposure to lead in groundwater is not a concern for current residents.

7.4 Conclusions

Conclusions based on results of the risk assessment are presented below.

Current Receptors

Considering current land use, the estimated cancer risks for all current receptors are below, within, or at EPA's target range of 1×10^{-6} to 1×10^{-4} except current residents at the Matteo property, site workers, and adult anglers. The total cancer risk for current residents (1×10^{-2}), site worker (3×10^{-4}), and adult anglers (2×10^{-4}) exceed EPA's target range. The main cancer risk drivers for residents are cPAH in soil (89%), arsenic (6%) and vinyl chloride (4%) in groundwater. However, these chemicals are not considered site-related. The risk drivers for anglers are PCBs in fish. The risk driver for site workers is Aroclor 1260 in surface soil.

In the evaluation of noncancer health hazards, the HIs for recreational users and residents at the Willow Woods property are below or at EPA's target threshold of unity. Residents at the Matteo property, trespasser, and anglers have target organ/effects HIs greater than one. The potential health

hazards are due to antimony, arsenic, iron, and vanadium in groundwater, Aroclor 1260 in soil and fish, and Aroclor 1254 in fish.

When a more typical exposure is considered under the CTE scenario, the total cancer risk and noncancer HIs for trespasser and adult anglers are below or at EPA target thresholds. However, the total cancer risk (4×10^{-3}) and noncancer HIs for residents at the Matteo property are still above EPA target thresholds. These results indicate potential unacceptable risks for people using groundwater as drinking water.

The mean lead concentrations in soils at the Matteo property, groundwater, and surface water and fish of Hessian Run and Woodbury Creek exceed EPA screening levels. Potential exposure to lead in these media and through consumption of fish caught from Hessian Run and Woodbury Creek may cause adverse health effects to site workers, trespassers, recreational users, residents, and anglers.

Risks are overestimated for current residents at the Matteo property because of the conservative assumption that groundwater is used for drinking water purposes, inclusion of soil outlier, the use of site-wide groundwater data and total metal concentrations in risk calculations, and the use of a conservative RfD for vanadium. Based on analytical data for the two potable wells, antimony, vanadium, and vinyl chloride were not detected while arsenic and lead were only present at levels below federal MCLs and state groundwater standards. Thus, current exposure to groundwater is not a concern for residents at the rental house.

Future Receptors

Estimated risks for future site workers, trespassers, recreational users, anglers, and residents at the Willow Woods property remain the same as those for the current land use scenarios.

The estimated total cancer risks and noncancer hazards for future construction workers at Willow Woods property are below EPA target thresholds, indicating that unacceptable health risks will unlikely to occur from future construction worker at the Willow Woods property. The noncancer hazards for future construction workers at Matteo property are above EPA target thresholds, indicating that unacceptable health risks will likely to occur from future construction worker at the Matteo property.

For future residents at the Matteo property, the estimated total cancer risk (6×10^{-3}) exceeds EPA's target range. Cancer risks are due to exposure to cPAHs (61%) and Aroclor 1260 (3%) in soil, cPAHs in surface water (13%), arsenic (10%) and vinyl chloride (7%) in groundwater, and PCBs in fish (4%). With the exception of PCBs, none of these chemicals is considered site-related.

In the evaluation of noncancer health hazards, future residents at the Matteo property have target organ/effect HIs exceeding the EPA threshold of unity. Noncancer risk drivers are antimony, arsenic, and iron in groundwater, vanadium in soil, groundwater, and sediment, Aroclor 1260 in soil and fish, and Aroclor 1254 in fish.

When a more typical exposure is considered under the CTE scenario, the total estimated excess cancer risk for future residents (2×10^{-3}) is above EPA's target range. The target organ/effect HIs are still

greater than one. These estimated risks indicate the potential for unacceptable risks for future resident at the Matteo property.

The mean lead concentrations in surface and surface/subsurface soils in the Matteo property, groundwater, and surface water and fish of Hessian Run and Woodbury Creek exceed EPA screening levels. Potential exposure to lead in these media and through consumption of fish caught from Hessian Run and Woodbury Creek may cause adverse health effects to future site workers, trespassers, recreational users, residents, anglers, and construction workers, especially future child residents at the Matteo property.

Summary

In conclusion, unacceptable health risks are estimated for current and future residents at the Matteo property and anglers consuming fish caught from Hessian Run and Woodbury Creek. Additionally, the presence of elevated lead concentrations in soil, groundwater, surface water, and fish may cause adverse health effects to site workers, trespassers, recreational users, residents, and anglers, especially future child residents at the Matteo property.

Risks are overestimated for current residents at the Matteo property from potential use of groundwater for drinking water. Based on analytical data for the potable wells, all risk drivers identified in groundwater were either not detected or present at levels below federal MCLs and state groundwater standards. Thus, current exposure to groundwater is not a concern for residents at the rental house.

Based on the results of the HHRA, lead, antimony, and PCBs are identified as risk drivers related to the Matteo site. Lead and antimony contamination originated from the automotive batteries and recycled wire that were processed and disposed at the site. PCB contamination probably resulted from widespread application of a PCB-containing product. Risks attributable to arsenic, iron, vanadium, cPAHs, and vinyl chloride are most likely related to natural, anthropogenic, or offsite sources that are unrelated to the Matteo site.

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Tables

TABLE 3-1
LIST OF CHEMICALS OF POTENTIAL CONCERN
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemicals	Scrapyard Area	Open Field / Waste Disposal Area	Rental Home Area	Willow Woods Property		Matteo Property [1]			Woodbury Creek / Hessian Run		
	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface / Subsurface Soil	Surface Soil	Surface / Subsurface Soil	Groundwater	Surface Water	Sediment	Fish
Volatile Organic Compounds											
1,4-Dioxane	--	--	--	--	--	--	--	**Yes**	NA	NA	NA
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	**Yes**	--	NA	NA
Trichloroethene	**Yes**	**Yes**	--	--	--	**Yes**	**Yes**	**Yes**	--	NA	NA
Vinyl Chloride	--	--	--	--	--	--	--	**Yes**	--	NA	NA
Semi-volatile Organic Compounds											
Benzo(a)anthracene	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	--	**Yes**	NA	NA
Benzo(a)pyrene	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	NA	NA
Benzo(b)fluoranthene	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	--	**Yes**	NA	NA
Benzo(k)fluoranthene	No	No	**Yes**	No	No	**Yes**	**Yes**	--	No	NA	NA
Chrysene	No	No	**Yes**	No	No	**Yes**	**Yes**	--	No	NA	NA
Dibenzo(a,h)anthracene	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	--	--	NA	NA
Indeno(1,2,3-cd)pyrene	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	--	**Yes**	NA	NA
Pentachlorophenol	--	--	--	--	--	--	--	No	**Yes**	NA	NA
Pyrene	No	No	**Yes**	No	No	**Yes**	**Yes**	No	--	NA	--
Dioxins/Furans											
Dioxin/Furan TEQ	**Yes**	**Yes**	NA	NA	NA	**Yes**	**Yes**	NA	NA	No	NA
Pesticides/Polychlorinated Biphenyls											
4,4'-DDT	**Yes**	No	No	No	No	**Yes**	**Yes**	No	--	--	NA
Aroclor 1248	**Yes**	No	--	--	--	No	No	--	--	**Yes**	**Yes**
Aroclor 1254	--	**Yes**	**Yes**	--	--	**Yes**	**Yes**	--	--	**Yes**	**Yes**
Aroclor 1260	**Yes**	**Yes**	No	No	No	**Yes**	**Yes**	--	--	--	**Yes**
Aroclor 1268	--	--	--	--	--	--	No	--	--	**Yes**	NA
Delta-BHC	**Yes**	No	--	--	--	**Yes**	**Yes**	--	--	--	NA
Dieldrin	**Yes**	No	No	No	No	**Yes**	**Yes**	**Yes**	--	--	NA
Heptachlor Epoxide	**Yes**	**Yes**	No	--	--	**Yes**	**Yes**	--	--	--	NA
Inorganics											
Aluminum	**Yes**	**Yes**	No	No	No	**Yes**	**Yes**	No	**Yes**	**Yes**	NA
Antimony	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	NA
Arsenic	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	NA
Barium	No	No	No	No	No	No	No	No	**Yes**	No	NA
Beryllium	No	No	No	--	No	No	No	No	**Yes**	No	NA
Cadmium	**Yes**	**Yes**	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	NA
Chromium	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	NA
Cobalt	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	NA
Copper	**Yes**	No	No	No	No	**Yes**	**Yes**	No	**Yes**	No	NA
Cyanide	**Yes**	**Yes**	--	--	--	**Yes**	No	**Yes**	**Yes**	**Yes**	NA
Iron	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	NA
Lead	No	**Yes**	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**
Manganese	**Yes**	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	NA
Mercury	**Yes**	No	No	No	No	**Yes**	**Yes**	No	**Yes**	No	NA
Nickel	**Yes**	No	No	No	No	**Yes**	**Yes**	No	**Yes**	No	NA
Thallium	--	--	**Yes**	--	--	**Yes**	**Yes**	--	No	**Yes**	NA
Vanadium	No	**Yes**	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	NA
Zinc	**Yes**	**Yes**	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	No	NA

Yes = selected as COPC
No = not selected as COPC
-- = not detected
NA = not analyzed

Note:
[1] This includes the Scrapyard Area, the Open Field/Waste Disposal Area, and the Rental Home Area.

TABLE 3-2
LEAD WORKSHEET
Site Name: Matteo & Sons, Inc. Site, Thorofare, New Jersey
Receptor: Residents (Adult and Child [under 6 years])

A. EXPOSURE SCENARIO: RESIDENTIAL

1. Lead Screening Questions

Medium	Mean Concentration		Screening Level		Basis for Screening Level Value	Exceeds Screening Level, Yes/No?
	Value	Unit	Value	Unit		
Current Land-Use Scenario						
Surface Soil (Rental Home Area)	281	mg/kg	400	mg/kg	EPA Regional Screening Level (RSL) for residential soil	No
Current/Future Land-Use Scenario						
Surface Soil (Willow Woods Property)	25.8	mg/kg	400	mg/kg	EPA Regional Screening Level (RSL) for residential soil	No
Groundwater	18.5	µg/L	5 15	µg/L	New Jersey Groundwater Quality Standards for Class IIA Water Federal Maximum Contaminant Level for drinking water	Yes
Future Land-Use Scenario						
Surface Soil (Matteo Property[1])	767	mg/kg	400	mg/kg	EPA RSL for residential soil	Yes
Surface Water (Woodbury Creek / Hessian Run)	27.4	µg/L	5	µg/L	New Jersey Surface Water Quality Criteria for Fresh Water (Human Health)	Yes
Sediment (Woodbury Creek / Hessian Run)	280	mg/kg	400	mg/kg	EPA RSL for residential soil	No
Fish (Woodbury Creek / Hessian Run)	0.44	mg/kg-ww	0.10	mg/kg	EPA Region 2 Screening Level for fish[2]	Yes

[1] This includes the scrapyard area, the open field/ waste disposal area, and the rental home area
[2] Based on a fish screening level developed by EPA Region 2 for the Raritan Bay Slag Superfund Site (CDM Smith 2011)

TABLE 3-2
LEAD WORKSHEET
Site Name: Matteo & Sons, Inc. Site, Thorofare, New Jersey
Receptor: Residents (Adult and Child [under 6 years])

2. Lead Model Questions

Question	Response for Residential Lead Model
Was a lead model used? (If "no" explain rationale)	No, based on the following considerations: **Groundwater** – The mean lead concentration in groundwater of 18.5 µg/L exceeds the New Jersey Groundwater Quality Standard for Class IIA Water of 5 µg/L and the federal MCL of 15 µg/L. Although potable wells at the site are not currently used for drinking water purposes, residents have access to this water and may potentially use it as a drinking source. This potential exposure to lead in groundwater may cause adverse health effects to residents, especially young children. The high lead concentrations in groundwater are present in the vicinity of the battery casing disposal areas north of the scrapyard. In the vicinity of the rental house and the office building (PW-1 and PW-2), lead was present at concentrations below the New Jersey Groundwater Quality Standard for Class IIA Water of 5 µg/L in the potable wells. As a result, current exposure to lead in groundwater is not a concern for current residents. The lead PRG in groundwater will be based on the New Jersey Groundwater Quality Standard for lead of 5 µg/L and the federal MCL of 15 µg/L. Thus, lead model is not performed. **Surface Soil** - In the Matteo property, the mean lead concentration in surface soil is 767 mg/kg, above the EPA screening level of 400 mg/kg. If the Matteo property is developed into residential properties in the future, potential exposure to lead in soil may cause adverse health effects to future residents. The EPA screening level of 400 mg/kg for residential soil can be used as a PRG for soil. The mean lead concentrations in surface soil in the rental home area (281 mg/kg) and the Willow Woods property (25.8 mg/kg) are below the EPA screening level of 400 mg/kg. **Surface Water** – The mean concentration of lead in surface water in Woodbury Creek/Hessian Run is 27.4 µg/L, above the New Jersey fresh water criterion of 5 µg/L for the protection of human health. **Sediment** – The mean concentration of lead in sediment in Woodbury Creek/Hessian Run is 280 mg/kg, below the EPA screening level of 400 mg/kg. Lead is not a COPC in sediment; thus, further evaluation is not required. **Fish** – The mean lead concentration in fish from Woodbury Creek/Hessian Run is 0.44 mg/kg in wet weight. This concentration exceeds the screening level of 0.10 mg/kg developed by EPA Region 2 for the Raritan Bay Slag Superfund Site. The screening level was based on a fish ingestion rate of 18 grams per day for a child aged 0 to 6 years. In proximity of the site, Hessian Run and Woodbury Creek are made up primarily of extensive tidal flats with small channels. It is unlikely that these water bodies are able to sustain such a high fish yield on a daily basis. Furthermore, the lead concentration in fish was obtained by analyzing whole-body (including bones and guts) fish due to the small size and limited number of the individual fish collected. Lead mainly accumulates in bones, and the guts most likely contained lead-contaminated sediment. Thus, the lead concentration in the whole-body fish sample is expected to be higher than the lead concentration in fish fillet tissues, which are typically consumed by the majority of the potentially exposed populations. Due to a limited number of fish available at the site and limitations of the fish data, a lead model is not performed.
Which lead model and what version/date was used?	NA

TABLE 3-2
LEAD WORKSHEET
Site Name: Matteo & Sons, Inc. Site, Thorofare, New Jersey
Receptor: Residents (Adult and Child [under 6 years])

Question	Response for Residential Lead Model
Where are the input values located in the risk assessment report?	NA
Where are the output values located in the risk assessment report?	NA
Was the model run using default values only?	NA
If non-default values were used, where are the rationale for those values located in the risk assessment report?	NA

3. Final Result

Medium	Result	Comment
NA	NA	NA

TABLE 3-2
LEAD WORKSHEET
Site Name: Matteo & Sons, Inc. Site, Thorofare, New Jersey
Receptor: Site Worker (Adult), Construction Worker (Adult), Recreational User (Adolescent [6-18 years]), Trespasser (Adolescent [6-18 years]), Angler (Adult and Child [under 6 years])

B. EXPOSURE SCENARIO: NON-RESIDENTIAL

1. Lead Screening Questions

Medium	Mean Concentration		Screening Level		Basis for Screening Level Value	Exceeds Screening Level, Yes/No?
	Value	Unit	Value	Unit		
Current / Future Land-Use Scenario						
Surface Soil (Scrapyard Area)	415	mg/kg	800	mg/kg	EPA RSL for industrial soil	No
Surface Soil (Open Field / Waste Disposal Area)	1,153	mg/kg	400	mg/kg	EPA RSL for residential soil	Yes
Surface Water (Woodbury Creek / Hessian Run)	27.4	µg/L	5	µg/L	New Jersey Surface Water Quality Criteria for Fresh Water (Human Health)	Yes
Sediment (Woodbury Creek / Hessian Run)	280	mg/kg	400	mg/kg	EPA RSL for residential soil	No
Fish (Woodbury Creek / Hessian Run)	0.44	mg/kg-ww	0.1	mg/kg	EPA Region 2 Screening Level for fish	Yes
Future Land-Use Scenario						
Surface/Subsurface Soil (Matteo Property)	1,707	mg/kg	800	mg/kg	EPA RSL for industrial soil	Yes
Surface/Subsurface Soil (Willow Woods Property)	17.1	mg/kg	800	mg/kg	EPA RSL for industrial soil	No

[1] This includes the scrapyard area, the open field/ waste disposal area, and the rental home area
[2] Based on a fish screening level developed by EPA Region 2 for the Raritan Bay Slag Superfund Site (CDM Smith 2011)

TABLE 3-2
LEAD WORKSHEET
Site Name: Matteo & Sons, Inc. Site, Thorofare, New Jersey
Receptor: Site Worker (Adult), Construction Worker (Adult), Recreational User (Adolescent [6-18 years]), Trespasser (Adolescent [6-18 years]), Angler (Adult and Child [under 6 years])

2. Lead Model Questions

Question	Response for Non-Residential Lead Model
Was a lead model used? (If "no" explain rationale)	No, based on the following considerations: **Surface Soil -** The mean lead concentration in surface soil in the scrapyard area of 415 mg/kg is below the EPA screening level of 800 mg/kg for industrial soil. Therefore potential exposure to lead in surface soil is unlikely to cause adverse health effects to site workers. The mean lead concentration in surface soil in the open field/waste disposal area is 1,153 mg/kg, exceeding the EPA screening level of 400 mg/kg for residential soil. Although trespassers and recreational users are not expected to have the same magnitude of exposure as residents, i.e., less exposure frequency and duration and less soil intake rate, the presence of elevated lead levels in the open field/waste disposal area may cause adverse health effects to trespassers and recreational users. The PRGs for lead of 400 mg/kg for residential soil and 800 mg/kg for industrial soil will be used for remediation if warranted. Thus, the lead model is not used. **Surface/Subsurface Soil -** The mean lead concentration in surface/subsurface soil in the Matteo property is 1,707 mg/kg, above the EPA screening level of 800 mg/kg for industrial soil. Thus, potential exposure to lead at the Matteo property may cause adverse health effects to future construction workers. The EPA screening level of 800 mg/kg for industrial soil is usually used for as the PRG for industrial use. The mean lead concentration in surface/subsurface soil in the Willow Woods property is 17.1 mg/kg, below the EPA screening level of 800 mg/kg. **Surface Water** – The mean concentration of lead in surface water in Woodbury Creek/Hessian Run is 27.4 µg/L, above the New Jersey fresh water criterion of 5 µg/L for the protection of human health. **Sediment** – The mean concentration of lead in sediment in Woodbury Creek/Hessian Run is 280 mg/kg, below the EPA screening level of 400 mg/kg. Lead is not a COPC in sediment; thus, further evaluation is not required. **Fish** – The mean concentration of lead in fish from Woodbury Creek/Hessian Run is 0.44 mg/kg in wet weight. This concentration exceeds the screening level of 0.10 mg/kg developed by EPA Region 2 for the Raritan Bay Slag Superfund Site. As mentioned earlier, fishing in Hessian Run and Woodbury Creek in the proximity of the site is limited due to the nature of these water bodies. Furthermore, lead concentration could be overestimated because whole-body fish instead of fillet tissues were analyzed. Thus, lead model is not performed.

TABLE 3-2
LEAD WORKSHEET
Site Name: Matteo & Sons, Inc. Site, Thorofare, New Jersey
Receptor: Site Worker (Adult), Construction Worker (Adult), Recreational User (Adolescent [6-18 years]), Trespasser (Adolescent [6-18 years]), Angler (Adult and Child [under 6 years])

Question	Response for Non-Residential Lead Model
Which lead model and what version/date was used?	NA
Where are the input values located in the risk assessment report?	NA
Where are the output values located in the risk assessment report?	NA
Was the model run using default values only?	NA
If non-default values were used, where are the rationale for those values located in the risk assessment report?	NA

3. Final Result

Medium	Result	Comment
NA	NA	NA

TABLE 5-1

NONCANCER TOXICITY DATA - ORAL/DERMAL

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal [1]	Absorbed RfD for Dermal [2]		Primary Target Organ	Combined Uncertainty/ Modifying Factor	Source	Date [3]
		Value	Unit		Value	Unit				
Volatile Organic Compounds										
1,4-Dioxane	Chronic	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Liver/Kidney	300	IRIS	7/8/2015
cis-1,2-Dichloroethene	Chronic	2.0E-03	mg/kg-day	1	2.0E-03	mg/kg-day	Kidney	3,000	IRIS	7/21/2012
Trichloroethene	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Heart/ Immune System/ Developmental/Kidney	10 to 1,000	IRIS	7/8/2015
Vinyl Chloride	Chronic	3.0E-03	mg/kg-day	1	3.0E-03	mg/kg-day	Liver	30	IRIS	7/21/2012
Semi-volatile Organic Compounds										
Benzo(a)anthracene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Chrysene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Pentachlorophenol	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Liver	300	IRIS	7/21/2012
Pyrene	Chronic	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Kidney	3,000	IRIS	7/8/2015
Dioxins/Furans										
Dioxin/Furan TEQ[4]	Chronic	7.0E-10	mg/kg-day	1	7.0E-10	mg/kg-day	Reproduction	30	IRIS	7/21/2012
Pesticides/Polychlorinated Biphenyls										
4,4'-DDT	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	100	IRIS	7/8/2015
Aroclor 1248	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Aroclor 1254	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye / Finger Nail / Immune System	300	IRIS	7/21/2012
Aroclor 1260[5]	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye / Finger Nail / Immune System	300	IRIS	7/21/2012
Aroclor 1268[5]	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye / Finger Nail / Immune System	300	IRIS	7/21/2012
Delta-BHC	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Dieldrin	Chronic	5.0E-05	mg/kg-day	1	5.0E-05	mg/kg-day	Liver	100	IRIS	7/21/2012
Heptachlor Epoxide	Chronic	1.3E-05	mg/kg-day	1	1.3E-05	mg/kg-day	Liver	1,000	IRIS	7/8/2015
Inorganics										
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/23/2006
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Longevity / Blood	1000	IRIS	7/21/2012
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin	3	IRIS	7/21/2012
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidney	300	IRIS	12/2/2011
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Intestine	300	IRIS	7/21/2012
Cadmium[6]	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidney	10	IRIS	7/21/2012
Chromium[7]	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None reported	300	IRIS	7/21/2012
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Thyroid	3,000	PPRTV	8/25/2008
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	GI Tract	NA	HEAST	7/1/1997
Cyanide	Chronic	6.0E-04	mg/kg-day	1	6.0E-04	mg/kg-day	None reported	NA	IRIS	7/21/2012
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	GI Tract	1.5	PPRTV	9/11/2006
Lead	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA

TABLE 5-1

NONCANCER TOXICITY DATA - ORAL/DERMAL

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal [1]	Absorbed RfD for Dermal [2]		Primary Target Organ	Combined Uncertainty/ Modifying Factor	Source	Date [3]
		Value	Unit		Value	Unit				
Manganese	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1	IRIS	7/21/2012
Mercury[8]	Chronic	3.0E-04	mg/kg-day	0.07	2.1E-05	mg/kg-day	Immune System	1000	IRIS	7/21/2012
Nickel[9]	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ Weight	300	IRIS	7/21/2012
Thallium	Chronic	1.0E-05	mg/kg-day	1	1.0E-05	mg/kg-day	Skin/Hair	3,000	PPRTV-S	10/8/2010
Vanadium	Chronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Kidney	3,000	PPRTV	9/30/2009
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Blood	3	IRIS	7/21/2012

[1] Oral Absorption Efficiency for Dermal from Risk Assessment Guidance for Superfund Part E, Supplemental Guidance for Dermal Risk Assessment

[2] Adjusted RfD for Dermal = Oral RfD x Oral Absorption Efficiency for Dermal.

[3] Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/
Date shown for other sources is the publication date.

[4] based on 2,3,7,8-tetrachlorodibenzo-p-dioxin

[5] based on Aroclor 1254

[6] based on cadmium (diet)

[7] Toxicity values are not available for total chromium. Hexavalent chromium is used as a surrogate.

[8] based on mercuric chloride

[9] based on nickel, soluble salts

Definition:

ATSDR = Agency for Toxic Substances and Disease Registry

CNS = central nervous system

GI = gastrointestinal

HEAST = Health Effect Assessment Summary Tables

IRIS = Integrated Risk Information System

mg/kg-day = milligram per kilogram per day

NA = not available

PPRTV = Provisional Peer Reviewed Toxicity Value

PPRTV-S = Screening Provisional Peer Reviewed Toxicity Value

RfD = reference dose

TABLE 5-2
NONCANCER TOXICITY DATA - INHALATION (CHRONIC)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source (1)	Date (2)
Volatile Organic Compounds						
1,4-Dioxane	3.0E-02	mg/m^3	Respiratory	1,000	IRIS	7/8/2015
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
Trichloroethene	2.0E-03	mg/m^3	Heart/Immune System/Liver	10 to 100	IRIS	7/8/2015
Vinyl Chloride	1.0E-01	mg/m^3	Liver	30	IRIS	7/21/2012
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Dioxins/Furans						
Dioxin/Furan TEQ	4.0E-08	mg/m^3	Liver/Reproductive/Development/ Endocrine System/Respiratory/ Blood	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Aroclor 1260	NA	NA	NA	NA	NA	NA
Aroclor 1268	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Aluminum	5.0E-03	mg/m^3	Neurological	300	PPRTV	10/23/2006
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	1.5E-05	mg/m^3	Developmental/Cardiovascular System/CNS/Lung/Skin	30	Cal/EPA	9/2009
Barium	5.0E-04	mg/m^3	Fetus	1,000	HEAST	7/1/1997
Beryllium	2.0E-05	mg/m^3	Lung	10	IRIS	7/21/2012
Cadmium	1.0E-05	mg/m^3	Kidney	9	ATSDR	2/2012
Chromium(3)	1.0E-04	mg/m^3	Lung	300	IRIS	7/21/2012
Cobalt	6.0E-06	mg/m^3	Respiratory System/Lung	300	PPRTV	8/25/2008
Copper	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Manganese	5.0E-05	mg/m^3	CNS	1,000	IRIS	7/21/2012

TABLE 5-2
NONCANCER TOXICITY DATA - INHALATION (CHRONIC)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Mercury[4]	3.0E-04	mg/m^3	Nervous System	30	IRIS	7/21/2012
Nickel	9.0E-05	mg/m^3	Respiratory	30	ATSDR	2/2012
Thallium	NA	NA	NA	NA	NA	NA
Vanadium	1.0E-04	mg/m^3	Respiratory System	30	ATSDR	2/2012
Zinc	NA	NA	NA	NA	NA	NA

[1] ATSDR chronic inhalation minimal risk level (MRL)
MRL is converted from units in ppmv to mg/m^3 using the following equation:

$$MRL\ (mg/m^3) = (ppmv)(1\ kg/1000\ g)(P/RT)(molecular\ weight)$$

where:
P = ambient air pressure, 1 atmosphere (atm)
R = ideal gas constant, 8.2×10^{-5} atm-m^3/mol-^{0}K
T = absolute temperature, 298.15 Kelvin (^{0}K)

[2] Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/
Date shown for other sources is the publication date.

[3] Toxicity values are not available for total chromium.
Hexavalent chromium particulate is used as a surrogate.

[4] based on mercury (inorganic)

Definition:
ATSDR = Agency for Toxic Substances and Disease Registry
Cal/EPA = California Environmental Protection Agency
CNS = central nervous system
IRIS = Integrated Risk Information System
mg/m^3 = milligram per cubic meter
NA = not available
ppmv = part per million by volume
PPRTV = Provisional Peer Reviewed Toxicity Value
RfC = reference concentration

TABLE 5-3
NONCANCER TOXICITY DATA - INHALATION (SUBCHRONIC)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source (1)	Date (2)
Volatile Organic Compounds						
1,4-Dioxane	7.2E-01	mg/m^3	Respiratory	100	ATSDR	4/2015
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
Trichloroethene	2.1E-03	mg/m^3	Developmental/Immune System	10 to 100	ATSDR	4/2015
Vinyl Chloride	7.7E-02	mg/m^3	Liver	30	ATSDR	2/2012
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Dioxins/Furans						
Dioxin/Furan TEQ	NA	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Aroclor 1260	NA	NA	NA	NA	NA	NA
Aroclor 1268	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Aluminum	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA
Chromium(3)	3.0E-04	mg/m^3	Respiratory	30	ATSDR	2/2012
Cobalt	2.0E-05	mg/m^3	Respiratory System/Lung	100	PPRTV	8/25/2008
Copper	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA

TABLE 5-3
NONCANCER TOXICITY DATA - INHALATION (SUBCHRONIC)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Mercury	NA	NA	NA	NA	NA	NA
Nickel	2.0E-04	mg/m^3	Respiratory	30	ATSDR	2/2012
Thallium	NA	NA	NA	NA	NA	NA
Vanadium[4]	1.0E-04	mg/m^3	Lung	1,000	PPRTV	4/30/2008
Zinc	NA	NA	NA	NA	NA	NA

[1] ATSDR chronic inhalation minimal risk level (MRL)
MRL is converted from units in ppmv to mg/m^3 using the following equation:

$$MRL\ (mg/m^3) = (ppmv)(1\ kg/1000\ g)(P/RT)(molecular\ weight)$$

where:
P = ambient air pressure, 1 atmosphere (atm)
R = ideal gas constant, 8.2×10^{-5} atm-m^3/mol-^{0}K
T = absolute temperature, 298.15 Kelvin (^{0}K)

[2] Date shown is the publication date.
[3] Toxicity values are not available for total chromium.
Hexavalent chromium particulate is used as a surrogate.
[4] based on vanadium pentoxide

Definition:
ATSDR = Agency for Toxic Substances and Disease Registry
mg/m^3 = milligram per cubic meter
NA = not available
ppmv = part per million by volume
PPRTV = Provisional Peer Reviewed Toxicity Value
RfC = reference concentration

TABLE 5-4
NONCANCER TOXICITY DATA - INHALATION (ACUTE)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Volatile Organic Compounds						
1,4-Dioxane	7.2E+00	mg/m^3	Eye	10	ATSDR	4/2015
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA
Vinyl Chloride	1.8E+02	mg/m^3	CNS/Eye/Respiratory System	10	Cal/EPA	9/2009
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Dioxins/Furans						
Dioxin/Furan TEQ	NA	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Aroclor 1260	NA	NA	NA	NA	NA	NA
Aroclor 1268	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Aluminum	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	2.0E-04	mg/m^3	Developmental/Cardiovascular System/CNS	1,000	Cal/EPA	9/2009
Barium	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium[3]	3.0E-05	mg/m^3	Respiratory System	300	ATSDR	2/2012
Chromium	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA
Copper	1.0E-01	mg/m^3	Respiratory System	10	Cal/EPA	9/2009
Cyanide	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Manganese	1.7E-04	mg/m^3	CNS	300	Cal/EPA	9/2009

TABLE 5-4
NONCANCER TOXICITY DATA - INHALATION (ACUTE)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Mercury[4]	6.0E-04	mg/m^3	Nervous system	3,000	Cal/EPA	9/2009
Nickel	2.0E-04	mg/m^3	Immune System	1,000	Cal/EPA	2/2012
Thallium	NA	NA	NA	NA	NA	NA
Vanadium[5]	3.0E-02	mg/m^3	Respiratory System/Eyes	10	Cal/EPA	9/2009
Zinc	NA	NA	NA	NA	NA	NA

[1] ATSDR chronic inhalation minimal risk level (MRL)
MRL is converted from units in ppmv to mg/m^3 using the following equation:

$$MRL\ (mg/m^3) = (ppmv)(1\ kg/1000\ g)(P/RT)(molecular\ weight)$$

where:

P = ambient air pressure, 1 atmosphere (atm)
R = ideal gas constant, 8.2×10^{-5} atm-m^3/mol-^{0}K
T = absolute temperature, 298.15 Kelvin (^{0}K)

[2] Date shown is the publication date.
[3] based on cadmium (diet)
[4] based on mercury (inorganic)
[5] based on vanadium pentoxide

Definition:
ATSDR = Agency for Toxic Substances and Disease Registry
Cal/EPA = California Environmental Protection Agency
CNS = central nervous system
mg/m^3 = milligram per cubic meter
NA = not available
ppmv = part per million by volume
RfC = reference concentration

TABLE 5-5

CANCER TOXICITY DATA - ORAL/DERMAL

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Chemical of Potential Concern	Oral Slope Factor		Oral Absorption Efficiency for Dermal [1]	Absorbed Slope Factor for Dermal [2]		Mutagen [3]	Weight of Evidence/ Cancer Guideline Description	Source	Date [4]
	Value	Unit		Value	Unit				
Volatile Organic Compounds									
1,4-Dioxane	1.0E-01	$(mg/kg\text{-}day)^{-1}$	1	1.0E-01	$(mg/kg\text{-}day)^{-1}$	--	likely to be carcinogenic to humans	IRIS	7/8/2015
cis-1,2-Dichloroethene	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	IRIS	7/21/2012
Trichloroethene	4.6E-02	$(mg/kg\text{-}day)^{-1}$	1	4.6E-02	$(mg/kg\text{-}day)^{-1}$	M	carcinogenic to humans	IRIS	7/8/2015
Vinyl Chloride	7.2E-01	$(mg/kg\text{-}day)^{-1}$	1	7.2E-01	$(mg/kg\text{-}day)^{-1}$	M	A	IRIS	7/21/2012
Semi-volatile Organic Compounds									
Benzo(a)anthracene	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1	7.3E-01	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Benzo(a)pyrene	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1	7.3E+00	$(mg/kg\text{-}day)^{-1}$	M	B2	IRIS	7/21/2012
Benzo(b)fluoranthene	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1	7.3E-01	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Benzo(k)fluoranthene	7.3E-02	$(mg/kg\text{-}day)^{-1}$	1	7.3E-02	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Chrysene	7.3E-03	$(mg/kg\text{-}day)^{-1}$	1	7.3E-03	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Dibenzo(a,h)anthracene	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1	7.3E+00	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Indeno(1,2,3-cd)pyrene	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1	7.3E-01	$(mg/kg\text{-}day)^{-1}$	M	B2	IRIS	7/21/2012
Pentachlorophenol	4.0E-01	$(mg/kg\text{-}day)^{-1}$	1	4.0E-01	$(mg/kg\text{-}day)^{-1}$	--	likely to be carcinogenic to humans	IRIS	7/21/2012
Pyrene	NA	NA	1	NA	NA	--	D	IRIS	7/8/2015
Dioxins/Furans									
Dioxin/Furan TEQ	1.3E+05	$(mg/kg\text{-}day)^{-1}$	1	1.3E+05	$(mg/kg\text{-}day)^{-1}$	--	B2	CalEPA	7/2009
Pesticides/Polychlorinated Biphenyls									
4,4'-DDT	3.4E-01	$(mg/kg\text{-}day)^{-1}$	1	3.4E-01	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/8/2015
Aroclor 1248 [5]	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1254 [5]	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1260 [5]	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1268 [5]	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Delta-BHC [6]	1.8E+00	$(mg/kg\text{-}day)^{-1}$	1	1.8E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/8/2015
Dieldrin	1.6E+01	$(mg/kg\text{-}day)^{-1}$	1	1.6E+01	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Heptachlor Epoxide	9.1E+00	$(mg/kg\text{-}day)^{-1}$	1	9.1E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/8/2015
Inorganics									
Aluminum	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	10/23/2006
Antimony	NA	NA	0.15	NA	NA	--	inadequate information to assess the cancer potential	PPRTV	8/5/2008
Arsenic	1.5E+00	$(mg/kg\text{-}day)^{-1}$	0.03	1.5E+00	$(mg/kg\text{-}day)^{-1}$	--	A	IRIS	7/21/2012
Barium	NA	NA	0.07	NA	NA	--	D	IRIS	12/2/2011
Beryllium	NA	NA	0.007	NA	NA	--	carcinogenic potential cannot be determined	IRIS	7/21/2012
Cadmium	NA	NA	0.025	NA	NA	--	NA	NA	NA
Chromium [7]	5.0E-01	$(mg/kg\text{-}day)^{-1}$	1	5.0E-01	$(mg/kg\text{-}day)^{-1}$	--	likely to be carcinogenic to humans	NJDEP	4/8/2009
Cobalt	NA	NA	1	NA	NA	--	NA	NA	NA
Copper	NA	NA	1	NA	NA	--	D	IRIS	7/21/2012
Cyanide	NA	NA	1	NA	NA	--	D	IRIS	7/21/2012
Iron	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/11/2006
Lead	NA	NA	1	NA	NA	--	NA	NA	NA

TABLE 5-5

CANCER TOXICITY DATA - ORAL/DERMAL

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Chemical of Potential Concern	Oral Slope Factor		Oral Absorption Efficiency for Dermal [1]	Absorbed Slope Factor for Dermal [2]		Mutagen [3]	Weight of Evidence/ Cancer Guideline Description	Source	Date [4]
	Value	Unit		Value	Unit				
Manganese	NA	NA	0.04	NA	NA	--	D	IRIS	7/21/2012
Mercury	NA	NA	1	NA	NA	--	NA	NA	NA
Nickel	NA	NA	0.04	NA	NA	--	NA	NA	NA
Thallium	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	10/8/2010
Vanadium	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/30/2009
Zinc	NA	NA	1	NA	NA	--	D	IRIS	7/21/2012

[1] Oral Absorption Efficiency for Dermal from Risk Assessment Guidance for Superfund Part E, Supplemental Guidance for Dermal Risk Assessment

[2] Oral cancer slope factor (CSF) for Dermal = Oral CSF

[3] Identified as a mutagen on the Regional Screening Level (RSL) Table, June 2011 http://www.epa.gov/region09/waste/sfund/prg/index.html

[4] Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/ Date shown for other sources is the publication date.

[5] based on oral slope factor for high risk and persistent polychlorinated biphenyls

[6] based on technical hexachlorocyclohexane

[7] Toxicity values are not available for total chromium. Hexavalent chromium particulate is used as a surrogate.

EPA Weight of Evidence (EPA 1986, EPA 1996):

A - Human Carcinogen

B1 - Probable human carcinogen indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as human carcinogen

Definition:

Cal/EPA = California Environmental Protection Agency

EPA = EPA Provisional Guidance for Quantitative Assessment of Polycyclic Aromatic Hydrocarbons

IRIS = Integrated Risk Information System

M = mutagen

mg/kg-day = milligram per kilogram per day

NA = not available

NJDEP = New Jersey Department of Environmental Protection

PPRTV = Provisional Peer Reviewed Toxicity Value

EPA Weight of Evidence Narrative (EPA 2005):

Carcinogenic to human

Likely to be carcinogenic to humans

Suggestive evidence of carcinogenic potential

Inadequate information to assess carcinogenic potential

Not likely to be carcinogenic to humans

TABLE 5-6
CANCER TOXICITY DATA - INHALATION
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation Unit Risk		Mutagen [1]	Weight of Evidence/ Cancer Guideline Description	Inhalation Unit Risk	
	Value	Unit			Source	Date [2]
Volatile Organic Compounds						
1,4-Dioxane	5.0E-06	$(\mu g/m^3)^{-1}$	--	likely to be carcinogenic to humans	IRIS	7/8/2015
cis-1,2-Dichloroethene	NA	NA	--	inadequate information to assess the carcinogenic potential	IRIS	7/21/2012
Trichloroethene	4.1E-06	$(\mu g/m^3)^{-1}$	M	carcinogenic to humans	IRIS	7/8/2015
Vinyl Chloride	4.4E-06	$(\mu g/m^3)^{-1}$	M	A	IRIS	7/21/2012
Semi-volatile Organic Compounds						
Benzo(a)anthracene	1.1E-04	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/2009
Benzo(a)pyrene	1.1E-03	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/2009
Benzo(b)fluoranthene	1.1E-04	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	5/2009
Benzo(k)fluoranthene	1.1E-04	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/17/2014
Chrysene	1.1E-05	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/18/2014
Dibenzo(a,h)anthracene	1.2E-03	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/2009
Indeno(1,2,3-cd)pyrene	1.1E-04	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	5/2009
Pentachlorophenol	5.1E-06	$(\mu g/m^3)^{-1}$	--	B2	Cal/EPA	7/2009
Pyrene	NA	NA	--	D	IRIS	7/8/2015
Dioxins/Furans						
Dioxin/Furan TEQ	3.8E+01	$(\mu g/m^3)^{-1}$	--	B2	Cal/EPA	7/2009
Pesticides/Polychlorinated Biphenyls						
4,4'-DDT	9.7E-05	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/8/2015
Aroclor 1248 [3]	5.7E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1254 [3]	5.7E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1260 [3]	5.7E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1268 [3]	5.7E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Delta-BHC	5.1E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/8/2015
Dieldrin	4.6E-03	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Heptachlor Epoxide	2.6E-03	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/8/2015
Inorganics						
Aluminum	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	10/23/2006
Antimony	NA	NA	--	suggestive evidence of the cancer potential	PPRTV	8/5/2008
Arsenic	4.3E-03	$(\mu g/m^3)^{-1}$	--	A	IRIS	7/21/2012
Barium	NA	NA	--	D	IRIS	12/2/2011
Beryllium	2.4E-03	$(\mu g/m^3)^{-1}$	--	known/likely human carcinogen	IRIS	7/21/2012
Cadmium	1.8E-03	$(\mu g/m^3)^{-1}$	--	B1	IRIS	7/21/2012
Chromium [4]	1.2E-02	$(\mu g/m^3)^{-1}$	--	A	IRIS	7/21/2012
Cobalt	9.0E-03	$(\mu g/m^3)^{-1}$	--	likely to be carcinogenic to humans	PPRTV	8/25/2008
Copper	NA	NA	--	D	IRIS	7/21/2012
Cyanide	NA	NA	--	D	IRIS	7/21/2012
Iron	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/11/2006
Lead	NA	NA	--	NA	NA	NA

TABLE 5-6
CANCER TOXICITY DATA - INHALATION
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation Unit Risk		Mutagen [1]	Weight of Evidence/ Cancer Guideline Description	Inhalation Unit Risk	
	Value	Unit			Source	Date [2]
Manganese	NA	NA	--	D	IRIS	7/21/2012
Mercury	NA	NA	--	NA	NA	NA
Nickel	2.6E-04	$(\mu g/m^3)^{-1}$		A	Cal/EPA	7/2009
Thallium	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	10/8/2010
Vanadium[5]	8.3E-03	$(\mu g/m^3)^{-1}$	--	suggestive evidence of carcinogenic potential	PPRTV	4/30/2008
Zinc	NA	NA	--	D	IRIS	7/21/2012

[1] Idenitified as a mutagen on the Regional Screening Level (RSL) Table, June 2011, http://www.epa.gov/region09/waste/sfund/prg/index.html
[2] Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/ Date shown for other sources is the publication date.
[3] based on inhalation unit risk of high risk and persistent polychlorinated biphenyls
[4] Toxicity values are not available for total chromium. Hexavalent chromium particulate is used as a surrogate.
[5] based on vanadium pentoxide

EPA Weight of Evidence (EPA 1986, EPA 1996):
A - Human Carcinogen
B1 - Probable human carcinogen indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen

Definition:
Cal/EPA = California Environmental Protection Agency
IRIS = Integrated Risk Information System
M = mutagen
NA = not available
PPRTV = Provisional Peer Reviewed Toxicity Value
$\mu g/m^3$ = microgram per cubic meter

EPA Weight of Evidence Narrative (EPA 2005):
Carcinogenic to human
Likely to be carcinogenic to humans
Suggestive evidence of carcinogenic potential
Inadequate information to assess carcinogenic potential
Not likely to be carcinogenic to humans

TABLE 6-1
SUMMARY OF CANCER RISKS AND NONCANCER HEALTH HAZARDS FOR NON-RESIDENTAL RECEPTORS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Receptor	Cancer Risk[1]				Noncancer Hazard Index[2]				Risk from Lead[3]
	Reasonable Maximum Exposure		Central Tendency Exposure		Reasonable Maximum Exposure		Central Tendency Exposure		
	Total	Major Risk Driver[4]	Total	Major Risk Driver	Total	Organ/Effect (Major Risk Driver)[4]	Total	Organ/Effect (Major Risk Driver)	Adverse Health Effect? (Yes or No)
Current/Future Land Use									
Site Worker									
Scrapyard Area	**3×10^{-4}**	▪ Aroclor 1260 (3×10^{-4})	3×10^{-5}	--	**20**	Aroclor 1260 ▪ HI Eye: 19 ▪ HI Finger Nail: 19 ▪ HI Immune System: 19	**5**	Aroclor 1260 ▪ HI Eye: 5 ▪ HI Finger Nail: 5 ▪ HI Immune System: 5	No
Trespasser									
Open Field/Waste Disposal Area/ Woodbury Creek/Hessian Run	**1×10^{-4}**	--	--	--	**2**	▪ HI Kidney: 2	0.5	--	**Yes** (in SS and SW)
Recreational User									
Open Field/Waste Disposal Area	3×10^{-6}	--	--	--	0.6	--	--	--	**Yes**
Angler (adult)									
Woodbury Creek/Hessian Run	**2×10^{-4}**	PCBs in fish ▪ Aroclor 1248 (3×10^{-5}) ▪ Aroclor 1254 (9×10^{-5}) ▪ Aroclor 1260 (6×10^{-5})	8×10^{-6}	--	**11**	Aroclors 1254 and 1260 in fish ▪ HI Eye: 11 ▪ HI Finger Nail: 11 ▪ HI Immune System: 11	**1**	--	**Yes** (in fish)
Angler (child)[5]									
Woodbury Creek/Hessian Run	7×10^{-5}	--	--	--	**17**	Aroclors 1254 and 1260 in fish ▪ HI Eye: 17 ▪ HI Finger Nail: 17 ▪ HI Immune System: 17	**2**	Aroclors 1254 and 1260 in fish ▪ HI Eye: 2 ▪ HI Finger Nail: 2 ▪ HI Immune System: 2	**Yes** (in fish)
Future Land Use									
Construction Worker									
Willow Woods Property	3×10^{-7}	--	--	--	0.04	--	--	--	No
Matteo Property	8×10^{-6}	--	--	--	**9**	Aroclors 1254 and 1260 in SS/S ▪ HI Eye: 9 ▪ HI Finger Nail: 9 ▪ HI Immune System: 9	--	--	**Yes** (in SS/SB)

PCBs = polychlorinated biphenyls SS = surface soil SW = surface water SB = subsurface soil

(1) Bolded values exceed EPA's target range of 1 in 1,000,000 to 1 in 10,000.

(2) Bolded values exceed EPA's threshold of unity (1).

(3) Lead concentration exceeds one or more of the following screening criteria:
EPA Regional Screening Level (RSL) for residential soil: 400 milligram per kilogram (mg/kg)
EPA RSL for industrial soil: 800 mg/kg
New Jersey Groundwater Quality Standards for Class IIA Water: 5 micrograms per liter (µg/L)
New Jersey Surface Water Quality Criteria for Fresh Water(Human Health): 5 µg/L
EPA Region 2 Screening Level for Fish: 0.1 mg/kg

(4) Major risk drivers include those chemicals that contribute more than 10% of the total cancer risk or cancer risk greater than 10^{-4} or have an HI greater than 1.

(5) The angler scenario for children (0 to 6 years old) assumes children will eat fish caught at the site by adult anglers.

TABLE 6-2
SUMMARY OF CANCER RISKS AND NONCANCER HEALTH HAZARDS FOR RESIDENTS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Receptor	Cancer Risk[1]					Noncancer Hazard Index[2]				Risk from Lead[3]
	Reasonable Maximum Exposure			Central Tendency Exposure		Reasonable Maximum Exposure		Central Tendency Exposure		
	Total	Major Risk Driver[4]	Percent of Total Risk	Total	Major Risk Driver	Total	Organ/Effect (Major Risk Driver)[4]	Total	Organ/Effect (Major Risk Driver)	Adverse Health Effect? (Yes or No)
Current Land Use										
Willow Woods Property	7×10^{-5}	--	--	--	--	0.5	--	--	--	No
Matteo Property[5]	**1×10^{-2}**	▪ cPAH in SS (9×10^{-3}) ▪ Vinyl Chloride in GW (4×10^{-4}) ▪ Arsenic in GW (6×10^{-4})	89% 4% 6%	**4×10^{-3}**	▪ cPAH in SS (3×10^{-3}) ▪ Vinyl Chloride in GW (1×10^{-4}) ▪ Arsenic in GW (1×10^{-4})	**28**	▪ HI Blood: 15 (antimony in GW) ▪ HI Kidney: 4 (vanadium in GW) ▪ HI Longevity: 15 (antimony in GW) ▪ HI Skin: 6 (arsenic in GW) ▪ HI GI Tract: 2 (iron in GW)	**9**	▪ HI Blood: 4 (antimony in GW) ▪ HI Kidney: 1 ▪ HI Longevity: 4 (antimony in GW) ▪ HI Skin: 2 (arsenic in GW)	**Yes** (in GW)
	3×10^{-3}	Total cumulative risk excluding soil outlier				**28**	HI excluding soil outlier			
	9×10^{-3}	Total cumulative risk using only PW-1 and PW-2 results to estimate risks from groundwater				1	HI using only PW-1 and PW-2 results to estimate HI from groundwater			
	6×10^{-5}	Total cumulative risk excluding soil outlier and using only PW-1 and PW-2 results to estimate risks from soil and groundwater, respectively				**1**	HI excluding soil outlier and using only PW-1 and PW-2 results to estimate risks from soil and groundwater, respectively			
Future Land Use										
Willow Woods Property	7×10^{-5}	--	--	--	--	0.5	--	--	--	No
Matteo Property	**6×10^{-3}**	▪ cPAHs in SS (4×10^{-3}) ▪ Aroclor 1260 in SS (2×10^{-4}) ▪ Vinyl Chloride in GW (4×10^{-4}) ▪ Arsenic in GW (6×10^{-4}) ▪ cPAHs in SW (8×10^{-4}) ▪ PCBs in fish (3×10^{-4}) □ Aroclor 1248 (5×10^{-5}) □ Aroclor 1254 (1×10^{-4}) □ Aroclor 1260 (9×10^{-5})	61% 3% 7% 10% 13% 4%	**2×10^{-3}**	▪ cPAHs in SS (2×10^{-3}) ▪ Arsenic in GW (1×10^{-4}) ▪ Vinyl Chloride in GW (1×10^{-4}) ▪ Arsenic in GW (1×10^{-4}) ▪ cPAHs in SW (3×10^{-4})	**94**	▪ HI Blood: 16 (antimony in GW) ▪ HI Liver: 3 (individual chemicals HIs < 1) ▪ HI Kidney: 15 (vanadium in SS, GW, and SED) ▪ HI Respiratory: 6 (vanadium in SS) ▪ HI Eye: 50 (Aroclor 1260 in SS and Aroclors 1254 and 1260 in fish) ▪ HI Longevity: 15 (antimony in GW) ▪ HI Skin: 6 (arsenic in GW) ▪ HI Immune System: 51 (Aroclor 1260 in SS and Aroclors 1254 and 1260 in fish) ▪ HI GI Tract: 3 (iron in GW) ▪ HI Finger Nail: 50 (Aroclor 1260 in SS and Aroclors 1254 and 1260 in fish)	**30**	▪ HI Blood: 5 (antimony in GW) ▪ HI Liver: 1 ▪ HI Kidney: 5 (vanadium in SS, GW, and SED) ▪ HI Respiratory: 3 (vanadium in SS) ▪ HI Eye: 16 (Aroclor 1260 in SS and Aroclors 1254 and 1260 in fish) ▪ HI Longevity: 4 (antimony in GW) ▪ HI Skin: 2 (arsenic in GW) ▪ HI Immune System: 16 (Aroclor 1260 in SS and Aroclors 1254 and 1260 in fish) ▪ HI GI Tract: 1 ▪ HI Finger Nail: 16 (Aroclor 1260 in SS and Aroclors 1254 and 1260 in fish)	**Yes** (in SS, GW, SW, and fish)

TABLE 6-2
SUMMARY OF CANCER RISKS AND NONCANCER HEALTH HAZARDS FOR RESIDENTS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Receptor	Cancer Risk[1]					Noncancer Hazard Index[2]				Risk from Lead[3]
	Reasonable Maximum Exposure			Central Tendency Exposure		Reasonable Maximum Exposure		Central Tendency Exposure		
	Total	Major Risk Driver[4]	Percent of Total Risk	Total	Major Risk Driver	Total	Organ/Effect (Major Risk Driver)[4]	Total	Organ/Effect (Major Risk Driver)	Adverse Health Effect? (Yes or No)
Matteo Property - continued	**2×10^{-3}**	Total risk excluding soil outlier				**60**	Total risk excluding soil outlier			
		▪ cPAHs in SS (3×10^{-5})	2%				▪ HI Blood: 16 (antimony in GW)			
		▪ Aroclor 1260 in SS (2×10^{-6})	0.1%				▪ HI Liver: 0.8			
		▪ Vinyl Chloride in GW (4×10^{-4})	19%				▪ HI Kidney: 15 (vanadium in SS, GW, and SED)			
		▪ Arsenic in GW (6×10^{-4})	27%				▪ HI Respiratory: 6 (vanadium in SS)			
		▪ cPAHs in SW (8×10^{-4})	36%				▪ HI Eye: 18 (Aroclors 1254 and 1260 in fish)			
		▪ PCBs in fish (3×10^{-4})	12%				▪ HI Longevity: 15 (antimony in GW)			
		□ Aroclor 1248 (5×10^{-5})					▪ HI Skin: 6 (arsenic in GW)			
		□ Aroclor 1254 (1×10^{-4})					▪ HI Immune System: 18 (Aroclors 1254 and 1260 in fish)			
		□ Aroclor 1260 (9×10^{-5})					▪ HI GI Tract: 3 (iron in GW)			
							▪ HI Finger Nail: 18 (Aroclors 1254 and 1260 in fish)			

cPAHs = carcinogenic polyaromatic hydrocarbons
PCBs = polychlorinated biphenyls
SED = sediment
GW = groundwater
SW = surface water
SS = surface soil
GI = gastrointestinal

[1] Bolded values exceed EPA's target range of 1 in 1,000,000 to 1 in 10,000

[2] Bolded values exceed EPA's threshold of unity (1)

[3] Lead concentration exceeds one or more of the following screening criteria
EPA Regional Screening Level (RSL) for residential soil: 400 milligram per kilogram (mg/kg)
EPA RSL for industrial soil: 800 mg/kg
New Jersey Groundwater Quality Standards for Class IIA Water: 5 micrograms per liter (µg/L)
New Jersey Surface Water Quality Criteria for Fresh Water(Human Health): 5µg/L
EPA Region 2 Screening Level for Fish: 0.1 mg/kg

[4] Major risk drivers include those chemicals that contribute more than 10% of the total cancer risk or cancer risk greater than $1(^{-4}$ or have an HI greater than 1.
Only PCBs, antimony, and lead are considered to be site-related chemicals

[5] For residents, cancer risk is based on age-adjusted scenario and noncancer hazard index is based on child exposure scenario

Figures

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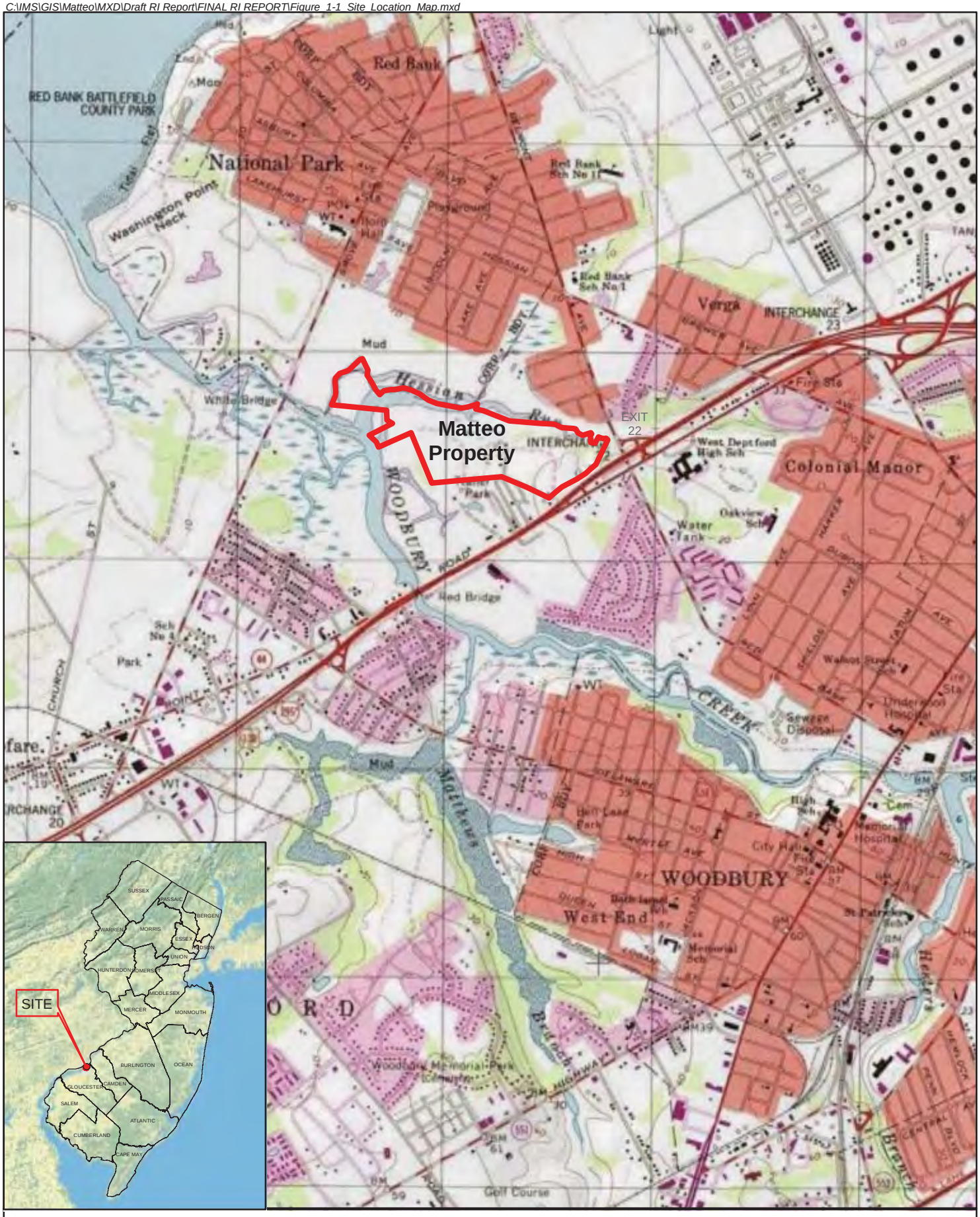

Source: USGS 7.5 Minute Quadrangle, Woodbury, NJ

N

0 500 1,000 2,000 3,000 Feet

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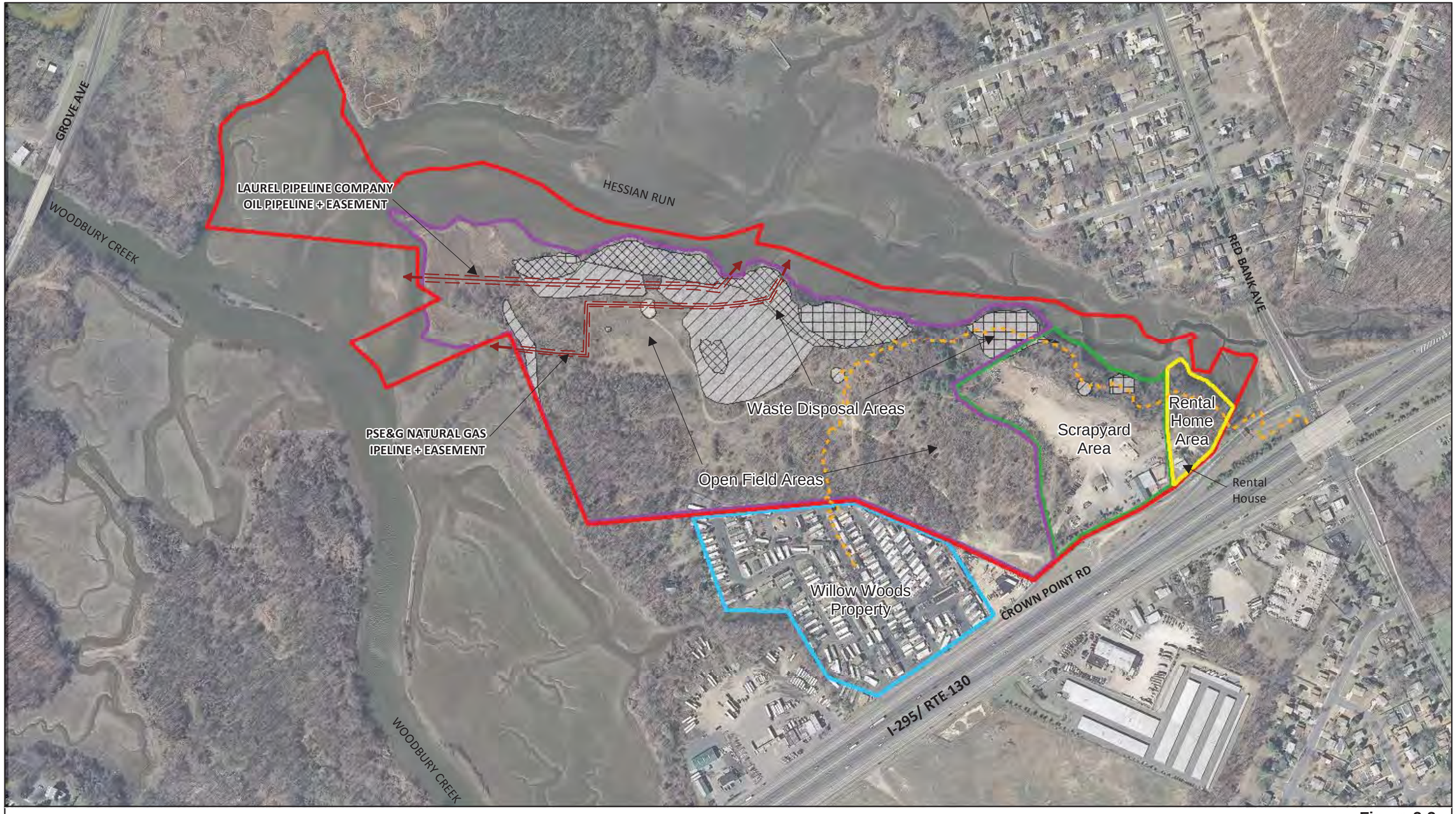
Figure 2-1
Site Location Map
Matteo & Sons, Inc. Site
Thorofare, NJ



Site Areas

- Matteo Property
- Scrapyard Area
- Open Field/Waste Disposal Area
- Rental Home Area
- Willow Woods Property

Delineated Waste Disposal Areas

- Batteries and Waste
- Batteries
- Waste

- Approximate Extent of 100-Year Flood Event
- Utility Line and Easement

N

0 200 400 800 Feet

1 inch = 400 feet

Figure 2-2
Site Map
Matteo & Sons, Inc. Site
Thorofare, NJ

CDM Smith

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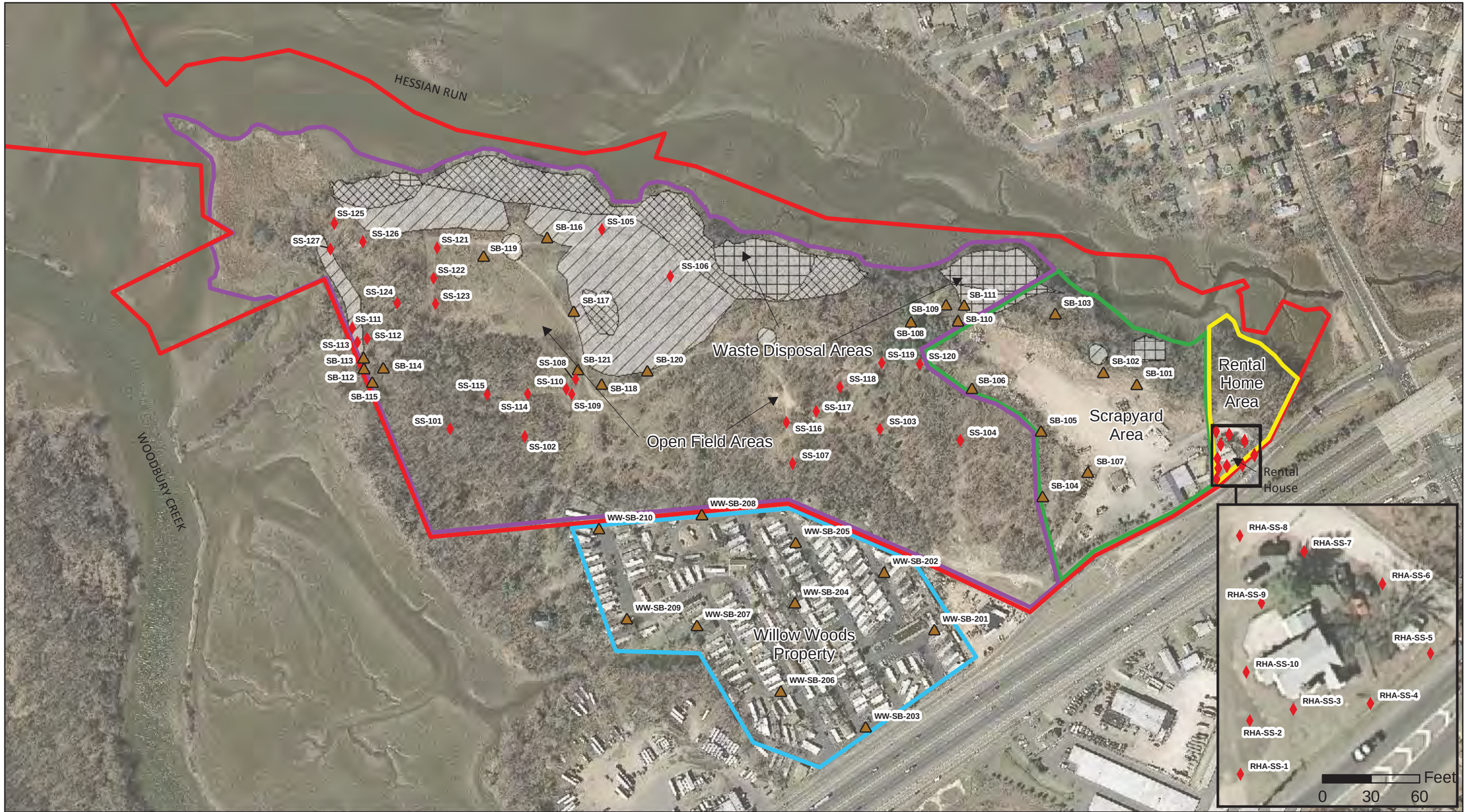

Matteo Property
Scrapyard Area
Open Field/Waste Disposal Area
Rental Home Area
Willow Woods Property

Sampling Locations
RI Soil Boring
RI Surface Soil

Delineated Waste Disposal Areas
Batteries and Waste
Batteries
Waste

N

0 150 300 600 Feet

1 inch = 300 feet

Figure 3-1
Soil Sample Location Map
Matteo & Sons, Inc. Site
Thorofare, NJ

CDM Smith

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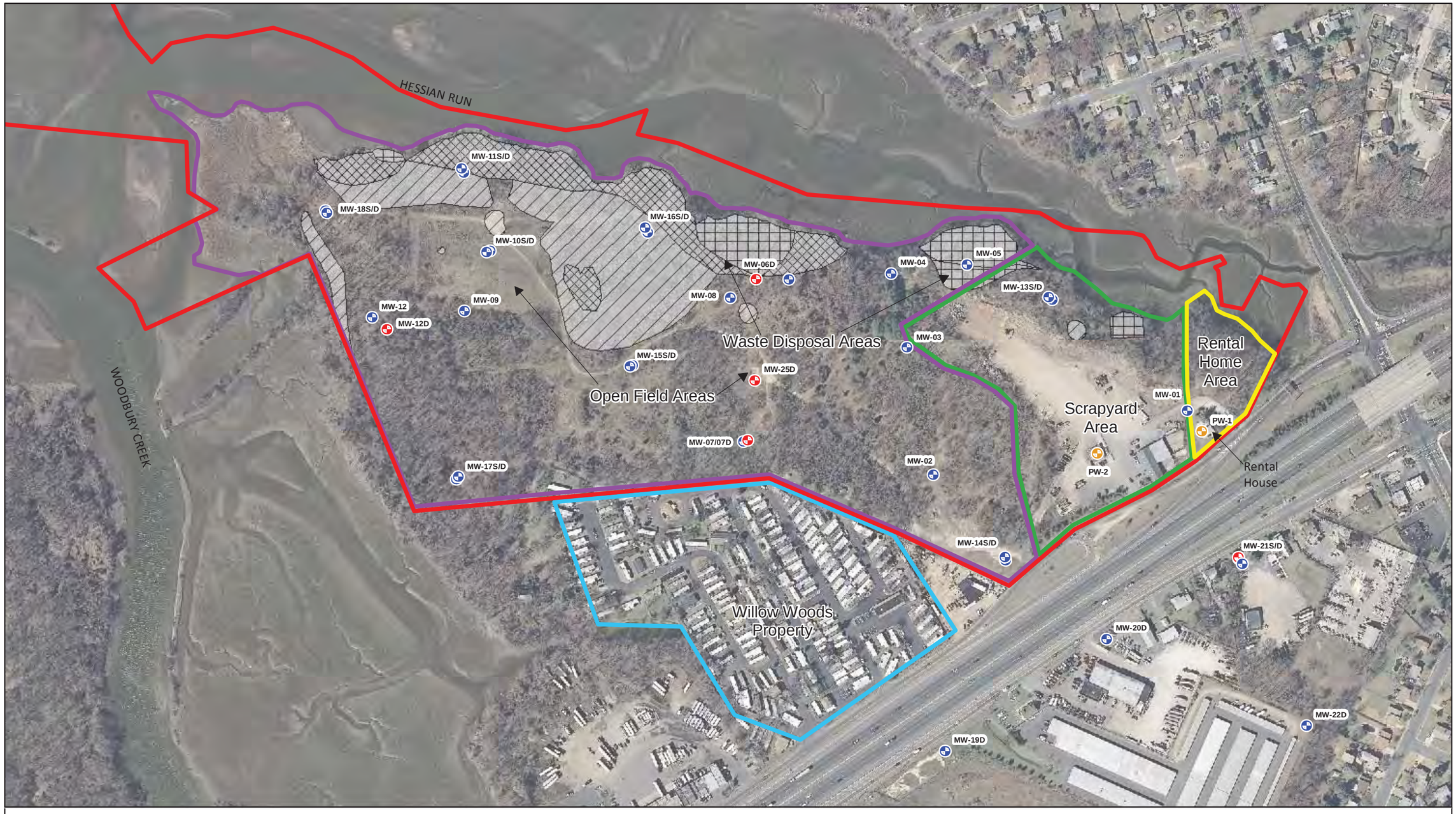

Site Areas

- Matteo Property
- Scrapyard Area
- Open Field/Waste Disposal Area
- Rental Home Area
- Willow Woods Property

- New Jersey Department of Environmental Protection Monitoring Well
- Monitoring Well
- Potable Well (locations are approximate)

Delineated Waste Disposal Areas

- Batteries and Waste
- Batteries
- Waste

N

0 150 300 600 Feet

1 inch = 300 feet

Figure 3-2
Monitoring Well Location Map
Matteo & Sons, Inc. Site
Thorofare, NJ

CDM Smith

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Site Areas

- Matteo Property
- Scrapyard Area
- Open Field/Waste Disposal Area
- Rental Home Area
- Willow Woods Property

- Surface Water Sample
- Sediment Sample

Delineated Waste Disposal Areas

- Batteries and Waste
- Batteries
- Waste

N

0 300 600 1,200 Feet

1 inch = 600 feet

Figure 3-3
Surface Water and Sediment Sample Location Map
Matteo & Sons, Inc. Site
Thorofare, NJ

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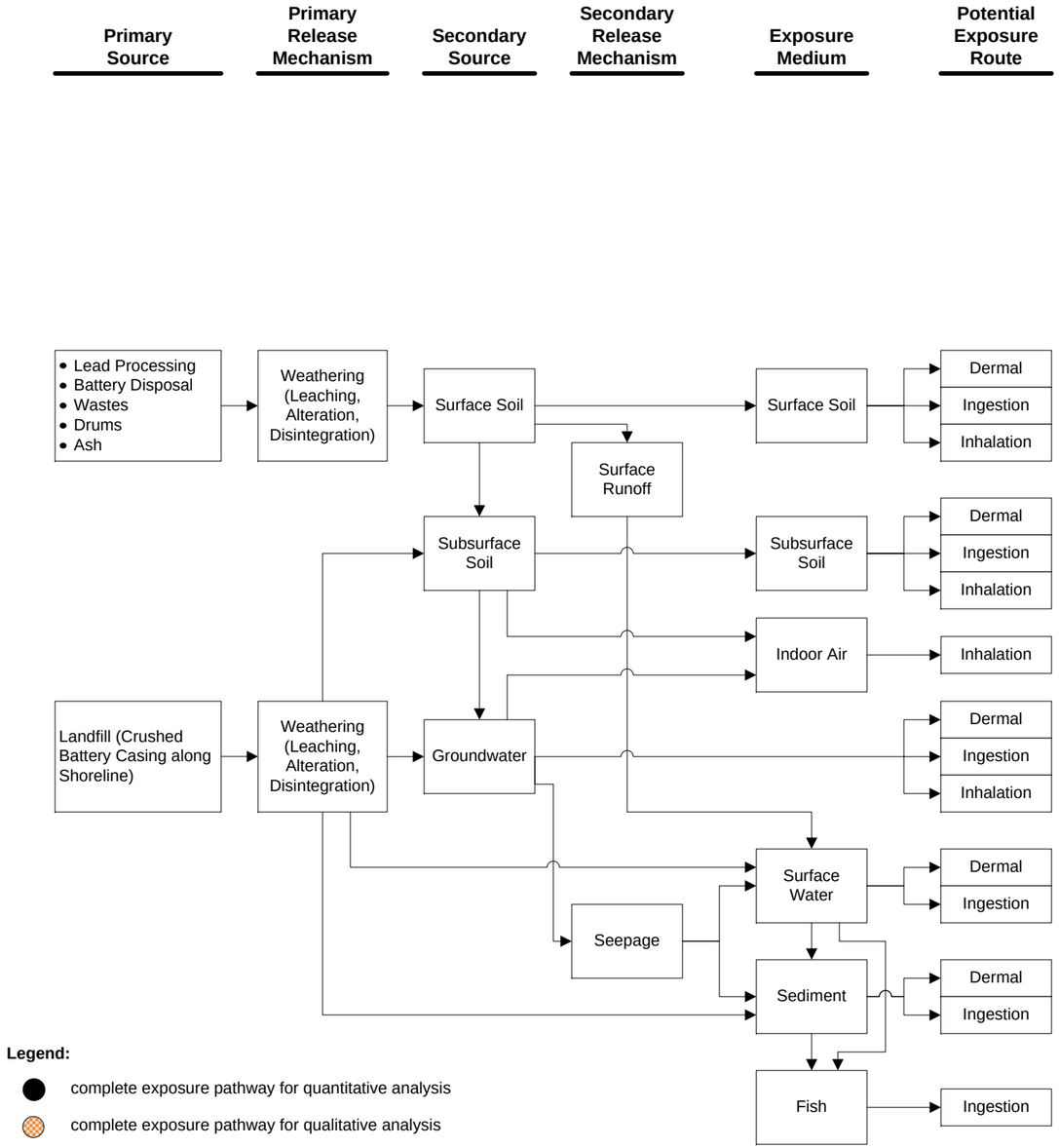

Site Worker	Trespasser		Recreational User (ATV Riders)		Angler	Resident	Resident
Scrapyard Area	Open Field/ Waste Disposal Area Woodbury Creek/ Hessian Run		Open Field/ Waste Disposal Area		Woodbury Creek/ Hessian Run	Matteo Property*	Willow Woods Property
Adults	Adolescents**	Adults	Adolescents**	Adults	Adults and Children**	Adults and Children**	Adults and Children**
●	●	⊠	●	⊠	○	●	●
●	●	⊠	●	⊠	○	●	●
●	●	⊠	●	⊠	○	●	●
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	●	○
○	○	○	○	○	○	●	○
○	○	○	○	○	○	●	○
○	●	⊠	○	○	○	○	○
○	●	⊠	○	○	○	○	○
○	●	⊠	○	○	○	○	○
○	●	⊠	○	○	○	○	○
○	○	○	○	○	●	○	○

Legend:

- ● complete exposure pathway for quantitative analysis
- ⊠ complete exposure pathway for qualitative analysis
- ○ incomplete/insignificant exposure pathway

*This includes the Rental House only

**Age groups: Children - under 6 years old; Adolescents - 6 to 18 years old

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Figure 4-1
Conceptual Site Model
Current Land-Use Scenario
Matteo & Sons, Inc. Site
Thorofare, Gloucester, New Jersey

Primary Source	Primary Release Mechanism	Secondary Source	Secondary Release Mechanism	Exposure Medium	Potential Exposure Route	Site Worker	Trespasser		Recreational User		Angler	Resident	Construction Worker	Resident	Construction Worker
						Scrapyard Area	Open Field/ Waste Disposal Area Woodbury Creek/ Hessian Run		Open Field/ Waste Disposal Area		Woodbury Creek/ Hessian Run	Matteo Property*/ Woodbury Creek/ Hessian Run	Matteo Property*	Willow Woods Property	Willow Woods Property
						Adults	Adolescents**	Adults	Adolescents**	Adults	Adults and Children**	Adults and Children**	Adults	Adults and Children**	Adults
• Lead Processing • Battery Disposal • Wastes • Drums • Ash	Weathering (Leaching, Alteration, Disintegration)	Surface Soil		Surface Soil	Dermal	●	●	⊗	●	⊗	○	●	●	●	●
					Ingestion	●	●	⊗	●	⊗	○	●	●	●	●
					Inhalation	●	●	⊗	●	⊗	○	●	●	●	●
			Surface Runoff												
		Subsurface Soil		Subsurface Soil	Dermal	○	○	○	○	○	○	○	●	○	●
					Ingestion	○	○	○	○	○	○	○	●	○	●
					Inhalation	○	○	○	○	○	○	○	●	○	●
				Indoor Air	Inhalation	○	○	○	○	○	○	○	○	○	○
Landfill (Crushed Battery Casing along Shoreline)	Weathering (Leaching, Alteration, Disintegration)	Groundwater			Dermal	○	○	○	○	○	○	●	○	⊗	○
					Ingestion	○	○	○	○	○	○	●	○	⊗	○
					Inhalation	○	○	○	○	○	○	●	○	⊗	○
				Surface Water	Dermal	○	●	⊗	○	○	○	●	○	○	○
					Ingestion	○	●	⊗	○	○	○	●	○	○	○
			Seepage												
				Sediment	Dermal	○	●	⊗	○	○	○	●	○	○	○
					Ingestion	○	●	⊗	○	○	○	●	○	○	○
				Fish	Ingestion	○	○	○	○	○	●	●	○	○	○

Legend:

● complete exposure pathway for quantitative analysis

⊗ complete exposure pathway for qualitative analysis

○ incomplete/insignificant exposure pathway

*This includes the Scrapyard Area, the Rental Home Area, and the Open Field/Waste Disposal Area

**Age groups: Children - under 6 years old; Adolescents - 6 to 18 years old

CDM Smith

Figure 4-2
Conceptual Site Model
Future Land-Use Scenario
Matteo & Sons, Inc. Site
Thorofare, Gloucester, New Jersey

Appendix A

Appendix A

List of Sample Used in the Risk Assessment

Appendix A Contents
Matteo & Sons, Inc. Site
Thorofare, New Jersey

A-1 Soil Sample List
A-2 Groundwater Sample List
A-3 Surface Water Sample List
A-4 Sediment Sample List
A-5 Fish Sample List

TABLE A-1
SOIL SAMPLE LIST
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Location	Organic[1]		Inorganic		Sample Depth (feet)	Use in Risk Assessment?						
						Surface Soil					Surface/Subsurface Soil	
	Sample ID	Collection Date	Sample ID	Collection Date		Scrapyard Area	Open Field/Waste Disposal Area	Rental Home Area	Matteo Property[2]	Willow Woods Property	Matteo Property[2]	Willow Woods Property
Scrapyard Area												
Surface Soil												
SB-101	SB-101-0-2-X	2/12/2015	SB-101-0-2	10/4/2011	0 - 2	Yes	No	No	Yes	No	Yes	No
SB-102	SB-102-0-2-X	2/12/2015	SB-102-0-2	10/4/2011	0 - 2	Yes	No	No	Yes	No	Yes	No
SB-103	SB-103-0-2-X	2/12/2015	SB-103-0-2	10/6/2011	0 - 2	Yes	No	No	Yes	No	Yes	No
SB-104	SB-104-0-2-X	2/11/2015	SB-104-0-2	10/10/2011	0 - 2	Yes	No	No	Yes	No	Yes	No
SB-105	SB-105-0-2-X	2/11/2015	SB-105-0-2	10/5/2011	0 - 2	Yes	No	No	Yes	No	Yes	No
SB-106	SB-106-0-2-X	2/11/2015	SB-106-0-2	10/5/2011	0 - 2	Yes	No	No	Yes	No	Yes	No
SB-107	SB-107-0-2-X	2/11/2015	SB-107-0-2	10/5/2011	0 - 2	Yes	No	No	Yes	No	Yes	No
Subsurface Soil												
SB-101	SB-101-2-4-X	2/12/2015	SB-101-2-4	10/4/2011	2 - 4	No	No	No	No	No	Yes	No
SB-101	SB-101-4-8-X	2/12/2015	SB-101-4-8	10/4/2011	4 - 8	No	No	No	No	No	Yes	No
SB-101	SB-101-8-12-X	2/12/2015	SB-101-8-12	10/4/2011	8 - 12	No	No	No	No	No	Yes	No
SB-102	SB-102-2-4-X	2/12/2015	SB-102-2-4	10/4/2011	2 - 4	No	No	No	No	No	Yes	No
SB-102	SB-102-4-8-X	2/12/2015	SB-102-4-8	10/4/2011	4 - 8	No	No	No	No	No	Yes	No
SB-102	SB-102-8-12-X	2/12/2015	SB-102-8-12	10/4/2011	8 - 12	No	No	No	No	No	Yes	No
SB-103	SB-103-2-4-X	2/12/2015	SB-103-2-4	10/6/2011	2 - 4	No	No	No	No	No	Yes	No
SB-103	SB-103-4-8-X	2/12/2015	SB-103-4-8	10/6/2011	4 - 8	No	No	No	No	No	Yes	No
SB-103	SB-103-8-12-X	2/12/2015	SB-103-8-12	10/6/2011	8 - 12	No	No	No	No	No	Yes	No
SB-104	SB-104-2-4-X	2/11/2015	SB-104-2-4	10/10/2011	2 - 4	No	No	No	No	No	Yes	No
SB-104	SB-104-4-8-X	2/11/2015	SB-104-4-8	10/10/2011	4 - 8	No	No	No	No	No	Yes	No
SB-104	SB-104-8-12-X	2/11/2015	SB-104-8-12	10/10/2011	8 - 12	No	No	No	No	No	Yes	No
SB-105	SB-105-2-4-X	2/11/2015	SB-105-2-4	10/5/2011	2 - 4	No	No	No	No	No	Yes	No
SB-105	SB-105-4-8-X	2/11/2015	SB-105-4-8	10/5/2011	4 - 8	No	No	No	No	No	Yes	No
SB-105	SB-105-8-12-X	2/11/2015	SB-105-8-12	10/5/2011	8 - 12	No	No	No	No	No	Yes	No
SB-106	SB-106-2-4-X	2/11/2015	SB-106-2-4	10/5/2011	2 - 4	No	No	No	No	No	Yes	No
SB-106	SB-106-4-8-X	2/11/2015	SB-106-4-8	10/5/2011	4 - 8	No	No	No	No	No	Yes	No
SB-106	SB-106-8-12-X	2/11/2015	SB-106-8-12	10/5/2011	8 - 12	No	No	No	No	No	Yes	No
SB-107	SB-107-2-4-X	2/11/2015	SB-107-2-4	10/5/2011	2 - 4	No	No	No	No	No	Yes	No
SB-107	SB-107-8-12-X	2/11/2015	SB-107-8-12	10/5/2011	8 - 12	No	No	No	No	No	Yes	No
SB-107	SB-107-12-16-X	2/11/2015	SB-107-12-16	10/5/2011	12 - 16	No	No	No	No	No	Yes	No
Open Field/Waste Disposal Area												
Surface Soil												
SS-101	SS-101-0-2-X	2/18/2015	SS-101-0-2	10/11/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-102	SS-102-0-2-X	2/18/2015	SS-102-0-2	10/11/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-103	SS-103-0-2-X	2/18/2015	SS-103-0-2	10/4/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-104	SS-104-0-2-X	2/18/2015	SS-104-0-2	10/4/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-105	SS-105-0-2-X	2/18/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-106	SS-106-0-2-X	2/18/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-107	SS-107-0-2-X	2/18/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-108	--	--	SS-108-0-2	10/12/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-109	--	--	SS-109-0-2	10/12/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-110	--	--	SS-110-0-2	10/12/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-111	SS-111-0-2-X	2/18/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-112	SS-112-0-2-X	2/13/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-113	SS-113-0-2-X	2/18/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-114	SS-114-0-2-X	2/18/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-115	SS-115-0-2-X	2/18/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-116	SS-116-0-2-X	2/18/2015	SS-116-0-2	10/4/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-117	SS-117-0-2-X	2/12/2015	SS-117-0-2	10/4/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-118	SS-118-0-2-X	2/12/2015	SS-118-0-2	10/4/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-119	SS-119-0-2-X	2/12/2015	SS-119-0-2	10/4/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-120	SS-120-0-2-X	2/12/2015	SS-120-0-2	10/4/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-121	SS-121-0-2-X	2/13/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-122	SS-122-0-2-X	2/13/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-123	SS-123-0-2-X	2/13/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-124	SS-124-0-2-X	2/13/2015	--	--	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-125	--	--	SS-125-0-2[3]	10/12/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-126	--	--	SS-126-0-2[3]	10/12/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SS-127	--	--	SS-127-0-2[3]	10/12/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SB-108	SB-108-0-2-X	2/12/2015	SB-108-0-2[4]	10/6/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SB-109	SB-109-0-2-X	2/12/2015	SB-109-0-2[4]	10/6/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SB-110	SB-110-0-2-X	2/11/2015	SB-110-0-2[4]	10/5/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SB-111	SB-111-0-2-X	2/12/2015	SB-111-0-2[4]	10/6/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SB-116	SB-116-0-2-X	2/16/2015	SB-116-0-2	10/7/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SB-117	SB-117-0-2-X	2/16/2015	SB-117-0-2	10/7/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
SB-118	SB-118-0-2-X	2/16/2015	SB-118-0-2	10/7/2011	0 - 2	No	Yes	No	Yes	No	Yes	No
Subsurface Soil												
SB-108	SB-108-2-4-X	2/12/2015	SB-108-2-4	10/6/2011	2 - 4	No	No	No	No	No	Yes	No
SB-108	SB-108-4-8-X	2/12/2015	SB-108-4-8	10/6/2011	4 - 8	No	No	No	No	No	Yes	No
SB-108	SB-108-8-12-X	2/12/2015	SB-108-8-12	10/6/2011	8 - 12	No	No	No	No	No	Yes	No
SB-109	SB-109-2-4-X	2/12/2015	SB-109-2-4	10/6/2011	2 - 4	No	No	No	No	No	Yes	No
SB-109	SB-109-4-8-X	2/12/2015	SB-109-4-8	10/6/2011	4 - 8	No	No	No	No	No	Yes	No
SB-109	SB-109-8-12-X	2/12/2015	SB-109-8-12	10/6/2011	8 - 12	No	No	No	No	No	Yes	No
SB-110	SB-110-2-4-X	2/11/2015	SB-110-2-4	10/5/2011	2 - 4	No	No	No	No	No	Yes	No
SB-110	SB-110-4-8-X	2/11/2015	SB-110-4-8	10/5/2011	4 - 8	No	No	No	No	No	Yes	No
SB-110	SB-110-8-12-X	2/11/2015	SB-110-8-12	10/5/2011	8 - 12	No	No	No	No	No	Yes	No
SB-111	SB-111-2-4-X	2/12/2015	SB-111-2-4	10/6/2011	2 - 4	No	No	No	No	No	Yes	No
SB-111	SB-111-4-8-X	2/12/2015	SB-111-4-8	10/6/2011	4 - 8	No	No	No	No	No	Yes	No
SB-111	SB-111-8-12-X	2/12/2015	SB-111-8-12	10/6/2011	8 - 12	No	No	No	No	No	Yes	No

TABLE A-1
SOIL SAMPLE LIST
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Location	Organic[1]		Inorganic		Sample Depth (feet)	Use in Risk Assessment?						
						Surface Soil					Surface/Subsurface Soil	
	Sample ID	Collection Date	Sample ID	Collection Date		Scrapyard Area	Open Field/Waste Disposal Area	Rental Home Area	Matteo Property[2]	Willow Woods Property	Matteo Property[2]	Willow Woods Property
SB-112	SB-112-5.5-6-X	2/13/2015	--	--	5.5 - 6	No	No	No	No	No	Yes	No
SB-112	SB-112-7.5-8-X	2/13/2015	--	--	7.5 - 8	No	No	No	No	No	Yes	No
SB-113	SB-113-4.5-5-X	2/13/2015	--	--	4.5 - 5	No	No	No	No	No	Yes	No
SB-113	SB-113-7.5-8-X	2/13/2015	--	--	7.5 - 8	No	No	No	No	No	Yes	No
SB-114	SB-114-4.5-5-X	2/13/2015	--	--	4.5 - 5	No	No	No	No	No	Yes	No
SB-114	SB-114-7.5-8-X	2/13/2015	--	--	7.5 - 8	No	No	No	No	No	Yes	No
SB-115	SB-115-4.5-5-X	2/13/2015	--	--	4.5 - 5	No	No	No	No	No	Yes	No
SB-115	SB-115-7.5-8-X	2/13/2015	--	--	7.5 - 8	No	No	No	No	No	Yes	No
SB-116	SB-116-2-4-X	2/16/2015	SB-116-2-4	10/7/2011	2 - 4	No	No	No	No	No	Yes	No
SB-116	SB-116-4-8-X	2/16/2015	SB-116-4-8	10/7/2011	4 - 8	No	No	No	No	No	Yes	No
SB-116	SB-116-8-12-X	2/16/2015	SB-116-8-12	10/10/2011	8 - 12	No	No	No	No	No	Yes	No
SB-117	SB-117-2-4-X	2/16/2015	SB-117-2-4	10/7/2011	2 - 4	No	No	No	No	No	Yes	No
SB-117	SB-117-4-8-X	2/16/2015	SB-117-4-8	10/7/2011	4 - 8	No	No	No	No	No	Yes	No
SB-117	SB-117-8-12-X	2/16/2015	SB-117-8-12	10/10/2011	8 - 12	No	No	No	No	No	Yes	No
SB-118	SB-118-2-4-X	2/16/2015	SB-118-2-4	10/7/2011	2 - 4	No	No	No	No	No	Yes	No
SB-118	SB-118-4-8-X	2/16/2015	SB-118-4-8	10/7/2011	4 - 8	No	No	No	No	No	Yes	No
SB-118	SB-118-8-12-X	2/16/2015	SB-118-8-12	10/7/2011	8 - 12	No	No	No	No	No	Yes	No
SB-119	SB-119-5.5-6-X	2/16/2015	--	--	5.5 - 6	No	No	No	No	No	Yes	No
SB-119	SB-119-7.5-8-X	2/16/2015	--	--	7.5 - 8	No	No	No	No	No	Yes	No
SB-120	SB-120-5.5-6-X	2/16/2015	--	--	5.5 - 6	No	No	No	No	No	Yes	No
SB-120	SB-120-7.5-8-X	2/16/2015	--	--	7.5 - 8	No	No	No	No	No	Yes	No
SB-121	SB-121-5.5-6-X	2/16/2015	--	--	5.5 - 6	No	No	No	No	No	Yes	No
SB-121	SB-121-7.5-8-X	2/16/2015	--	--	7.5 - 8	No	No	No	No	No	Yes	No
Rental Home Area												
Surface Soil												
RHA-SS-1	RHA-SS-1-02	2/19/2015	RHA-SS-1-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-2	RHA-SS-2-02	2/19/2015	RHA-SS-2-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-3	RHA-SS-3-02	2/19/2015	RHA-SS-3-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-4	RHA-SS-4-02	2/19/2015	RHA-SS-4-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-5	RHA-SS-5-02	2/19/2015	RHA-SS-5-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-6	RHA-SS-6-02	2/19/2015	RHA-SS-6-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-7	RHA-SS-7-02	2/19/2015	RHA-SS-7-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-8	RHA-SS-8-02	2/19/2015	RHA-SS-8-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-9	RHA-SS-9-02	2/19/2015	RHA-SS-9-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
RHA-SS-10	RHA-SS-10-02	2/19/2015	RHA-SS-10-02	2/19/2015	0 - 2	No	No	Yes	Yes	No	Yes	No
Willow Woods Property												
Surface Soil												
WW-SB-201	WW-SB-201-0-2-X	2/24/2015	WW-SB-201-0-2	10/12/2011	0 - 2	No	No	No	No	Yes	No	Yes
WW-SB-202	WW-SB-202-0-2-X	2/24/2015	WW-SB-202-0-2	10/12/2011	0 - 2	No	No	No	No	Yes	No	Yes
WW-SB-203	WW-SB-203-0-2-X	2/24/2015	WW-SB-203-0-2	10/13/2011	0 - 2	No	No	No	No	Yes	No	Yes
WW-SB-204	WW-SB-204-0-2-X	2/24/2015	WW-SB-204-0-2	10/12/2011	0 - 2	No	No	No	No	Yes	No	Yes
WW-SB-205	WW-SB-205-0-1.5-X	2/24/2015	WW-SB-205-0-1.5	10/13/2011	0 - 1.5	No	No	No	No	Yes	No	Yes
WW-SB-206	WW-SB-206-0-2-X	2/24/2015	WW-SB-206-0-2	10/13/2011	0 - 2	No	No	No	No	Yes	No	Yes
WW-SB-207	WW-SB-207-0-2-X	2/25/2015	WW-SB-207-0-2	10/13/2011	0 - 2	No	No	No	No	Yes	No	Yes
WW-SB-208	WW-SB-208-0-2-X	2/24/2015	WW-SB-208-0-2	10/10/2011	0 - 2	No	No	No	No	Yes	No	Yes
WW-SB-209	WW-SB-209-0-2-X	2/24/2015	WW-SB-209-0-2	10/13/2011	0 - 2	No	No	No	No	Yes	No	Yes
WW-SB-210	WW-SB-210-0-2-X	2/24/2015	WW-SB-210-0-2	10/13/2011	0 - 2	No	No	No	No	Yes	No	Yes
Subsurface Soil												
WW-SB-201	WW-SB-201-2-4-X	2/24/2015	WW-SB-201-2-4	10/12/2011	2 - 4	No	No	No	No	No	No	Yes
WW-SB-202	WW-SB-202-2-3-X	2/24/2015	WW-SB-202-2-3	10/12/2011	2 - 3	No	No	No	No	No	No	Yes
WW-SB-203	WW-SB-203-2-4-X	2/24/2015	WW-SB-203-2-4	10/13/2011	2 - 4	No	No	No	No	No	No	Yes
WW-SB-207	WW-SB-207-2-4-X	2/25/2015	WW-SB-207-2-4	10/13/2011	2 - 4	No	No	No	No	No	No	Yes
WW-SB-208	WW-SB-208-2-4-X	2/24/2015	WW-SB-208-2-4	10/10/2011	2 - 4	No	No	No	No	No	No	Yes
WW-SB-209	WW-SB-209-2-4-X	2/24/2015	WW-SB-209-2-4	10/13/2011	2 - 4	No	No	No	No	No	No	Yes
WW-SB-210	WW-SB-210-2-4-X	2/24/2015	WW-SB-210-2-4	10/13/2011	2 - 4	No	No	No	No	No	No	Yes
					Total	**7**	**34**	**10**	**51**	**10**	**107**	**17**

Notes:
[1] Samples collected during 2015 field investigation were analyzed for volatile organic compounds, semivolatile organic compounds, pesticides, and polychlorinated biphenyls.
[2] This includes the scrapyard area, the open field/waste disposal area, and the rental home area.
[3] Samples are only analyzed for dioxins and furans.
[4] Samples are also analyzed for dioxins and furans.

TABLE A-2
GROUNDWATER SAMPLE LIST
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Location	Organic[1]		Inorganic[2]		Comment	Use In Risk Assessment?
	Sample ID	Collection Date	Sample ID	Collection Date		
MW-01	MW-01-RIFS-X	12/16/2014	MW-01-RIFS	1/27/2012		Yes
MW-02	MW-02-RIFS-X	12/16/2014	MW-02-RIFS	1/27/2012		Yes
MW-03	MW-03-RIFS-X	12/16/2014	MW-03-RIFS	1/26/2012		Yes
MW-04	MW-04-RIFS-X	12/16/2014	MW-04-RIFS	1/26/2012		Yes
MW-05	MW-05-RIFS-X	12/17/2014	MW-05-RIFS	1/26/2012		Yes
MW-06	MW-06-RIFS-X	12/17/2014	MW-06-RIFS	1/31/2012		Yes
MW-06D	MW-06D-RIFS-X	12/17/2014	MW-06D-RIFS	1/31/2012		Yes
MW-07	MW-07-RIFS-X	12/17/2014	MW-07-RIFS	1/26/2012		Yes
MW-07D	MW-07D-RIFS-X	12/17/2014	MW-07D-RIFS	1/26/2012		Yes
MW-09	MW-09-RIFS-X	12/18/2014	MW-09-RIFS	1/26/2012		Yes
MW-10D	MW-10D-RIFS-X	12/16/2014	MW-10D-RIFS	1/24/2012		Yes
MW-10S	MW-10S-RIFS-X	12/16/2014	MW-10S-RIFS	1/24/2012		Yes
MW-11D	MW-11D-RIFS-X	12/15/2014	MW-11D-RIFS	1/25/2012		Yes
MW-11S	MW-11S-RIFS-X	12/15/2014	MW-11S-RIFS	1/25/2012		Yes
MW-12	MW-12-RIFS-X	12/18/2014	MW-12-RIFS	1/31/2012		Yes
MW-12D	MW-12D-RIFS-X	12/19/2014	MW-12D-RIFS	2/2/2012		Yes
MW-13D	MW-13D-RIFS-X	12/17/2014	MW-13D-RIFS	1/23/2012		Yes
MW-13S	MW-13S-RIFS-X	12/17/2014	MW-13S-RIFS	1/23/2012		Yes
MW-14D	MW-14D-RIFS-X	12/19/2014	MW-14D-RIFS	1/23/2012		Yes
MW-14S	--	--	MW-14S-RIFS	1/23/2012		Yes
MW-15D	MW-15D-RIFS-X	12/16/2014	MW-15D-RIFS	1/23/2012		Yes
MW-15S	MW-15S-RIFS-X	12/16/2014	MW-15S-RIFS	1/23/2012		Yes
MW-16D	MW-16D-RIFS-X	12/18/2014	MW-16D-RIFS	1/25/2012		Yes
MW-16S	MW-16S-RIFS-X	3/12/2015	MW-16S-RIFS	1/25/2012		Yes
MW-17D	MW-17D-RIFS-X	12/19/2014	MW-17D-RIFS	1/25/2012		Yes
MW-17S	MW-17S-RIFS-X	12/19/2014	MW-17S-RIFS	1/25/2012		Yes
MW-18D	MW-18D-RIFS-X	12/15/2014	MW-18D-RIFS	1/24/2012		Yes
MW-18S	MW-18S-RIFS-X	12/15/2014	MW-18S-RIFS	1/24/2012		Yes
MW-19D	MW-19D-RIFS-X	12/18/2014	MW-19D-RIFS	1/27/2012		Yes
MW-20D	MW-20D-RIFS-X	12/18/2014	MW-20D-RIFS	1/27/2012		Yes
MW-21D	MW-21D-RIFS-X	12/18/2014	MW-21D-RIFS	1/31/2012		Yes
MW-21S	MW-21S-RIFS-X	12/18/2014	MW-21S-RIFS	2/2/2012	Upgradient well[3]	No
MW-22D	MW-22D-RIFS-X	12/22/2014	MW-22D-RIFS	1/24/2012		Yes
MW-25D	MW-25D-RIFS-X	12/17/2014	MW-25D-RIFS	1/31/2012		Yes
PW-1	PW-1-RIFS-X	12/15/2014	PW-1-RIFS	1/16/2012		Yes
PW-2	PW-2-RIFS-X	12/15/2014	PW-2-RIFS	1/16/2012		Yes

Notes:
[1] Samples collected during 2014 field investigation were analyzed for volatile organic compounds, semivolatile organic compounds, pesticides, and polychlorinated biphenyls.
[2] Filtered and unfiltered groundwater samples were collected during the remedial investigation, but only unfiltered samples are used in the risk assessment.
[3] The groundwater sample from the upgradient well is not used in the risk assessment.

TABLE A-3
SURFACE WATER SAMPLE LIST
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Location	Sample ID[(1)]	Collection Date	Use In Risk Assessment?
T1-SW-01	T1-SW-01	11/3/2011	Yes
T2-SW-01	T2-SW-01-R	11/21/2011	Yes
T2-SW-02	T2-SW-02	10/28/2011	Yes
T4-SW-01	T4-SW-01	10/28/2011	Yes
T4-SW-02	T4-SW-02	10/28/2011	Yes
T7-SW-01	T7-SW-01	10/28/2011	Yes
T7-SW-02	T7-SW-02	10/28/2011	Yes
T11-SW-01	T11-SW-01-R	11/21/2011	Yes
T11-SW-02	T11-SW-02	11/10/2011	Yes
T11-SW-03	T11-SW-03	11/10/2011	Yes
T14-SW-01	T14-SW-01	10/25/2011	Yes
T14-SW-02	T14-SW-02	10/25/2011	Yes
T14-SW-03	T14-SW-03	10/26/2011	Yes
T16-SW-01	T16-SW-01	11/4/2011	Yes
T16-SW-02	T16-SW-02	11/4/2011	Yes
T17-SW-01	T17-SW-01	11/4/2011	Yes
T17-SW-02	T17-SW-02	11/4/2011	Yes
T22-SW-01	T22-SW-01	11/10/2011	Yes
T22-SW-02	T22-SW-02	11/11/2011	Yes
T25-SW-01	T25-SW-01	11/11/2011	Yes
T30-SW-01	T30-SW-01	10/26/2011	Yes
T31-SW-01	T31-SW-01	11/3/2011	Yes
T32-SW-01	T32-SW-01-R	11/21/2011	Yes
T32-SW-02	T32-SW-02	11/10/2011	Yes
T33-SW-01	T33-SW-01	11/11/2011	Yes
T34-SW-01	T34-SW-01	11/10/2011	Yes
T35-SW-01	T35-SW-01-R	11/21/2011	Yes

Notes:

[(1)] Filtered and unfiltered surface water samples were collected during the remedial investigation, but only unfiltered samples are used in the risk assessment.

TABLE A-4
SEDIMENT SAMPLE LIST
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Location	Sample ID	Sample Depth (feet)	Collection Date	Use In Risk Assessment?
SD-ST4	SD-ST4-0-0.5	0 - 0.5	11/7/2011	Yes
SD-T11-D	SD-T11-D-0-0.5	0 - 0.5	11/7/2011	Yes
SD-T11-E	SD-T11-E-0-0.5	0 - 0.5	11/7/2011	Yes
SD-T11-F	SD-T11-F-0-0.5	0 - 0.5	11/7/2011	Yes
SD-T11-G	SD-T11-G-0-0.5	0 - 0.5	11/7/2011	Yes
SD-T11-H	SD-T11-H-0-0.5	0 - 0.5	11/7/2011	Yes
SD-T14-A	SD-T14-A-0-0.5	0 - 0.5	10/25/2011	Yes
SD-T14-B	SD-T14-B-0-0.5	0 - 0.5	10/25/2011	Yes
SD-T14-E	SD-T14-E-0-0.5	0 - 0.5	10/25/2011	Yes
SD-T14-F	SD-T14-F-0-0.5	0 - 0.5	10/25/2011	Yes
SD-T14-G	SD-T14-G-0-0.5	0 - 0.5	10/25/2011	Yes
SD-T14-H	SD-T14-H-0-0.5	0 - 0.5	10/26/2011	Yes
SD-T14-I	SD-T14-I-0-0.5	0 - 0.5	10/26/2011	Yes
SD-T16-C	SD-T16-C-0-0.5	0 - 0.5	11/3/2011	Yes
SD-T16-E	SD-T16-E-0-0.5	0 - 0.5	11/4/2011	Yes
SD-T16-F	SD-T16-F-0-0.5	0 - 0.5	11/4/2011	Yes
SD-T16-G	SD-T16-G-0-0.5	0 - 0.5	11/4/2011	Yes
SD-T17-A	SD-T17-A-0-0.5	0 - 0.5	11/3/2011	Yes
SD-T17-B	SD-T17-B-0-0.5	0 - 0.5	11/3/2011	Yes
SD-T17-E	SD-T17-E-0-0.5	0 - 0.5	11/3/2011	Yes
SD-T17-F	SD-T17-F-0-0.5	0 - 0.5	11/4/2011	Yes
SD-T1-A	SD-T1-A-0-0.5	0 - 0.5	10/31/2011	Yes
SD-T1-B	SD-T1-B-0-0.5	0 - 0.5	10/31/2011	Yes
SD-T1-D	SD-T1-D-0-0.5	0 - 0.5	10/31/2011	Yes
SD-T22-D	SD-T22-D-0-0.5	0 - 0.5	11/8/2011	Yes
SD-T22-E	SD-T22-E-0-0.5	0 - 0.5	11/8/2011	Yes
SD-T22-F	SD-T22-F-0-0.5	0 - 0.5	11/8/2011	Yes
SD-T22-G	SD-T22-G-0-0.5	0 - 0.5	11/9/2011	Yes
SD-T22-H	SD-T22-H-0-0.5	0 - 0.5	11/9/2011	Yes
SD-T25-A	SD-T25-A-0-0.5	0 - 0.5	11/1/2011	Yes
SD-T25-C	SD-T25-C-0-0.5	0 - 0.5	11/1/2011	Yes
SD-T25-E	SD-T25-E-0-0.5	0 - 0.5	11/1/2011	Yes
SD-T2-A	SD-T2-A-0-0.5	0 - 0.5	10/27/2011	Yes
SD-T2-D	SD-T2-D-0-0.5	0 - 0.5	10/27/2011	Yes
SD-T2-E	SD-T2-E-0-0.5	0 - 0.5	10/27/2011	Yes
SD-T30-A	SD-T30-A-0-0.5	0 - 0.5	10/26/2011	Yes
SD-T30-D	SD-T30-D-0-0.5	0 - 0.5	10/26/2011	Yes
SD-T30-E	SD-T30-E-0-0.5	0 - 0.5	10/26/2011	Yes
SD-T31-A	SD-T31-A-0-0.5	0 - 0.5	10/31/2011	Yes
SD-T31-B	SD-T31-B-0-0.5	0 - 0.5	10/31/2011	Yes
SD-T32-A	SD-T32-A-0-0.5	0 - 0.5	11/9/2011	Yes
SD-T32-B	SD-T32-B-0-0.5	0 - 0.5	11/9/2011	Yes
SD-T32-C	SD-T32-C-0-0.5	0 - 0.5	11/9/2011	Yes
SD-T32-D	SD-T32-D-0-0.5	0 - 0.5	11/9/2011	Yes

TABLE A-4
SEDIMENT SAMPLE LIST
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Location	Sample ID	Sample Depth (feet)	Collection Date	Use In Risk Assessment?
SD-T33-A	SD-T33-A-0-0.5	0 - 0.5	11/1/2011	Yes
SD-T33-B	SD-T33-B-0-0.5	0 - 0.5	11/1/2011	Yes
SD-T34-A	SD-T34-A-0-0.5	0 - 0.5	11/2/2011	Yes
SD-T34-B	SD-T34-B-0-0.5	0 - 0.5	11/2/2011	Yes
SD-T34-C	SD-T34-C-0-0.5	0 - 0.5	11/2/2011	Yes
SD-T35-A	SD-T35-A-0-0.5	0 - 0.5	11/2/2011	Yes
SD-T35-B	SD-T35-B-0-0.5	0 - 0.5	11/2/2011	Yes
SD-T35-C	SD-T35-C-0-0.5	0 - 0.5	11/3/2011	Yes
SD-T4-D	SD-T4-D-0-0.5	0 - 0.5	10/28/2011	Yes
SD-T4-E	SD-T4-E-0-0.5	0 - 0.5	10/28/2011	Yes
SD-T4-F	SD-T4-F-0-0.5	0 - 0.5	10/27/2011	Yes
SD-T4-G	SD-T4-G-0-0.5	0 - 0.5	10/28/2011	Yes
SD-T4-H	SD-T4-H-0-0.5	0 - 0.5	10/27/2011	Yes
SD-T7-D	SD-T7-D-0-0.5	0 - 0.5	11/9/2011	Yes
SD-T7-E	SD-T7-E-0-0.5	0 - 0.5	11/8/2011	Yes
SD-T7-F	SD-T7-F-0-0.5	0 - 0.5	11/8/2011	Yes
SD-T7-G	SD-T7-G-0-0.5-R	0 - 0.5	11/9/2011	Yes

TABLE A-5
FISH SAMPLE LIST
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Location	Sample ID	Collection Date	Comment	Use In Risk Assessment?
Hessian Run	4F1L	2003	(1)	Yes
	4F2L	2003	(1)	Yes
	4F3L	2003	(1)	Yes
Woodbury Creek	4F1L	2003	(1)	Yes
	4F2L	2003	(1)	Yes
	4F3L	2003	(1)	Yes

Note:
(1) Pumpkinseed (*Lepomis gibbosus*) samples were collected by the Louis Berger Group, Inc.
Source:
The Louis Berger Group Inc., 2004. Final Aquatic Biota Study Report. Matteo Iron and Metal. West Deptford, New Jersey. December.

Appendix B

Appendix B

RAGS D Tables for RME Scenario

Appendix B Contents
Matteo & Sons, Inc. Site
Thorofare, New Jersey

B-1 Selection of Exposure Pathways
B-2 Occurrence, Distribution and Selection of Chemicals of Potential Concern
- B-2.1a Current/Future Surface Soil - Scrapyard Area
- B-2.1b Current/Future Surface Soil - Open Field/Waste Disposal Area
- B-2.1c Current Surface Soil - Rental Home Area
- B-2.1d Current/Future Surface Soil - Willow Woods Property
- B-2.1e Future Surface Soil - Matteo Property
- B-2.2a Future Surface / Subsurface Soil - Matteo Property
- B-2.2b Future Surface / Subsurface Soil - Willow Woods Property
- B-2.3 Current/Future Groundwater
- B-2.4 Current/Future Surface Water
- B-2.5 Current/Future Sediment
- B-2.6 Current/Future Whole-body Fish

B-3 Medium-Specific Exposure Point Concentration Summary
- B-3.1a Current/Future Surface Soil - Scrapyard Area
- B-3.1b Current/Future Surface Soil - Open Field/Waste Disposal Area
- B-3.1c Current Surface Soil - Rental Home Area
- B-3.1d Current/Future Surface Soil - Willow Woods Property
- B-3.1e Future Surface Soil - Matteo Property
- B-3.2a Future Surface / Subsurface Soil - Matteo Property
- B-3.2b Future Surface / Subsurface Soil - Willow Woods Property
- B-3.3 Current/Future Groundwater
- B-3.4 Current/Future Surface Water
- B-3.5 Current/Future Sediment
- B-3.6 Current/Future Whole-body Fish

B-4 Values and Equations Used for Intake Calculations
- B-4.1 Soil
- B-4.2 Groundwater
- B-4.3 Surface Water
- B-4.4 Sediment
- B-4.5 Whole-Body Fish
- B-4.6 Chemical-Specific Information Used for Daily Intake Calculations
- B-4.7 Particulate Emission Factor

B-5 Noncancer Toxicity Data
- B-5.1 Oral/Dermal
- B-5.2a Inhalation (Chronic)
- B-5.2b Inhalation (Subchronic)
- B-5.2c Inhalation (Acute)

B-6 Cancer Toxicity Data
- B-6.1 Oral/Dermal
- B-6.2 Inhalation

B-7 Calculation of Chemical Cancer Risks and Noncancer Hazards - Reasonable Maximum Exposure
- B-7.0.1 Trichloroethene - Surface Soil for Current/Future Trespasser (Adolescent [6-18 years]) at Open Field/Waste Disposal Area
- B-7.0.2 Trichloroethene - Surface Soil for Current/Future Recreational User (Adolescent [6-18 years]) at Open Field/Waste Disposal Area
- B-7.0.3 Trichloroethene - Surface Soil for Future Resident at Matteo Property
- B-7.0.4 Trichloroethene - Groundwater for Current/Future Resident
- B-7.1 Current/Future Site Worker - Scrapyard Area
- B-7.2 Current/Future Trespasser (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
- B-7.3 Current/Future Recreational User (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
- B-7.4 Current/Future Residents (Adults and Children [0-6 years]) - Willow Woods Property
- B-7.5 Future Construction Worker - Willow Woods Property
- B-7.6 Current Residents (Adults and Children [0-6 years]) - Rental Home Area on Matteo Property
- B-7.7 Future Residents (Adults and Children [0-6 years]) - Matteo Property
- B-7.8a Current/Future Angler (Adult) - Woodbury Creek/Hessian Run
- B-7.8b Current/Future Angler (Child [0-6 years]) - Woodbury Creek/Hessian Run
- B-7.9 Future Construction Worker - Matteo Property

B-8 Calculation of Radiation Cancer Risks - NOT APPLICABLE TO THIS SITE

B-9 Summary of Receptor Risks and Hazards for Chemical of Potential Concerns - Reasonable Maximum Exposure
B-9.1 Current/Future Site Worker - Scrapyard Area
B-9.2 Current/Future Trespasser (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
B-9.3 Current/Future Recreational User (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
B-9.4 Current/Future Residents (Adults and Children [0-6 years]) - Willow Woods Property
B-9.5 Future Construction Worker - Willow Woods Property
B-9.6 Current Residents (Adults and Children [0-6 years]) - Rental Home Area on Matteo Property
B-9.7 Future Residents (Adults and Children [0-6 years]) - Matteo Property
B-9.8a Current/Future Angler (Adult) - Woodbury Creek/Hessian Run
B-9.8b Current/Future Angler (Child [0-6 years]) - Woodbury Creek/Hessian Run
B-9.9 Future Construction Worker - Matteo Property
B-10 Risk Assessment Summary - Reasonable Maximum Exposure
B-10.1 Current/Future Site Worker - Scrapyard Area
B-10.2 Current/Future Trespasser (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
B-10.3 Current/Future Recreational User (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
B-10.4 Current/Future Residents (Adults and Children [0-6 years]) - Willow Woods Property
B-10.5 Future Construction Worker - Willow Woods Property
B-10.6 Current Residents (Adults and Children [0-6 years]) - Rental Home Area on Matteo Property
B-10.7 Future Residents (Adults and Children [0-6 years]) - Matteo Property
B-10.8a Current/Future Angler (Adult) - Woodbury Creek/Hessian Run
B-10.8b Current/Future Angler (Child [0-6 years]) - Woodbury Creek/Hessian Run
B-10.9 Future Construction Worker - Matteo Property

TABLE B-1
SELECTION OF EXPOSURE PATHWAYS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor (Age)	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Soil	Surface Soil	Scrapyard Area	Site Worker	Adult	Dermal	Quant	Workers may come into contact with contaminants in surface soil and/or inhale particulates and/or volatile chemicals while working at the site.
						Ingestion	Quant	
						Inhalation	Quant	
			Open Field / Waste Disposal Area	Trespasser	Adolescent (6-18 yrs)	Dermal	Quant	Trespassers may come into contact with contaminants in surface soil and/or inhale particulates and/or volatile chemicals while visiting the site. While trespassers are most likely adults and adolescents, adolescents (6 to 18 years old) generally have higher relative intake rates and lower body weight when compared to adults. The adolescent exposure scenario provides a conservative basis for evaluating potential exposures to adults. Thus adolescents are selected as potential receptors for quantitative evaluation. Adults are qualitatively evaluated in the risk assessment.
						Ingestion	Quant	
						Inhalation	Quant	
					Adult	Dermal	Qual	
						Ingestion	Qual	
						Inhalation	Qual	
				Recreational User	Adolescent (6-18 yrs)	Dermal	Quant	Recreational users may come into contact with contaminants in surface soil and/or inhale particulates and/or volatile chemicals while visiting the site. Adolescents are selected as potential receptors for quantitative evaluation. Adults are qualitatively evaluated in the risk assessment.
						Ingestion	Quant	
						Inhalation	Quant	
					Adult	Dermal	Qual	
						Ingestion	Qual	
						Inhalation	Qual	
			Rental Home Area	Resident	Adult and Child (0-6 yrs)	Dermal	Quant	Residents may come into contact with contaminants in surface soil and/or inhale fugitive dust and volatile chemicals.
						Ingestion	Quant	
						Inhalation	Quant	
			Willow Woods Property	Resident	Adult and Child (0-6 yrs)	Dermal	Quant	Residents may come into contact with contaminants in surface soil and/or inhale fugitive dust and volatile chemicals.
						Ingestion	Quant	
						Inhalation	Quant	
	Groundwater	Groundwater	Matteo Property[(1)]	Resident	Adult and Child (0-6 yrs)	Dermal	Quant	Residents have the potential to use groundwater as drinking water.
						Ingestion	Quant	
						Inhalation	Quant	
	Surface Water	Surface Water	Hessian Run / Woodbury Creek	Trespasser	Adolescent (6-18 yrs)	Dermal	Quant	Trespassers may come into contact with contaminants in surface water and sediment while visiting the site. While trespassers are most likely adults and adolescents, adolescents (6 to 18 years old) generally have higher relative intake rates and lower body weight when compared to adults. The adolescent exposure scenario provides a conservative basis for evaluating potential exposures to adults. Thus adolescents are selected as potential receptors for quantitative evaluation. Adults are qualitatively evaluated in the risk assessment.
						Ingestion	Quant	
					Adult	Dermal	Qual	
						Ingestion	Qual	
	Sediment	Sediment	Hessian Run / Woodbury Creek	Trespasser	Adolescent (6-18 yrs)	Dermal	Quant	
						Ingestion	Quant	
					Adult	Dermal	Qual	
						Ingestion	Qual	

TABLE B-1
SELECTION OF EXPOSURE PATHWAYS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor (Age)	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Fish	Fish	Hessian Run / Woodbury Creek	Angler	Adult and Child (0-6 yrs)	Ingestion	Quant	People may consume self-caught fish from the site. The angler scenario assesses exposure to adult anglers and young children (0 to 6 years old) who may consume fish caught at the site by anglers.
Future	Soil	Surface Soil	Scrapyard Area	Site Worker	Adult	Dermal	Quant	Workers may come into contact with contaminants in surface soil and/or inhale particulates and/or volatile chemicals while working at the site.
						Ingestion	Quant	
						Inhalation	Quant	
			Matteo Property[(1)]	Resident	Adult and Child (0-6 yrs)	Dermal	Quant	Residents may come into contact with contaminants in surface soil and/or inhale particulates and/or volatile chemicals while at their residence.
						Ingestion	Quant	
						Inhalation	Quant	
			Open Field / Waste Disposal Area	Trespasser	Adolescent (6-18 yrs)	Dermal	Quant	Trespassers may come into contact with contaminants in surface soil and/or particulates and/or volatile chemicals while visiting the site. Adolescents are selected as potential receptors for quantitative evaluation. Adults are qualitatively evaluated in the risk assessment.
						Ingestion	Quant	
						Inhalation	Quant	
					Adult	Dermal	Qual	
						Ingestion	Qual	
						Inhalation	Qual	
				Recreational User	Adolescent (6-18 yrs)	Dermal	Quant	Recreational users may come into contact with contaminants in surface soil and/or inhale particulates and/or volatile chemicals while visiting the site. Adolescents are selected as potential receptors for quantitative evaluation. Adults are qualitatively evaluated in the risk assessment.
						Ingestion	Quant	
						Inhalation	Quant	
					Adult	Dermal	Qual	
						Ingestion	Qual	
						Inhalation	Qual	
			Willow Woods Property	Resident	Adult and Child (0-6 yrs)	Dermal	Quant	Residents may come into contact with contaminants in surface soil and/or inhale particulates and/or volatile chemicals while at their residence.
						Ingestion	Quant	
						Inhalation	Quant	
		Surface and Subsurface Soil	Matteo Property[(1)]	Construction Worker	Adult	Dermal	Quant	Construction workers may come into contact with contaminants in soil and/or inhale particulates and/or volatile chemicals while working at the site.
						Ingestion	Quant	
						Inhalation	Quant	
			Willow Woods Property	Construction Worker	Adult	Dermal	Quant	Construction workers may come into contact with contaminants in soil and/or inhale particulates and/or volatile chemicals while working at the site.
						Ingestion	Quant	
						Inhalation	Quant	

TABLE B-1
SELECTION OF EXPOSURE PATHWAYS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor (Age)	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Groundwater	Matteo Property[(1)]	Resident	Adult and Child (0-6 yrs)	Dermal	Quant	Residents have the potential to use groundwater as drinking water.
						Ingestion	Quant	
						Inhalation	Quant	
	Surface Water	Surface Water	Hessian Run / Woodbury Creek	Resident	Adult and Child (0-6 yrs)	Dermal	Quant	Residents may come into contact with contaminants in surface water while living at the site.
						Ingestion	Quant	
			Hessian Run / Woodbury Creek	Trespasser	Adolescent (6-18 yrs)	Dermal	Quant	Trespassers may come into contact with contaminants in surface water while visiting the site. Adolescents are selected as potential receptors for quantitative evaluation. Adults are qualitatively evaluated in the risk assessment.
						Ingestion	Quant	
					Adult	Dermal	Qual	
						Ingestion	Qual	
	Sediment	Sediment	Woodbury Creek / Hessian Run	Resident	Adult and Child (0-6 yrs)	Dermal	Quant	Residents may come into contact with contaminants in sediment while living at the site.
						Ingestion	Quant	
			Hessian Run / Woodbury Creek	Trespasser	Adolescent (6-18 yrs)	Dermal	Quant	Trespassers may come into contact with contaminants in surface water and/or inhale particulates and/or volatile chemicals while visiting the site. Adolescents are selected as potential receptors for quantitative evaluation. Adults are qualitatively evaluated in the risk assessment.
						Ingestion	Quant	
					Adult	Dermal	Qual	
						Ingestion	Qual	
	Fish	Fish	Hessian Run / Woodbury Creek	Angler	Adult and Child (0-6 yrs)	Ingestion	Quant	People may consume self-caught fish from the site. The angler scenario assesses exposure to adult anglers and young children (0 to 6 years old) who may consume fish caught at the site by anglers.
				Resident				

[(1)] This includes the scrapyard area, the open field/waste disposal area, and the rental home area.

Quant = Quantitative risk analysis performed
Qual = Qualitative risk analysis performed

TABLE B-2.1a

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Scrapyard Area

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Volatile Organic Compounds**														
	78-93-3	2-Butanone	5.7 J	5.7 J	µg/kg	SB-104	1 / 7	9.8 - 15	5.7	NA	2700000 n	3100000	SSL[4]	No	BSL
	10061-01-5	cis-1,3-Dichloropropene	2.9 J	2.9 J	µg/kg	SB-102	1 / 7	4.9 - 7.6	2.9	NA	1800 c[5]	2000	SSL[4]	No	BSL
	127-18-4	Tetrachloroethene	11 J+	11 J+	µg/kg	SB-101	1 / 7	4.9 - 7.6	11	NA	8100 n	2000	SSL[4]	No	BSL
	79-01-6	**Trichloroethene**	**2.4 J**	**2.4 J**	**µg/kg**	**SB-101**	**1 / 7**	**4.9 - 7.6**	**2.4**	**NA**	**410 n**	**7000**	**SSL[4]**	**Yes**	**TOXB**
	Semi-volatile Organic Compounds														
	83-32-9	Acenaphthene	57 J	79 J	µg/kg	SB-101	2 / 7	190 - 250	79	NA	360000 n	3400000	SSL[4]	No	BSL
	208-96-8	Acenaphthylene	68 J	93 J	µg/kg	SB-102/ SB-107	3 / 7	190 - 250	93	NA	360000 n[6]	NA	SSL[4]	No	BSL
	98-86-2	Acetophenone	71 J	110 J	µg/kg	SB-101	3 / 7	190 - 250	110	NA	780000 n	2000	SSL[4]	No	BSL
	120-12-7	Anthracene	56 J	290	µg/kg	SB-102	4 / 7	190 - 250	290	NA	1800000 n	17000000	SSL[4]	No	BSL
	100-52-7	Benzaldehyde	92 J	92 J	µg/kg	SB-107	1 / 7	190 - 250	92	NA	780000 n	6100000	SSL[4]	No	BSL
	56-55-3	**Benzo(a)anthracene**	**210 J**	**610**	**µg/kg**	**SB-107**	**4 / 7**	**190 - 250**	**610**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	50-32-8	**Benzo(a)pyrene**	**180 J**	**630**	**µg/kg**	**SB-101**	**4 / 7**	**190 - 250**	**630**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	205-99-2	**Benzo(b)fluoranthene**	**270**	**820**	**µg/kg**	**SB-101**	**4 / 7**	**190 - 250**	**820**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	191-24-2	Benzo(g,h,i)perylene	160 J	570	µg/kg	SB-107	4 / 7	190 - 250	570	NA	180000 n[7]	380000000	SSL[4]	No	BSL
	207-08-9	Benzo(k)fluoranthene	210 J	870	µg/kg	SB-107	4 / 7	190 - 250	870	NA	1600 c	6000	SSL[4]	No	BSL
	117-81-7	Bis(2-Ethylhexyl)Phthalate	160 J	930	µg/kg	SB-107	4 / 7	190 - 250	930	NA	39000 c	35000	SSL[4]	No	BSL
	85-68-7	Butylbenzylphthalate	400	920	µg/kg	SB-107	2 / 7	190 - 250	920	NA	290000 c	1200000	SSL[4]	No	BSL
	86-74-8	Carbazole	64 J	82 J	µg/kg	SB-101	2 / 7	190 - 250	82	NA	NA	24000	SSL[4]	No	NTX
	218-01-9	Chrysene	240	890	µg/kg	SB-107	4 / 7	190 - 250	890	NA	16000 c	62000	SSL[4]	No	BSL
	53-70-3	**Dibenzo(a,h)anthracene**	**69 J**	**230 J**	**µg/kg**	**SB-107**	**4 / 7**	**190 - 250**	**230**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	132-64-9	Dibenzofuran	34 J	51 J	µg/kg	SB-102	2 / 7	190 - 250	51	NA	7300 n	NL	SSL[4]	No	BSL
	131-11-3	Dimethylphthalate	52 J	72 J	µg/kg	SB-107	2 / 7	190 - 250	72	NA	NA	NL	SSL[4]	No	NTX
	84-74-2	Di-N-Butylphthalate	48 J	200 J	µg/kg	SB-107	3 / 7	190 - 250	200	NA	630000 n	6100000	SSL[4]	No	BSL
	206-44-0	Fluoranthene	340	1100	µg/kg	SB-101/ SB-107	4 / 7	190 - 250	1100	NA	240000 n	2300000	SSL[4]	No	BSL
	86-73-7	Fluorene	68 J	93 J	µg/kg	SB-102	2 / 7	190 - 250	93	NA	240000 n	2300000	SSL[4]	No	BSL
	118-74-1	Hexachlorobenzene	120 J	120 J	µg/kg	SB-107	1 / 7	190 - 250	120	NA	210 c	300	SSL[4]	No	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**160 J**	**540**	**µg/kg**	**SB-107**	**4 / 7**	**190 - 250**	**540**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	91-20-3	Naphthalene	27 J	27 J	µg/kg	SB-101	1 / 7	190 - 250	27	NA	3800 c	6000	SSL[4]	No	BSL
	85-01-8	Phenanthrene	110 J	880	µg/kg	SB-102	4 / 7	190 - 250	880	NA	1800000 n[8]	NA	SSL[4]	No	BSL
	129-00-0	Pyrene	300	1200	µg/kg	SB-107	4 / 7	190 - 250	1200	NA	180000 n	1700000	SSL[4]	No	BSL
	Dioxins/Furans														
	--	**Dioxin/Furan TEQ**	**0.74**	**48.37**	**ng/kg**	**SB-102**	**7 / 7**	**NA - NA**	**48.37**	**NA**	**4.8 c**	**NL**	**NL**	**Yes**	**ASL**

TABLE B-2.1a

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Scrapyard Area

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Pesticides/Polychlorinated Biphenyls**														
	72-54-8	4,4'-DDD	25 NJ	25 NJ	µg/kg	SB-101	1 / 7	3.6 - 4400	25	NA	2300 c	3000	SSL[4]	No	BSL
	72-55-9	4,4'-DDE	100 NJ	1900 NJ	µg/kg	SB-107	2 / 7	3.6 - 490	1900	NA	2000 c	2000	SSL[4]	No	BSL
	50-29-3	**4,4'-DDT**	**6.2 J**	**32000 J**	**µg/kg**	**SB-107**	**4 / 7**	**3.6 - 3900**	**32000**	**NA**	**1900 c**	**2000**	**SSL[4]**	**Yes**	**ASL**
	5103-71-9	Alpha-Chlordane	2.2	8.3	µg/kg	SB-101	2 / 7	1.8 - 250	8.3	NA	1700 c[9]	200	SSL[4]	No	BSL
	12672-29-6	**Aroclor 1248**	**480 J**	**480 J**	**µg/kg**	**SB-101**	**1 / 7**	**35 - 78**	**480**	**NA**	**230 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	11096-82-5	**Aroclor 1260**	**20 J**	**200000**	**µg/kg**	**SB-107**	**5 / 7**	**35 - 20000**	**200000**	**NA**	**240 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	319-85-7	Beta-BHC	5.3 J	5.3 J	µg/kg	SB-101	1 / 7	1.8 - 250	5.3	NA	300 c	400	SSL[4]	No	BSL
	319-86-8	**Delta-BHC**	**690 J**	**690 J**	**µg/kg**	**SB-107**	**1 / 7**	**1.8 - 250**	**690**	**NA**	**300 c[10]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	60-57-1	**Dieldrin**	**8.2**	**2400 J**	**µg/kg**	**SB-107**	**2 / 7**	**3.6 - 490**	**2400**	**NA**	**34 c**	**40**	**SSL[4]**	**Yes**	**ASL**
	959-98-8	Endosulfan I	5.1 NJ	7.3 NJ	µg/kg	SB-101	2 / 7	1.8 - 250	7.3	NA	47000 n[11]	470000	SSL[4]	No	BSL
	72-20-8	Endrin	780 J	780 J	µg/kg	SB-107	1 / 7	3.6 - 490	780	NA	1900 n	23000	SSL[4]	No	BSL
	1024-57-3	**Heptachlor Epoxide**	**2.5 J**	**1600 J**	**µg/kg**	**SB-107**	**3 / 7**	**1.8 - 250**	**1600**	**NA**	**70 c**	**70**	**SSL[4]**	**Yes**	**ASL**
	Inorganics														
	7429-90-5	**Aluminum**	**1940**	**11800 J**	**mg/kg**	**SB-101**	**7 / 7**	**20.9 - 27.4**	**11800**	**NA**	**7700 n**	**78000**	**SSL[4]**	**Yes**	**ASL**
	7440-36-0	**Antimony**	**0.54 J**	**25.2 J**	**mg/kg**	**SB-101**	**5 / 7**	**1 - 1.4**	**25.2**	**NA**	**3.1 n**	**31**	**SSL[4]**	**Yes**	**ASL**
	7440-38-2	**Arsenic**	**1.5**	**6.1 J**	**mg/kg**	**SB-103**	**7 / 7**	**0.52 - 0.69**	**6.1**	**NA**	**0.68 c**	**0.4**	**SSL[4]**	**Yes**	**ASL**
	7440-39-3	Barium	12.8 J	155	mg/kg	SB-107	5 / 7	5.2 - 6.9	155	NA	1500 n	16000	SSL[4]	No	BSL
	7440-41-7	Beryllium	0.18 J	0.23 J	mg/kg	SB-107	3 / 7	0.52 - 0.69	0.23	NA	16 n	16	SSL[4]	No	BSL
	7440-43-9	**Cadmium**	**0.55**	**11.3**	**mg/kg**	**SB-101**	**5 / 7**	**0.52 - 0.69**	**11.3**	**NA**	**7.1 n**	**78**	**SSL[4]**	**Yes**	**ASL**
	7440-70-2	Calcium	213 J	30100 J	mg/kg	SB-101	7 / 7	524 - 686	30100	NA	NA	NL	SSL[4]	No	NUT
	7440-47-3	**Chromium**	**2.8**	**153 J**	**mg/kg**	**SB-101**	**7 / 7**	**1 - 1.4**	**153**	**NA**	**0.3 c[12]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7440-48-4	**Cobalt**	**0.78**	**11.3**	**mg/kg**	**SB-101**	**7 / 7**	**0.52 - 0.69**	**11.3**	**NA**	**2.3 n**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7440-50-8	**Copper**	**3.3**	**4070 J**	**mg/kg**	**SB-101**	**7 / 7**	**1 - 22.7**	**4070**	**NA**	**310 n**	**3100**	**SSL[4]**	**Yes**	**ASL**
	57-12-5	**Cyanide**	**0.59 J**	**0.59 J**	**mg/kg**	**SB-107**	**1 / 7**	**0.53 - 0.67**	**0.59**	**NA**	**0.27 n**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7439-89-6	**Iron**	**2850 J**	**89300 J**	**mg/kg**	**SB-101**	**7 / 7**	**10.5 - 35**	**89300**	**NA**	**5500 n**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7439-92-1	Lead	33.5 J	1200 J	mg/kg	SB-101	7 / 7	0.52 - 11.3	1200	NA	800 n[13]	400	SSL[4]	No	BSL
	7439-95-4	Magnesium	281 J	7460	mg/kg	SB-107	7 / 7	524 - 686	7460	NA	NA	NL	SSL[4]	No	NUT
	7439-96-5	**Manganese**	**36.9 J**	**674**	**mg/kg**	**SB-101**	**7 / 7**	**0.52 - 11.3**	**674**	**NA**	**180 n**	**11000**	**SSL[4]**	**Yes**	**ASL**
	7439-97-6	**Mercury**	**0.035 J**	**2.9 J**	**mg/kg**	**SB-101**	**5 / 7**	**0.099 - 0.16**	**2.9**	**NA**	**2.3 n[14]**	**23**	**SSL[4]**	**Yes**	**ASL**
	7440-02-0	**Nickel**	**2**	**218 J**	**mg/kg**	**SB-101**	**7 / 7**	**0.52 - 0.69**	**218**	**NA**	**150 n[15]**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7440-09-7	Potassium	173 J	466 J	mg/kg	SB-107	3 / 7	524 - 686	466	NA	NA	NL	SSL[4]	No	NUT
	7440-22-4	Silver	0.21 J	1.4	mg/kg	SB-101	3 / 7	0.52 - 0.69	1.4	NA	39 n	390	SSL[4]	No	BSL

TABLE B-2.1a

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Scrapyard Area

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Inorganics continued**														
	7440-23-5	Sodium	799	799	mg/kg	SB-101	1 / 7	524 - 686	799	NA	NA	NL	SSL[4]	No	NUT
	7440-62-2	Vanadium	4	15.9	mg/kg	SB-101	7 / 7	2.6 - 3.4	15.9	NA	39 n[16]	78	SSL[4]	No	BSL
	7440-66-6	**Zinc**	**11.2**	**8760 J**	**mg/kg**	**SB-101**	**7 / 7**	**1 - 22.7**	**8760**	**NA**	**2300 n**	**23000**	**SSL[4]**	**Yes**	**ASL**

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level
TOXB = group A carcinogen, but below screening level

Deletion Reason: BSL = below screening level
NTX = no screening level
NUT = essential nutrient

[4] Potential ARAR/TBC value from New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard.

[5] screening value for 1,3-dichloropropene

[6] screening value for acenaphthene

[7] screening value for pyrene

[8] screening value for anthracene

[9] screening value for chlordane

[10] screening value for hexachlorocyclohexane, technical

[11] screening value for endosulfan

[12] screening value for chromium VI

[13] Screening value is based on OSWER screening value for industrial soil. Mean lead concentration is further screened in Table 3-2.

[14] screening value for mercuric chloride (and other mercury salts)

[15] screening value for nickel soluble salts

[16] screening value for vanadium and compounds

NA = not available
NL = not listed
n = screening toxicity value based on noncancer effects
c = screening toxicity value based on cancer effects
s = concentration may exceed saturation concentration
SSL = soil screening level
COPC = chemical of potential concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = qualifier for estimated value
J+ = qualifier for estimated value biased high
NJ = qualifier for tentatively identified and estimated value
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
4,4'-DDD = p,p'-dichlorodiphenyldichloroethane
4,4'-DDE = p,p'-dichlorodiphenyldichloroethylene
4,4'-DDT = p,p'-dichlorodiphenyltrichloroethane
BHC = hexachlorocyclohexane
TEQ = toxicity equivalence

TABLE B-2.1b

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Open Field / Waste Disposal Area

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Volatile Organic Compounds**														
	75-35-4	1,1-Dichloroethene	2.8 J	2.8 J	µg/kg	SB-111	1 / 7	4 - 6	2.8	NA	23000 n	11000	SSL[4]	No	BSL
	127-18-4	Tetrachloroethene	27 J+	27 J+	µg/kg	SB-111	1 / 7	4 - 6	27	NA	8100 n	2000	SSL[4]	No	BSL
	108-88-3	Toluene	2 J	2 J	µg/kg	SB-111	1 / 7	4 - 6	2	NA	360000 ns	6300000	SSL[4]	No	BSL
	79-01-6	**Trichloroethene**	**7 J+**	**7 J+**	**µg/kg**	**SB-111**	**1 / 7**	**4 - 6**	**7**	**NA**	**410 n**	**7000**	**SSL[4]**	**Yes**	**TOXB**
	Semi-volatile Organic Compounds														
	92-52-4	1,1'-Biphenyl	36 J	150 J	µg/kg	SB-111	2 / 7	180 - 200	150	NA	4700 n	3100000	SSL[4]	No	BSL
	91-57-6	2-Methylnaphthalene	68 J	170 J	µg/kg	SB-111	2 / 7	180 - 200	170	NA	24000 n	230000	SSL[4]	No	BSL
	83-32-9	Acenaphthene	36 J	62 J	µg/kg	SB-110	2 / 7	180 - 200	62	NA	360000 n	3400000	SSL[4]	No	BSL
	208-96-8	Acenaphthylene	160 J	160 J	µg/kg	SB-117	1 / 7	180 - 200	160	NA	360000 n[5]	NA	SSL[4]	No	BSL
	98-86-2	Acetophenone	120 J	400	µg/kg	SB-111	2 / 7	180 - 200	400	NA	780000 n	2000	SSL[4]	No	BSL
	120-12-7	Anthracene	66 J	150 J	µg/kg	SB-117	3 / 7	180 - 200	150	NA	1800000 n	17000000	SSL[4]	No	BSL
	100-52-7	Benzaldehyde	42 J	320 J+	µg/kg	SB-111	3 / 7	180 - 200	320	NA	780000 n	6100000	SSL[4]	No	BSL
	56-55-3	**Benzo(a)anthracene**	**19 J**	**1300 J+**	**µg/kg**	**SB-111**	**6 / 7**	**180 - 200**	**1300**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	50-32-8	**Benzo(a)pyrene**	**35 J**	**440**	**µg/kg**	**SB-117**	**3 / 7**	**180 - 200**	**440**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	205-99-2	**Benzo(b)fluoranthene**	**23 J**	**1000**	**µg/kg**	**SB-111**	**6 / 7**	**180 - 200**	**1000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	191-24-2	Benzo(g,h,i)perylene	26 J	370	µg/kg	SB-117	4 / 7	180 - 200	370	NA	180000 n[6]	380000000	SSL[4]	No	BSL
	207-08-9	Benzo(k)fluoranthene	71 J	700	µg/kg	SB-111	3 / 7	180 - 200	700	NA	1600 c	6000	SSL[4]	No	BSL
	117-81-7	Bis(2-Ethylhexyl)Phthalate	100 J	420	µg/kg	SB-110	3 / 7	180 - 200	420	NA	39000 c	35000	SSL[4]	No	BSL
	85-68-7	Butylbenzylphthalate	48 J	48 J	µg/kg	SB-110	1 / 7	180 - 200	48	NA	290000 c	1200000	SSL[4]	No	BSL
	86-74-8	Carbazole	77 J	77 J	µg/kg	SB-117	1 / 7	180 - 200	77	NA	NA	24000	SSL[4]	No	NTX
	218-01-9	Chrysene	27 J	980 J+	µg/kg	SB-111	6 / 7	180 - 200	980	NA	16000 c	62000	SSL[4]	No	BSL
	53-70-3	**Dibenzo(a,h)anthracene**	**40 J**	**140 J**	**µg/kg**	**SB-117**	**2 / 7**	**180 - 200**	**140**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	132-64-9	Dibenzofuran	27 J	54 J	µg/kg	SB-110	2 / 7	180 - 200	54	NA	7300 n	NL	SSL[4]	No	BSL
	84-74-2	Di-N-Butylphthalate	52 J	190 J	µg/kg	SB-117	2 / 7	180 - 200	190	NA	630000 n	6100000	SSL[4]	No	BSL
	206-44-0	Fluoranthene	28 J	210	µg/kg	SB-110	6 / 7	180 - 200	210	NA	240000 n	2300000	SSL[4]	No	BSL
	86-73-7	Fluorene	48 J	210	µg/kg	SB-111	3 / 7	180 - 200	210	NA	240000 n	2300000	SSL[4]	No	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**51 J**	**340**	**µg/kg**	**SB-117**	**3 / 7**	**180 - 200**	**340**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	91-20-3	Naphthalene	61 J	190	µg/kg	SB-111	2 / 7	180 - 200	190	NA	3800 c	6000	SSL[4]	No	BSL
	86-30-6	N-Nitrosodiphenylamine	200	200	µg/kg	SB-111	1 / 7	180 - 200	200	NA	110000 c	99000	SSL[4]	No	BSL
	85-01-8	Phenanthrene	51 J	1000	µg/kg	SB-111	4 / 7	180 - 200	1000	NA	1800000 n[7]	NA	SSL[4]	No	BSL
	108-95-2	Phenol	140 J	140 J	µg/kg	SB-111	1 / 7	180 - 200	140	NA	1900000 n	18000000	SSL[4]	No	BSL
	129-00-0	Pyrene	27 J	540 J+	µg/kg	SB-111	6 / 7	180 - 200	540	NA	180000 n	1700000	SSL[4]	No	BSL

TABLE B-2.1b

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Open Field / Waste Disposal Area

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Dioxins/Furans**														
	--	**Dioxin/Furan TEQ**	**0.89**	**36.25**	**ng/kg**	**SB-125**	**7 / 7**	**NA - NA**	**36.25**	**NA**	**4.8 c**	**NL**	**SSL[4]**	**Yes**	**ASL**
	Pesticides/Polychlorinated Biphenyls														
	72-55-9	4,4'-DDE	26 NJ	42 NJ	µg/kg	SB-110	2 / 8	3.5 - 3.9	42	NA	2000 c	2000	SSL[4]	No	BSL
	50-29-3	4,4'-DDT	4.6 NJ	250 J	µg/kg	SB-110	3 / 8	3.5 - 39	250	NA	1900 c	2000	SSL[4]	No	BSL
	12672-29-6	Aroclor 1248	3400 NJ	3400 NJ	µg/kg	SB-110	1 / 25	35 - 390	3400	NA	230 c	200	SSL[4]	No	IFD
	11097-69-1	**Aroclor 1254**	**36**	**1200 J**	**µg/kg**	**SS-106**	**11 / 25**	**35 - 240**	**1200**	**NA**	**120 n**	**200**	**SSL[4]**	**Yes**	**ASL**
	11096-82-5	**Aroclor 1260**	**28 J**	**3000**	**µg/kg**	**SB-110**	**14 / 25**	**35 - 390**	**3000**	**NA**	**240 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	319-85-7	Beta-BHC	2.9 NJ	2.9 NJ	µg/kg	SB-111	1 / 8	1.8 - 2.6	2.9	NA	300 c	400	SSL[4]	No	BSL
	319-86-8	Delta-BHC	72 J	72 J	µg/kg	SB-110	1 / 8	1.8 - 20	72	NA	300 c[8]	NL	SSL[4]	No	BSL
	60-57-1	Dieldrin	12 J	32 NJ	µg/kg	SB-110	2 / 8	3.5 - 3.9	32	NA	34 c	40	SSL[4]	No	BSL
	72-20-8	Endrin	12 J	12 J	µg/kg	SB-110	1 / 8	3.5 - 3.9	12	NA	1900 n	23000	SSL[4]	No	BSL
	5103-74-2	Gamma-Chlordane	54 J	54 J	µg/kg	SB-111	1 / 8	1.8 - 9.5	54	NA	1700 c[9]	200	SSL[4]	No	BSL
	76-44-8	Heptachlor	5.6 NJ	5.6 NJ	µg/kg	SB-110	1 / 8	1.8 - 2	5.6	NA	130 c	100	SSL[4]	No	BSL
	1024-57-3	**Heptachlor Epoxide**	**15**	**120 J**	**µg/kg**	**SB-110**	**2 / 8**	**1.8 - 20**	**120**	**NA**	**70 c**	**70**	**SSL[4]**	**Yes**	**ASL**
	Inorganics														
	7429-90-5	**Aluminum**	**1250**	**11900**	**mg/kg**	**SB-109**	**19 / 19**	**20.6 - 24.4**	**11900**	**NA**	**7700 n**	**78000**	**SSL[4]**	**Yes**	**ASL**
	7440-36-0	**Antimony**	**0.22 J**	**18.6**	**mg/kg**	**SB-110**	**11 / 19**	**1 - 1.2**	**18.6**	**NA**	**3.1 n**	**31**	**SSL[4]**	**Yes**	**ASL**
	7440-38-2	**Arsenic**	**1.3**	**8 J**	**mg/kg**	**SB-109**	**19 / 19**	**0.52 - 0.59**	**8**	**NA**	**0.68 c**	**0.4**	**SSL[4]**	**Yes**	**ASL**
	7440-39-3	Barium	9.2	149 J	mg/kg	SB-109	12 / 19	5.2 - 5.9	149	NA	1500 n	16000	SSL[4]	No	BSL
	7440-41-7	Beryllium	0.19 J	0.31 J	mg/kg	SB-117	3 / 19	0.52 - 0.59	0.31	NA	16 n	16	SSL[4]	No	BSL
	7440-43-9	**Cadmium**	**0.14 J**	**9.5**	**mg/kg**	**SB-109**	**7 / 19**	**0.52 - 0.59**	**9.5**	**NA**	**7.1 n**	**78**	**SSL[4]**	**Yes**	**ASL**
	7440-70-2	Calcium	167 J	8910	mg/kg	SB-109	15 / 19	515 - 609	8910	NA	NA	NL	SSL[4]	No	NUT
	7440-47-3	**Chromium**	**2.5 J**	**39.9 J**	**mg/kg**	**SB-109**	**19 / 19**	**1 - 1.2**	**39.9**	**NA**	**0.3 c[10]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7440-48-4	**Cobalt**	**0.37 J**	**4.4**	**mg/kg**	**SB-110**	**19 / 19**	**0.52 - 0.59**	**4.4**	**NA**	**2.3 n**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7440-50-8	Copper	2.8 J	292 J	mg/kg	SB-109	19 / 19	1 - 1.2	292	NA	310 n	3100	SSL[4]	No	BSL
	57-12-5	**Cyanide**	**0.85**	**0.85**	**mg/kg**	**SB-116**	**1 / 19**	**0.52 - 0.63**	**0.85**	**NA**	**0.27 n**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7439-89-6	**Iron**	**2280 J**	**85300 J**	**mg/kg**	**SB-109**	**19 / 19**	**10.3 - 30.5**	**85300**	**NA**	**5500 n**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7439-92-1	**Lead**	**7.3 J**	**10100 J**	**mg/kg**	**SB-110**	**19 / 19**	**0.52 - 23.7**	**10100**	**NA**	**400 n[11]**	**400**	**SSL[4]**	**Yes**	**ASL**
	7439-95-4	Magnesium	169 J	829	mg/kg	SB-109	18 / 19	515 - 609	829	NA	NA	NL	SSL[4]	No	NUT
	7439-96-5	**Manganese**	**16.2**	**427 J**	**mg/kg**	**SB-109**	**19 / 19**	**0.52 - 23.7**	**427**	**NA**	**180 n**	**11000**	**SSL[4]**	**Yes**	**ASL**
	7439-97-6	Mercury	0.079 J	0.23	mg/kg	SB-109	6 / 19	0.11 - 0.12	0.23	NA	2.3 n[12]	23	SSL[4]	No	BSL
	7440-02-0	Nickel	1.1 J	64.4	mg/kg	SB-110	19 / 19	0.52 - 0.59	64.4	NA	150 n[13]	1600	SSL[4]	No	BSL
	7440-09-7	Potassium	214 J	325 J	mg/kg	SS-116	2 / 19	515 - 609	325	NA	NA	NL	SSL[4]	No	NUT
	7440-22-4	Silver	0.14 J	0.91	mg/kg	SB-109	5 / 19	0.52 - 0.59	0.91	NA	39 n	390	SSL[4]	No	BSL
	7440-23-5	Sodium	277 J	277 J	mg/kg	SB-109	1 / 19	515 - 609	277	NA	NA	NL	SSL[4]	No	NUT

TABLE B-2.1b

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Open Field / Waste Disposal Area

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Inorganics continued**														
	7440-62-2	**Vanadium**	**3.9**	**146**	**mg/kg**	**SB-117**	**19 / 19**	**2.6 - 3**	**146**	**NA**	**39 n[14]**	**78**	**SSL[4]**	**Yes**	**ASL**
	7440-66-6	**Zinc**	**9.3 J**	**13400**	**mg/kg**	**SB-109**	**19 / 19**	**1 - 47.4**	**13400**	**NA**	**2300 n**	**23000**	**SSL[4]**	**Yes**	**ASL**

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level
TOXB = group A carcinogen, but below screening level

Deletion Reason: BSL = below screening level
NUT = essential nutrient
NTX = no screening level
IFD = detection frequency less than 5%

[4] Potential ARAR/TBC value from New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard.

[5] screening value for acenaphthene

[6] screening value for pyrene

[7] screening value for anthracene

[8] screening value for hexachlorocyclohexane, technical

[9] screening value for chlordane

[10] screening value for chromium VI

[11] Screening value is based on OSWER screening value for residential soil. Lead is further screened in Table 3-2.

[12] screening value for mercuric chloride (and other mercury salts)

[13] screening value for nickel soluble salts

[14] screening value for vanadium and compounds

NA = not available
NL = not listed
n = screening toxicity value based on noncancer effects
c = screening toxicity value based on cancer effects
SSL = soil screening level
COPC = chemical of potential concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = qualifier for estimated value
J+ = qualifier for estimated value biased high
NJ = qualifier for tentatively identified and estimated value
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
4,4'-DDE = p,p'-dichlorodiphenyldichloroethylene
4,4'-DDT = p,p'-dichlorodiphenyltrichloroethane
TEQ = toxicity equivalence

TABLE B-2.1c

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current
Medium:	Soil
Exposure Medium:	Surface Soil - Rental Home Area

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Semi-volatile Organic Compounds**														
	91-57-6	2-Methylnaphthalene	150 J	2100 J	µg/kg	RHA-SS-10	2 / 10	170 - 4100	2100	NA	24000 n	230000	SSL[4]	No	BSL
	83-32-9	Acenaphthene	9700 J-	9700 J-	µg/kg	RHA-SS-10	1 / 10	170 - 4100	9700	NA	360000 n	3400000	SSL[4]	No	BSL
	208-96-8	Acenaphthylene	62 J	4100 J	µg/kg	RHA-SS-10	3 / 10	170 - 4100	4100	NA	360000 n[5]	NA	SSL[4]	No	BSL
	98-86-2	Acetophenone	64 J	150 J	µg/kg	RHA-SS-8	4 / 10	170 - 4100	150	NA	780000 n	2000	SSL[4]	No	BSL
	120-12-7	Anthracene	34 J	49000 J-	µg/kg	RHA-SS-10	4 / 10	170 - 4100	49000	NA	1800000 n	17000000	SSL[4]	No	BSL
	56-55-3	**Benzo(a)anthracene**	**27 J**	**130000**	**µg/kg**	**RHA-SS-10**	**9 / 10**	**170 - 41000**	**130000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	50-32-8	**Benzo(a)pyrene**	**29 J**	**79000**	**µg/kg**	**RHA-SS-10**	**9 / 10**	**170 - 41000**	**79000**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	205-99-2	**Benzo(b)fluoranthene**	**41 J**	**110000 J**	**µg/kg**	**RHA-SS-10**	**9 / 10**	**170 - 41000**	**110000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	191-24-2	Benzo(g,h,i)perylene	49 J	34000	µg/kg	RHA-SS-10	7 / 10	170 - 4100	34000	NA	180000 n[6]	380000000	SSL[4]	No	BSL
	207-08-9	**Benzo(k)fluoranthene**	**50 J**	**63000**	**µg/kg**	**RHA-SS-10**	**6 / 10**	**170 - 41000**	**63000**	**NA**	**1600 c**	**6000**	**SSL[4]**	**Yes**	**ASL**
	117-81-7	Bis(2-Ethylhexyl)Phthalate	43 J	2600	µg/kg	RHA-SS-7	6 / 10	170 - 4100	2600	NA	39000 c	35000	SSL[4]	No	BSL
	86-74-8	Carbazole	20000 J-	20000 J-	µg/kg	RHA-SS-10	1 / 10	170 - 4100	20000	NA	NA	24000	SSL[4]	No	NTX
	218-01-9	**Chrysene**	**35 J**	**110000**	**µg/kg**	**RHA-SS-10**	**9 / 10**	**170 - 41000**	**110000**	**NA**	**16000 c**	**62000**	**SSL[4]**	**Yes**	**ASL**
	53-70-3	**Dibenzo(a,h)anthracene**	**40 J**	**23000**	**µg/kg**	**RHA-SS-10**	**3 / 10**	**170 - 4100**	**23000**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	132-64-9	Dibenzofuran	38 J	5600 J-	µg/kg	RHA-SS-10	2 / 10	170 - 4100	5600	NA	7300 n	NL	SSL[4]	No	BSL
	84-74-2	Di-N-Butylphthalate	59 J	80 J	µg/kg	RHA-SS-7	9 / 10	170 - 4100	80	NA	630000 n	6100000	SSL[4]	No	BSL
	206-44-0	Fluoranthene	39 J	190000 J-	µg/kg	RHA-SS-10	10 / 10	170 - 41000	190000	NA	240000 n	2300000	SSL[4]	No	BSL
	86-73-7	Fluorene	51 J	12000 J-	µg/kg	RHA-SS-10	2 / 10	170 - 4100	12000	NA	240000 n	2300000	SSL[4]	No	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**45 J**	**35000**	**µg/kg**	**RHA-SS-10**	**6 / 10**	**170 - 4100**	**35000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	91-20-3	Naphthalene	74 J	3200 J	µg/kg	RHA-SS-10	2 / 10	170 - 4100	3200	NA	3800 c	6000	SSL[4]	No	BSL
	85-01-8	Phenanthrene	39 J	120000 J-	µg/kg	RHA-SS-10	8 / 10	170 - 41000	120000	NA	1800000 n[7]	NA	SSL[4]	No	BSL
	129-00-0	**Pyrene**	**41 J**	**180000**	**µg/kg**	**RHA-SS-10**	**10 / 10**	**170 - 41000**	**180000**	**NA**	**180000 n**	**1700000**	**SSL[4]**	**Yes**	**ASL**
	Pesticides/Polychlorinated Biphenyls														
	72-55-9	4,4'-DDE	10 J	10 J	µg/kg	RHA-SS-7	1 / 10	3.4 - 3.9	10	NA	2000 c	2000	SSL[4]	No	BSL
	50-29-3	4,4'-DDT	4.6	18 J	µg/kg	RHA-SS-8	3 / 10	3.4 - 3.9	18	NA	1900 c	2000	SSL[4]	No	BSL
	309-00-2	Aldrin	2.2 J-	2.2 J-	µg/kg	RHA-SS-10	1 / 10	1.7 - 2	2.2	NA	39 c	40	SSL[4]	No	BSL
	319-84-6	Alpha-BHC	2.2 NJ	2.2 NJ	µg/kg	RHA-SS-10	1 / 10	1.7 - 2	2.2	NA	86 c	100	SSL[4]	No	BSL
	5103-71-9	Alpha-Chlordane	14 NJ	78 NJ	µg/kg	RHA-SS-7	2 / 10	1.7 - 20	78	NA	1700 c[8]	200	SSL[4]	No	BSL
	11097-69-1	**Aroclor 1254**	**39 NJ**	**210 J**	**µg/kg**	**RHA-SS-8**	**2 / 10**	**34 - 40**	**210**	**NA**	**120 n**	**200**	**SSL[4]**	**Yes**	**ASL**
	11096-82-5	Aroclor 1260	58	180 J	µg/kg	RHA-SS-8	4 / 10	34 - 57	180	NA	240 c	200	SSL[4]	No	BSL
	60-57-1	Dieldrin	3.6	4.7 J	µg/kg	RHA-SS-7	2 / 10	3.5 - 3.9	4.7	NA	34 c	40	SSL[4]	No	BSL
	53494-70-5	Endrin Ketone	14 J-	14 J-	µg/kg	RHA-SS-10	1 / 10	3.4 - 3.9	14	NA	1900 n[9]	NL	SSL[4]	No	BSL
	5103-74-2	Gamma-Chlordane	2.1 J-	67	µg/kg	RHA-SS-7	4 / 10	1.7 - 20	67	NA	1700 c[8]	200	SSL[4]	No	BSL
	1024-57-3	Heptachlor Epoxide	4.8	7.2	µg/kg	RHA-SS-7	2 / 10	1.7 - 2	7.2	NA	70 c	70	SSL[4]	No	BSL
	Inorganics														
	7429-90-5	Aluminum	2640	5080	mg/kg	RHA-SS-4	10 / 10	14.5 - 17.7	5080	NA	7700 n	78000	SSL[4]	No	BSL
	7440-36-0	**Antimony**	**0.9**	**3.2**	**mg/kg**	**RHA-SS-8**	**4 / 10**	**0.73 - 0.88**	**3.2**	**NA**	**3.1 n**	**31**	**SSL[4]**	**Yes**	**ASL**
	7440-38-2	**Arsenic**	**1.5**	**3.7**	**mg/kg**	**RHA-SS-7**	**10 / 10**	**0.36 - 0.44**	**3.7**	**NA**	**0.68 c**	**0.4**	**SSL[4]**	**Yes**	**ASL**
	7440-39-3	Barium	20.9	110	mg/kg	RHA-SS-7	10 / 10	3.6 - 4.4	110	NA	1500 n	16000	SSL[4]	No	BSL
	7440-41-7	Beryllium	0.13 J	0.46	mg/kg	RHA-SS-2	10 / 10	0.36 - 0.44	0.46	NA	16 n	16	SSL[4]	No	BSL

TABLE B-2.1c

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current
Medium:	Soil
Exposure Medium:	Surface Soil - Rental Home Area

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Inorganics continued**														
	7440-43-9	Cadmium	0.11 J	0.67	mg/kg	RHA-SS-7	10 / 10	0.36 - 0.44	0.67	NA	7.1 n	78	SSL[4]	No	BSL
	7440-70-2	Calcium	366 J	26300	mg/kg	RHA-SS-2	10 / 10	363 - 442	26300	NA	NA	NL	SSL[4]	No	NUT
	7440-47-3	**Chromium**	**6.4**	**40.2**	**mg/kg**	**RHA-SS-2**	**10 / 10**	**0.73 - 0.88**	**40.2**	**NA**	**0.3 c[10]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7440-48-4	**Cobalt**	**1.2**	**2.6**	**mg/kg**	**RHA-SS-7**	**10 / 10**	**0.36 - 0.44**	**2.6**	**NA**	**2.3 n**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7440-50-8	Copper	7.9	82.2	mg/kg	RHA-SS-8	10 / 10	0.73 - 0.88	82.2	NA	310 n	3100	SSL[4]	No	BSL
	7439-89-6	**Iron**	**5960**	**13300**	**mg/kg**	**RHA-SS-10**	**10 / 10**	**7.3 - 8.8**	**13300**	**NA**	**5500 n**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7439-92-1	Lead	64.5	763	mg/kg	RHA-SS-8	10 / 10	0.42 - 11	763	NA	400 n[11]	400	SSL[4]	No	BSL
	7439-95-4	Magnesium	402	7270	mg/kg	RHA-SS-2	10 / 10	363 - 442	7270	NA	NA	NL	SSL[4]	No	NUT
	7439-96-5	**Manganese**	**60.5**	**722**	**mg/kg**	**RHA-SS-2**	**10 / 10**	**0.37 - 10.3**	**722**	**NA**	**180 n**	**11000**	**SSL[4]**	**Yes**	**ASL**
	7439-97-6	Mercury	0.059 J	0.58	mg/kg	RHA-SS-8	10 / 10	0.091 - 0.11	0.58	NA	2.3 n[12]	23	SSL[4]	No	BSL
	7440-02-0	Nickel	4.1	15	mg/kg	RHA-SS-8	10 / 10	0.36 - 0.44	15	NA	150 n[13]	1600	SSL[4]	No	BSL
	7440-09-7	Potassium	214 J	793	mg/kg	RHA-SS-10	10 / 10	363 - 442	793	NA	NA	NL	SSL[4]	No	NUT
	7782-49-2	Selenium	0.11 J	0.44 J	mg/kg	RHA-SS-7	10 / 10	1.8 - 2.2	0.44	NA	39 n	390	SSL[4]	No	BSL
	7440-23-5	Sodium	33.9 J	167 J	mg/kg	RHA-SS-5	10 / 10	363 - 442	167	NA	NA	NL	SSL[4]	No	NUT
	7440-28-0	**Thallium**	**0.03 J**	**0.084 J**	**mg/kg**	**RHA-SS-7**	**10 / 10**	**0.36 - 0.44**	**0.084**	**NA**	**0.078 n**	**5**	**SSL[4]**	**Yes**	**ASL**
	7440-62-2	Vanadium	7.7	21.5	mg/kg	RHA-SS-10	10 / 10	1.8 - 2.2	21.5	NA	39 n[14]	78	SSL[4]	No	BSL
	7440-66-6	Zinc	33.5	139	mg/kg	RHA-SS-8	10 / 10	0.73 - 18.3	139	NA	2300 n	23000	SSL[4]	No	BSL

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level

Deletion Reason: BSL = below screening level
NTX = no screening level
NUT = essential nutrient

[4] Potential ARAR/TBC value from New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard.

[5] screening value for acenaphthene

[6] screening value for pyrene

[7] screening value for anthracene

[8] screening value for chlordane

[9] screening value for endrin

[10] screening value for chromium VI

[11] Screening value is based on OSWER screening value for residential soil. Mean lead concentration is further screened in Table 3-2.

[12] screening value for mercuric chloride (and other mercury salts)

[13] screening value for nickel soluble salts

[14] screening value for vanadium and compounds

NA = not available
NL = not listed
n = screening toxicity value based on noncancer effects
c = screening toxicity value based on cancer effects
s = concentration may exceed saturation concentration
SSL = soil screening level
COPC = chemical of potential concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = qualifier for estimated value
J- = qualifier for estimated value biased low
JN = qualifier for tentatively identified and estimated value
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
4,4'-DDE = p,p'-dichlorodiphenyldichloroethylene
4,4'-DDT = p,p'-dichlorodiphenyltrichloroethane
BHC = hexachlorocyclohexane
TEQ = toxicity equivalence

TABLE B-2.1d

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Willow Woods Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Volatile Organic Compounds**														
	67-64-1	Acetone	10 J	10 J	µg/kg	WW-SB-204	1 / 10	9.5 - 13	10	NA	6100000 n	70000000	SSL[4]	No	BSL
	Semi-volatile Organic Compounds														
	83-32-9	Acenaphthene	37 J	37 J	µg/kg	WW-SB-203	1 / 10	180 - 260	37	NA	360000 n	3400000	SSL[4]	No	BSL
	98-86-2	Acetophenone	60 J	60 J	µg/kg	WW-SB-210	1 / 10	180 - 260	60	NA	780000 n	2000	SSL[4]	No	BSL
	120-12-7	Anthracene	28 J	97 J	µg/kg	WW-SB-203	7 / 10	180 - 260	97	NA	1800000 n	17000000	SSL[4]	No	BSL
	100-52-7	Benzaldehyde	120 J	120 J	µg/kg	WW-SB-204	1 / 10	180 - 260	120	NA	780000 n	6100000	SSL[4]	No	BSL
	56-55-3	**Benzo(a)anthracene**	**71 J**	**620**	**µg/kg**	**WW-SB-201**	**8 / 10**	**180 - 260**	**620**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	50-32-8	**Benzo(a)pyrene**	**100 J**	**670**	**µg/kg**	**WW-SB-201**	**8 / 10**	**180 - 260**	**670**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	205-99-2	**Benzo(b)fluoranthene**	**47 J**	**1100 J**	**µg/kg**	**WW-SB-201/ WW-SB-205**	**9 / 10**	**180 - 260**	**1100**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	191-24-2	Benzo(g,h,i)perylene	110 J	570	µg/kg	WW-SB-205	8 / 10	180 - 260	570	NA	180000 n[5]	380000000	SSL[4]	No	BSL
	207-08-9	Benzo(k)fluoranthene	73 J	630 J	µg/kg	WW-SB-205	8 / 10	180 - 260	630	NA	1600 c	6000	SSL[4]	No	BSL
	117-81-7	Bis(2-Ethylhexyl)Phthalate	50 J	360	µg/kg	WW-SB-201	5 / 10	180 - 260	360	NA	39000 c	35000	SSL[4]	No	BSL
	86-74-8	Carbazole	43 J	92 J	µg/kg	WW-SB-203	4 / 10	180 - 260	92	NA	NA	24000	SSL[4]	No	NTX
	218-01-9	Chrysene	77 J	920	µg/kg	WW-SB-201	9 / 10	180 - 260	920	NA	16000 c	62000	SSL[4]	No	BSL
	53-70-3	**Dibenzo(a,h)anthracene**	**38 J**	**160 J**	**µg/kg**	**WW-SB-201/ WW-SB-205**	**7 / 10**	**180 - 260**	**160**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	84-74-2	Di-N-Butylphthalate	54 J	65 J	µg/kg	WW-SB-201/ WW-SB-204	7 / 10	180 - 260	65	NA	630000 n	6100000	SSL[4]	No	BSL
	206-44-0	Fluoranthene	43 J	1400	µg/kg	WW-SB-205	10 / 10	180 - 260	1400	NA	240000 n	2300000	SSL[4]	No	BSL
	86-73-7	Fluorene	46 J	46 J	µg/kg	WW-SB-203	1 / 10	180 - 260	46	NA	240000 n	2300000	SSL[4]	No	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**89 J**	**480**	**µg/kg**	**WW-SB-205**	**8 / 10**	**180 - 260**	**480**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	85-01-8	Phenanthrene	58 J	950	µg/kg	WW-SB-203	9 / 10	180 - 260	950	NA	1800000 n[6]	NL	SSL[4]	No	BSL
	129-00-0	Pyrene	40 J	1500	µg/kg	WW-SB-201	10 / 10	180 - 260	1500	NA	180000 n	1700000	SSL[4]	No	BSL
	Pesticides/Polychlorinated Biphenyls														
	72-55-9	4,4'-DDE	10 J	10 J	µg/kg	WW-SB-208	1 / 10	3.5 - 5	10	NA	2000 c	2000	SSL[4]	No	BSL
	50-29-3	4,4'-DDT	7.4 J	8.4	µg/kg	WW-SB-208	2 / 10	3.5 - 5	8.4	NA	1900 c	2000	SSL[4]	No	BSL
	5103-71-9	Alpha-Chlordane	6.3 NJ	6.6 J	µg/kg	WW-SB-201	2 / 10	1.8 - 2.6	6.6	NA	1700 c[7]	200	SSL[4]	No	BSL
	11096-82-5	Aroclor 1260	110	110	µg/kg	WW-SB-205	1 / 10	35 - 50	110	NA	240 c	200	SSL[4]	No	BSL
	60-57-1	Dieldrin	5.7 J	5.7 J	µg/kg	WW-SB-205	1 / 10	3.5 - 5	5.7	NA	34 c	40	SSL[4]	No	BSL
	1031-07-8	Endosulfan Sulfate	8.8	8.8	µg/kg	WW-SB-205	1 / 10	3.5 - 5	8.8	NA	47000 n[8]	470000	SSL[4]	No	BSL
	7421-93-4	Endrin Aldehyde	6.2	6.2	µg/kg	WW-SB-205	1 / 10	3.5 - 5	6.2	NA	1900 n[9]	NL	SSL[4]	No	BSL
	5103-74-2	Gamma-Chlordane	2.1 J	5.6 J	µg/kg	WW-SB-203	3 / 10	1.8 - 2.6	5.6	NA	1700 c[7]	200	SSL[4]	No	BSL
	76-44-8	Heptachlor	4.3	4.3	µg/kg	WW-SB-205	1 / 10	1.8 - 2.6	4.3	NA	130 c	100	SSL[4]	No	BSL
	Inorganics														
	7429-90-5	Aluminum	1570 J	4060	mg/kg	WW-SB-207	10 / 10	20.7 - 23.4	4060	NA	7700 n	78000	SSL[4]	No	BSL
	7440-36-0	Antimony	0.21 J	0.57 J	mg/kg	WW-SB-208	5 / 10	1 - 1.2	0.57	NA	3.1 n	31	SSL[4]	No	BSL
	7440-38-2	**Arsenic**	**0.63**	**14.8**	**mg/kg**	**WW-SB-202**	**9 / 10**	**0.52 - 0.58**	**14.8**	**NA**	**0.68 c**	**0.4**	**SSL[4]**	**Yes**	**ASL**
	7440-39-3	Barium	7.8 J	18.2	mg/kg	WW-SB-209	9 / 10	5.2 - 5.8	18.2	NA	1500 n	16000	SSL[4]	No	BSL

TABLE B-2.1d

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Willow Woods Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Inorganics continued**														
	7440-43-9	Cadmium	0.12 J	0.42 J	mg/kg	WW-SB-205	4 / 10	0.52 - 0.58	0.42	NA	7.1 n	78	SSL[4]	No	BSL
	7440-70-2	Calcium	383 J	1230	mg/kg	WW-SB-205	8 / 10	517 - 584	1230	NA	NA	NL	SSL[4]	No	NUT
	7440-47-3	**Chromium**	**2.1**	**13.3**	**mg/kg**	**WW-SB-207**	**9 / 10**	**1 - 1.2**	**13.3**	**NA**	**0.3 c[10]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7440-48-4	Cobalt	0.48 J	0.89	mg/kg	WW-SB-205	9 / 10	0.52 - 0.58	0.89	NA	2.3 n	1600	SSL[4]	No	BSL
	7440-50-8	Copper	2.4 J	10.2 J	mg/kg	WW-SB-205	9 / 10	1 - 1.2	10.2	NA	310 n	3100	SSL[4]	No	BSL
	7439-89-6	**Iron**	**4420 J**	**16500**	**mg/kg**	**WW-SB-207**	**10 / 10**	**10.3 - 11.7**	**16500**	**NA**	**5500 n**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7439-92-1	Lead	10.3	75.5	mg/kg	WW-SB-205	9 / 10	0.52 - 0.58	75.5	NA	400 n[11]	400	SSL[4]	No	BSL
	7439-95-4	Magnesium	185 J	561	mg/kg	WW-SB-210	10 / 10	517 - 584	561	NA	NA	NL	SSL[4]	No	NUT
	7439-96-5	Manganese	20.1	73.6 J	mg/kg	WW-SB-208	9 / 10	0.52 - 0.58	73.6	NA	180 n	11000	SSL[4]	No	BSL
	7439-97-6	Mercury	0.024 J	0.12	mg/kg	WW-SB-209	2 / 10	0.099 - 0.12	0.12	NA	2.3 n[12]	23	SSL[4]	No	BSL
	7440-02-0	Nickel	1.3 J	6.5 J	mg/kg	WW-SB-205	9 / 10	0.52 - 0.58	6.5	NA	150 n[13]	1600	SSL[4]	No	BSL
	7440-09-7	Potassium	188 J	903	mg/kg	WW-SB-207	6 / 10	517 - 584	903	NA	NA	NL	SSL[4]	No	NUT
	7440-62-2	Vanadium	3.1	20.9	mg/kg	WW-SB-207	9 / 10	2.6 - 2.9	20.9	NA	39 n[14]	78	SSL[4]	No	BSL
	7440-66-6	Zinc	8.4	55.3	mg/kg	WW-SB-205	9 / 10	1 - 1.2	55.3	NA	2300 n	23000	SSL[4]	No	BSL

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level

Deletion Reason: BSL = below screening level

NTX = no screening level

NUT = essential nutrient

[4] Potential ARAR/TBC value from New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard.

[5] screening value for pyrene

[6] screening value for anthracene

[7] screening value for chlordane

[8] screening value for endosulfan

[9] screening value for endrin

[10] screening value for chromium VI

[11] Screening value is based on OSWER screening value for residential soil. Lead is further screened in Table 3-2.

[12] screening value for mercuric chloride (and other mercury salts)

[13] screening value for nickel soluble salts

[14] screening value for vanadium and compounds

NA = not available

NL = not listed

n = screening toxicity value based on noncancer effects

c = screening toxicity value based on cancer effects

s = concentration may exceed saturation concentration

SSL = soil screening level

COPC = chemical of potential concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = qualifier for estimated value

NJ = qualifier for tentatively identified and estimated value

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

4,4'-DDE = p,p'-dichlorodiphenyldichloroethylene

4,4'-DDT = p,p'-dichlorodiphenyltrichloroethane

TABLE B-2.1e

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface Soil - Matteo Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Volatile Organic Compounds**														
	75-35-4	1,1-Dichloroethene	2.8 J	2.8 J	µg/kg	SB-111	1 / 24	4 - 7.6	2.8	NA	23000 n	11000	SSL[4]	No	IFD
	78-93-3	2-Butanone	5.7 J	5.7 J	µg/kg	SB-104	1 / 24	8 - 15	5.7	NA	2700000 n	3100000	SSL[4]	No	IFD
	10061-01-5	cis-1,3-Dichloropropene	2.9 J	2.9 J	µg/kg	SB-102	1 / 24	4 - 7.6	2.9	NA	1800 c[5]	2000	SSL[4]	No	IFD
	127-18-4	Tetrachloroethene	11 J+	27 J+	µg/kg	SB-111	2 / 24	4 - 7.6	27	NA	8100 n	2000	SSL[4]	No	BSL
	108-88-3	Toluene	2 J	2 J	µg/kg	SB-111	1 / 24	4 - 7.6	2	NA	360000 ns	6300000	SSL[4]	No	IFD
	79-01-6	**Trichloroethene**	**2.4 J**	**7 J+**	**µg/kg**	**SB-111**	**2 / 24**	**4 - 7.6**	**7**	**NA**	**410 n**	**7000**	**SSL[4]**	**Yes**	**TOXB**
	Semi-volatile Organic Compounds														
	92-52-4	1,1'-Biphenyl	36 J	150 J	µg/kg	SB-111	2 / 24	170 - 4100	150	NA	4700 n	3100000	SSL[4]	No	BSL
	91-57-6	2-Methylnaphthalene	68 J	2100 J	µg/kg	RHA-SS-10	4 / 24	170 - 4100	2100	NA	24000 n	230000	SSL[4]	No	BSL
	83-32-9	Acenaphthene	36 J	9700 J-	µg/kg	RHA-SS-10	5 / 24	170 - 4100	9700	NA	360000 n	3400000	SSL[4]	No	BSL
	208-96-8	Acenaphthylene	62 J	4100 J	µg/kg	RHA-SS-10	7 / 24	170 - 4100	4100	NA	360000 n[6]	NA	SSL[4]	No	BSL
	98-86-2	Acetophenone	64 J	400	µg/kg	SB-111	9 / 24	170 - 4100	400	NA	780000 n	2000	SSL[4]	No	BSL
	120-12-7	Anthracene	34 J	49000 J-	µg/kg	RHA-SS-10	11 / 24	170 - 4100	49000	NA	1800000 n	17000000	SSL[4]	No	BSL
	100-52-7	Benzaldehyde	42 J	320 J+	µg/kg	SB-111	4 / 24	170 - 4100	320	NA	780000 n	6100000	SSL[4]	No	BSL
	56-55-3	**Benzo(a)anthracene**	**19 J**	**130000**	**µg/kg**	**RHA-SS-10**	**19 / 24**	**170 - 41000**	**130000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	50-32-8	**Benzo(a)pyrene**	**29 J**	**79000**	**µg/kg**	**RHA-SS-10**	**16 / 24**	**170 - 41000**	**79000**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	205-99-2	**Benzo(b)fluoranthene**	**23 J**	**110000 J**	**µg/kg**	**RHA-SS-10**	**19 / 24**	**170 - 41000**	**110000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	191-24-2	Benzo(g,h,i)perylene	26 J	34000	µg/kg	RHA-SS-10	15 / 24	170 - 4100	34000	NA	180000 n[7]	380000000	SSL[4]	No	BSL
	207-08-9	**Benzo(k)fluoranthene**	**50 J**	**63000**	**µg/kg**	**RHA-SS-10**	**13 / 24**	**170 - 41000**	**63000**	**NA**	**1600 c**	**6000**	**SSL[4]**	**Yes**	**ASL**
	117-81-7	Bis(2-Ethylhexyl)Phthalate	43 J	2600	µg/kg	RHA-SS-7	13 / 24	170 - 4100	2600	NA	39000 c	35000	SSL[4]	No	BSL
	85-68-7	Butylbenzylphthalate	48 J	920	µg/kg	SB-107	3 / 24	170 - 4100	920	NA	290000 c	1200000	SSL[4]	No	BSL
	86-74-8	Carbazole	64 J	20000 J-	µg/kg	RHA-SS-10	4 / 24	170 - 4100	20000	NA	NA	24000	SSL[4]	No	NTX
	218-01-9	**Chrysene**	**27 J**	**110000**	**µg/kg**	**RHA-SS-10**	**19 / 24**	**170 - 41000**	**110000**	**NA**	**16000 c**	**62000**	**SSL[4]**	**Yes**	**ASL**
	53-70-3	**Dibenzo(a,h)anthracene**	**40 J**	**23000**	**µg/kg**	**RHA-SS-10**	**9 / 24**	**170 - 4100**	**23000**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	132-64-9	Dibenzofuran	27 J	5600 J-	µg/kg	RHA-SS-10	6 / 24	170 - 4100	5600	NA	7300 n	NL	SSL[4]	No	BSL
	131-11-3	Dimethylphthalate	52 J	72 J	µg/kg	SB-107	2 / 24	170 - 4100	72	NA	NA	NL	SSL[4]	No	NTX
	84-74-2	Di-N-Butylphthalate	48 J	200 J	µg/kg	SB-107	14 / 24	170 - 4100	200	NA	630000 n	6100000	SSL[4]	No	BSL
	206-44-0	Fluoranthene	28 J	190000 J-	µg/kg	RHA-SS-10	20 / 24	170 - 41000	190000	NA	240000 n	2300000	SSL[4]	No	BSL
	86-73-7	Fluorene	48 J	12000 J-	µg/kg	RHA-SS-10	7 / 24	170 - 4100	12000	NA	240000 n	2300000	SSL[4]	No	BSL
	118-74-1	Hexachlorobenzene	120 J	120 J	µg/kg	SB-107	1 / 24	170 - 4100	120	NA	210 c	300	SSL[4]	No	IFD
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**45 J**	**35000**	**µg/kg**	**RHA-SS-10**	**13 / 24**	**170 - 4100**	**35000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	91-20-3	Naphthalene	27 J	3200 J	µg/kg	RHA-SS-10	5 / 24	170 - 4100	3200	NA	3800 c	6000	SSL[4]	No	BSL
	86-30-6	N-Nitrosodiphenylamine	200	200	µg/kg	SB-111	1 / 24	170 - 4100	200	NA	110000 c	99000	SSL[4]	No	IFD
	85-01-8	Phenanthrene	39 J	120000 J-	µg/kg	RHA-SS-10	16 / 24	170 - 41000	120000	NA	1800000 n[8]	NL	SSL[4]	No	BSL
	108-95-2	Phenol	140 J	140 J	µg/kg	SB-111	1 / 24	170 - 4100	140	NA	1900000 n	18000000	SSL[4]	No	IFD
	129-00-0	**Pyrene**	**27 J**	**180000**	**µg/kg**	**RHA-SS-10**	**20 / 24**	**170 - 41000**	**180000**	**NA**	**180000 n**	**1700000**	**SSL[4]**	**Yes**	**ASL**
	Dioxins/Furans														
	--	**Dioxin/Furan TEQ**	**0.74**	**48.37**	**ng/kg**	**SB-102**	**14 / 14**	**NA - NA**	**48.37**	**NA**	**4.8 c**	**NL**	**NL**	**Yes**	**ASL**

TABLE B-2.1e

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface Soil - Matteo Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Pesticides/Polychlorinated Biphenyls**														
	72-54-8	4,4'-DDD	25 NJ	25 NJ	µg/kg	SB-101	1 / 25	3.4 - 4400	25	NA	2300 c	3000	SSL[4]	No	IFD
	72-55-9	4,4'-DDE	10 J	1900 NJ	µg/kg	SB-107	5 / 25	3.4 - 490	1900	NA	2000 c	2000	SSL[4]	No	BSL
	50-29-3	**4,4'-DDT**	**4.6 NJ**	**32000 J**	**µg/kg**	**SB-107**	**10 / 25**	**3.4 - 3900**	**32000**	**NA**	**1900 c**	**2000**	**SSL[4]**	**Yes**	**ASL**
	309-00-2	Aldrin	2.2 J-	2.2 J-	µg/kg	RHA-SS-10	1 / 25	1.7 - 250	2.2	NA	39 c	40	SSL[4]	No	IFD
	319-84-6	Alpha-BHC	2.2 NJ	2.2 NJ	µg/kg	RHA-SS-10	1 / 25	1.7 - 250	2.2	NA	86 c	100	SSL[4]	No	IFD
	5103-71-9	Alpha-Chlordane	2.2	78 NJ	µg/kg	RHA-SS-7	4 / 25	1.7 - 250	78	NA	1700 c[9]	200	SSL[4]	No	BSL
	12672-29-6	Aroclor 1248	480 J	3400 NJ	µg/kg	SB-110	2 / 42	34 - 390	3400	NA	230 c	200	SSL[4]	No	IFD
	11097-69-1	**Aroclor 1254**	**36**	**1200 J**	**µg/kg**	**SS-106**	**13 / 42**	**34 - 240**	**1200**	**NA**	**120 n**	**200**	**SSL[4]**	**Yes**	**ASL**
	11096-82-5	**Aroclor 1260**	**20 J**	**200000**	**µg/kg**	**SB-107**	**23 / 42**	**34 - 20000**	**200000**	**NA**	**240 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	319-85-7	Beta-BHC	2.9 NJ	5.3 J	µg/kg	SB-101	2 / 25	1.7 - 250	5.3	NA	300 c	400	SSL[4]	No	BSL
	319-86-8	**Delta-BHC**	**72 J**	**690 J**	**µg/kg**	**SB-107**	**2 / 25**	**1.7 - 250**	**690**	**NA**	**300 c[10]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	60-57-1	**Dieldrin**	**3.6**	**2400 J**	**µg/kg**	**SB-107**	**6 / 25**	**3.5 - 490**	**2400**	**NA**	**34 c**	**40**	**SSL[4]**	**Yes**	**ASL**
	959-98-8	Endosulfan I	5.1 NJ	7.3 NJ	µg/kg	SB-101	2 / 25	1.7 - 250	7.3	NA	47000 n[11]	470000	SSL[4]	No	BSL
	72-20-8	Endrin	12 J	780 J	µg/kg	SB-107	2 / 25	3.4 - 490	780	NA	1900 n	23000	SSL[4]	No	BSL
	53494-70-5	Endrin Ketone	14 J-	14 J-	µg/kg	RHA-SS-10	1 / 25	3.4 - 490	14	NA	1900 n[12]	NL	SSL[4]	No	IFD
	5103-74-2	Gamma-Chlordane	2.1 J-	67	µg/kg	RHA-SS-7	5 / 25	1.7 - 250	67	NA	1700 c[9]	200	SSL[4]	No	BSL
	76-44-8	Heptachlor	5.6 NJ	5.6 NJ	µg/kg	SB-110	1 / 25	1.7 - 250	5.6	NA	130 c	100	SSL[4]	No	IFD
	1024-57-3	**Heptachlor Epoxide**	**2.5 J**	**1600 J**	**µg/kg**	**SB-107**	**7 / 25**	**1.7 - 250**	**1600**	**NA**	**70 c**	**70**	**SSL[4]**	**Yes**	**ASL**
	Inorganics														
	7429-90-5	**Aluminum**	**1250**	**11900**	**mg/kg**	**SB-109**	**36 / 36**	**14.5 - 27.4**	**11900**	**NA**	**7700 n**	**78000**	**SSL[4]**	**Yes**	**ASL**
	7440-36-0	**Antimony**	**0.22 J**	**25.2 J**	**mg/kg**	**SB-101**	**20 / 36**	**0.73 - 1.4**	**25.2**	**NA**	**3.1 n**	**31**	**SSL[4]**	**Yes**	**ASL**
	7440-38-2	**Arsenic**	**1.3**	**8 J**	**mg/kg**	**SB-109**	**36 / 36**	**0.36 - 0.69**	**8**	**NA**	**0.68 c**	**0.4**	**SSL[4]**	**Yes**	**ASL**
	7440-39-3	Barium	9.2	155	mg/kg	SB-107	27 / 36	3.6 - 1980	155	NA	1500 n	16000	SSL[4]	No	BSL
	7440-41-7	Beryllium	0.13 J	0.46	mg/kg	RHA-SS-2	16 / 36	0.36 - 0.69	0.46	NA	16 n	16	SSL[4]	No	BSL
	7440-43-9	**Cadmium**	**0.11 J**	**11.3**	**mg/kg**	**SB-101**	**22 / 36**	**0.36 - 0.69**	**11.3**	**NA**	**7.1 n**	**78**	**SSL[4]**	**Yes**	**ASL**
	7440-70-2	Calcium	167 J	30100 J	mg/kg	SB-101	32 / 36	363 - 686	30100	NA	NA	NL	SSL[4]	No	NUT
	7440-47-3	**Chromium**	**2.5 J**	**153 J**	**mg/kg**	**SB-101**	**36 / 36**	**0.73 - 1.4**	**153**	**NA**	**0.3 c[13]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7440-48-4	**Cobalt**	**0.37 J**	**11.3**	**mg/kg**	**SB-101**	**36 / 36**	**0.36 - 0.69**	**11.3**	**NA**	**2.3 n**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7440-50-8	**Copper**	**2.8 J**	**4070 J**	**mg/kg**	**SB-101**	**36 / 36**	**0.73 - 22.7**	**4070**	**NA**	**310 n**	**3100**	**SSL[4]**	**Yes**	**ASL**
	57-12-5	**Cyanide**	**0.59 J**	**0.85**	**mg/kg**	**SB-116**	**2 / 36**	**0.5 - 0.67**	**0.85**	**NA**	**0.27 n**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7439-89-6	**Iron**	**2280 J**	**89300 J**	**mg/kg**	**SB-101**	**36 / 36**	**7.3 - 35**	**89300**	**NA**	**5500 n**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7439-92-1	**Lead**	**7.3 J**	**10100 J**	**mg/kg**	**SB-110**	**36 / 36**	**0.42 - 23.7**	**10100**	**NA**	**400 n[14]**	**400**	**SSL[4]**	**Yes**	**ASL**
	7439-95-4	Magnesium	169 J	7460	mg/kg	SB-107	35 / 36	363 - 686	7460	NA	NA	NL	SSL[4]	No	NUT
	7439-96-5	**Manganese**	**16.2**	**722**	**mg/kg**	**RHA-SS-2**	**36 / 36**	**0.37 - 23.7**	**722**	**NA**	**180 n**	**11000**	**SSL[4]**	**Yes**	**ASL**
	7439-97-6	**Mercury**	**0.035 J**	**2.9 J**	**mg/kg**	**SB-101**	**21 / 36**	**0.091 - 0.16**	**2.9**	**NA**	**2.3 n[15]**	**23**	**SSL[4]**	**Yes**	**ASL**
	7440-02-0	**Nickel**	**1.1 J**	**218 J**	**mg/kg**	**SB-101**	**36 / 36**	**0.36 - 0.69**	**218**	**NA**	**150 n[16]**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7440-09-7	Potassium	173 J	793	mg/kg	RHA-SS-10	15 / 36	363 - 686	793	NA	NA	NL	SSL[4]	No	NUT

TABLE B-2.1e

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface Soil - Matteo Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Soil	**Inorganics continued**														
	7782-49-2	Selenium	0.11 J	0.44 J	mg/kg	RHA-SS-7	10 / 36	1.8 - 3.4	0.44	NA	39 n	390	SSL[4]	No	BSL
	7440-22-4	Silver	0.14 J	1.4	mg/kg	SB-101	8 / 36	0.36 - 0.69	1.4	NA	39 n	390	SSL[4]	No	BSL
	7440-23-5	Sodium	33.9 J	799	mg/kg	SB-101	12 / 36	363 - 686	799	NA	NA	NL	SSL[4]	No	NUT
	7440-28-0	**Thallium**	**0.03 J**	**0.084 J**	**mg/kg**	**RHA-SS-7**	**10 / 36**	**0.36 - 0.69**	**0.084**	**NA**	**0.078 n**	**5**	**SSL[4]**	**Yes**	**ASL**
	7440-62-2	**Vanadium**	**3.9**	**146**	**mg/kg**	**SB-117**	**36 / 36**	**1.8 - 3.4**	**146**	**NA**	**39 n[17]**	**78**	**SSL[4]**	**Yes**	**ASL**
	7440-66-6	**Zinc**	**9.3 J**	**13400**	**mg/kg**	**SB-109**	**36 / 36**	**0.73 - 47.4**	**13400**	**NA**	**2300 n**	**23000**	**SSL[4]**	**Yes**	**ASL**

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level
TOXB = group A carcinogen, but below screening level

Deletion Reason: BSL = below screening level
NTX = no screening level
NUT = essential nutrient
IFD = detection frequency less than 5%

[4] Potential ARAR/TBC value from New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard.

[5] screening value for 1,3-dichloropropene

[6] screening value for acenaphthene

[7] screening value for pyrene

[8] screening value for anthracene

[9] screening value for chlordane

[10] screening value for hexachlorocyclohexane, technical

[11] screening value for endosulfan

[12] screening value for endrin

[13] screening value for chromium VI

[14] Screening value is based on OSWER screening value for residential soil. Lead is further screened in Table 3-2.

[15] screening value for mercuric chloride (and other mercury salts)

[16] screening value for nickel soluble salts

[17] screening value for vanadium and compounds

NA = not available
NL = not listed
n = screening toxicity value based on noncancer effects
c = screening toxicity value based on cancer effects
s = concentration may exceed saturation concentration
SSL = soil screening level
COPC = chemical of potential concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = qualifier for estimated value
J+ = qualifier for estimated value biased high
J- = qualifier for estimated value biased low
JN = qualifier for tentatively identified and estimated value
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
4,4'-DDD = p,p'-dichlorodiphenyldichloroethane
4,4'-DDE = p,p'-dichlorodiphenyldichloroethylene
4,4'-DDT = p,p'-dichlorodiphenyltrichloroethane
BHC = hexachlorocyclohexane
TEQ = toxicity equivalence

TABLE B-2.2a

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil - Matteo Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface / Subsurface Soil	**Volatile Organic Compounds**														
	75-35-4	1,1-Dichloroethene	2.8 J	2.8 J	µg/kg	SB-111	1 / 67	4 - 8.2	2.8	NA	23000 n	11000	SSL[4]	No	IFD
	78-93-3	2-Butanone	5.7 J	5.7 J	µg/kg	SB-104	1 / 67	8 - 16	5.7	NA	2700000 n	3100000	SSL[4]	No	IFD
	67-64-1	Acetone	130	130	µg/kg	SB-108	1 / 67	8 - 56	130	NA	6100000 n	70000000	SSL[4]	No	IFD
	10061-01-5	cis-1,3-Dichloropropene	2.9 J	2.9 J	µg/kg	SB-102	1 / 67	4 - 8.2	2.9	NA	1800 c[5]	2000	SSL[4]	No	IFD
	127-18-4	Tetrachloroethene	11 J+	27 J+	µg/kg	SB-111	2 / 67	4 - 8.2	27	NA	8100 n	2000	SSL[4]	No	IFD
	108-88-3	Toluene	2 J	2 J	µg/kg	SB-111	1 / 67	4 - 8.2	2	NA	360000 ns	6300000	SSL[4]	No	IFD
	79-01-6	**Trichloroethene**	**2.4 J**	**7 J+**	**µg/kg**	**SB-111**	**2 / 67**	**4 - 8.2**	**7**	**NA**	**410 n**	**7000**	**SSL[4]**	**Yes**	**TOXB**
	Semi-volatile Organic Compounds														
	92-52-4	1,1'-Biphenyl	36 J	550	µg/kg	SB-111	5 / 66	170 - 4100	550	NA	4700 n	3100000	SSL[4]	No	BSL
	91-57-6	2-Methylnaphthalene	25 J	2100 J	µg/kg	RHA-SS-10	10 / 66	170 - 4100	2100	NA	24000 n	230000	SSL[4]	No	BSL
	106-47-8	4-Chloroaniline	50 J	50 J	µg/kg	SB-106	1 / 66	170 - 4100	50	NA	2700 c	NL	SSL[4]	No	IFD
	100-01-6	4-Nitroaniline	100 J	100 J	µg/kg	SB-107	1 / 66	340 - 7900	100	NA	25000 n	NL	SSL[4]	No	IFD
	83-32-9	Acenaphthene	34 J	9700 J-	µg/kg	RHA-SS-10	10 / 66	170 - 4100	9700	NA	360000 n	3400000	SSL[4]	No	BSL
	208-96-8	Acenaphthylene	18 J	4100 J	µg/kg	RHA-SS-10	11 / 66	170 - 4100	4100	NA	360000 n[6]	NA	SSL[4]	No	BSL
	98-86-2	Acetophenone	64 J	400	µg/kg	SB-111	18 / 66	170 - 4100	400	NA	780000 n	2000	SSL[4]	No	BSL
	120-12-7	Anthracene	23 J	49000 J-	µg/kg	RHA-SS-10	19 / 66	170 - 4100	49000	NA	1800000 n	17000000	SSL[4]	No	BSL
	100-52-7	Benzaldehyde	42 J	320 J+	µg/kg	SB-111	5 / 66	170 - 4100	320	NA	780000 n	6100000	SSL[4]	No	BSL
	56-55-3	**Benzo(a)anthracene**	**19 J**	**130000**	**µg/kg**	**RHA-SS-10**	**32 / 66**	**170 - 41000**	**130000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	50-32-8	**Benzo(a)pyrene**	**29 J**	**79000**	**µg/kg**	**RHA-SS-10**	**26 / 66**	**170 - 41000**	**79000**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	205-99-2	**Benzo(b)fluoranthene**	**23 J**	**110000 J**	**µg/kg**	**RHA-SS-10**	**31 / 66**	**170 - 41000**	**110000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	191-24-2	Benzo(g,h,i)perylene	26 J	34000	µg/kg	RHA-SS-10	27 / 66	170 - 4100	34000	NA	180000 n[7]	380000000	SSL[4]	No	BSL
	207-08-9	**Benzo(k)fluoranthene**	**37 J**	**63000**	**µg/kg**	**RHA-SS-10**	**23 / 66**	**170 - 41000**	**63000**	**NA**	**1600 c**	**6000**	**SSL[4]**	**Yes**	**ASL**
	117-81-7	Bis(2-Ethylhexyl)Phthalate	40 J	2600	µg/kg	RHA-SS-7	27 / 66	170 - 4100	2600	NA	39000 c	35000	SSL[4]	No	BSL
	85-68-7	Butylbenzylphthalate	48 J	920	µg/kg	SB-107	7 / 66	170 - 4100	920	NA	290000 c	1200000	SSL[4]	No	BSL
	86-74-8	Carbazole	46 J	20000 J-	µg/kg	RHA-SS-10	8 / 66	170 - 4100	20000	NA	NA	24000	SSL[4]	No	NTX
	58-90-2	Chlorophenols	81 NJ	250 NJ	µg/kg	SB-107	2 / 66	170 - 4100	250	NA	190000 n	0	SSL[4]	No	IFD
	218-01-9	**Chrysene**	**26 J**	**110000**	**µg/kg**	**RHA-SS-10**	**32 / 66**	**170 - 41000**	**110000**	**NA**	**16000 c**	**62000**	**SSL[4]**	**Yes**	**ASL**
	53-70-3	**Dibenzo(a,h)anthracene**	**31 J**	**23000**	**µg/kg**	**RHA-SS-10**	**15 / 66**	**170 - 4100**	**23000**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	132-64-9	Dibenzofuran	27 J	5600 J-	µg/kg	RHA-SS-10	11 / 66	170 - 4100	5600	NA	7300 n	NL	SSL[4]	No	BSL
	84-66-2	Diethylphthalate	45 J	45 J	µg/kg	SB-111	1 / 66	170 - 4100	45	NA	5100000 n	49000000	SSL[4]	No	IFD
	131-11-3	Dimethylphthalate	50 J	180 J	µg/kg	SB-101	4 / 66	170 - 4100	180	NA	NA	NL	SSL[4]	No	NTX
	84-74-2	Di-N-Butylphthalate	42 J	240	µg/kg	SB-101	19 / 66	170 - 4100	240	NA	630000 n	6100000	SSL[4]	No	BSL
	206-44-0	Fluoranthene	28 J	190000 J-	µg/kg	RHA-SS-10	32 / 66	170 - 41000	190000	NA	240000 n	2300000	SSL[4]	No	BSL
	86-73-7	Fluorene	43 J	12000 J-	µg/kg	RHA-SS-10	13 / 66	170 - 4100	12000	NA	240000 n	2300000	SSL[4]	No	BSL
	118-74-1	Hexachlorobenzene	120 J	220	µg/kg	SB-101	2 / 66	170 - 4100	220	NA	210 c	300	SSL[4]	No	IFD
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**33 J**	**35000**	**µg/kg**	**RHA-SS-10**	**24 / 66**	**170 - 4100**	**35000**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	91-20-3	Naphthalene	27 J	3200 J	µg/kg	RHA-SS-10	11 / 66	170 - 4100	3200	NA	3800 c	6000	SSL[4]	No	BSL
	86-30-6	N-Nitrosodiphenylamine	140 J	200	µg/kg	SB-111	2 / 66	170 - 4100	200	NA	110000 c	99000	SSL[4]	No	IFD
	85-01-8	Phenanthrene	36 J	120000 J-	µg/kg	RHA-SS-10	27 / 66	170 - 41000	120000	NA	1800000 n[8]	NA	SSL[4]	No	BSL
	108-95-2	Phenol	140 J	140 J	µg/kg	SB-111	1 / 66	170 - 4100	140	NA	1900000 n	18000000	SSL[4]	No	IFD
	129-00-0	**Pyrene**	**27 J**	**180000**	**µg/kg**	**RHA-SS-10**	**32 / 66**	**170 - 41000**	**180000**	**NA**	**180000 n**	**1700000**	**SSL[4]**	**Yes**	**ASL**

TABLE B-2.2a

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil - Matteo Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface / Subsurface Soil	**Dioxins/Furans**														
	--	**Dioxin/Furan TEQ**	**0.74**	**48.37**	**ng/kg**	**SB-101**	**14 / 14**	**NA - NA**	**48.37**	**NA**	**4.8 c**	**NL**	**SSL[4]**	**Yes**	**ASL**
	Pesticides/Polychlorinated Biphenyls														
	72-54-8	4,4'-DDD	7.7 NJ	94 J	µg/kg	SB-101	4 / 58	3.4 - 4400	94	NA	2300 c	3000	SSL[4]	No	BSL
	72-55-9	4,4'-DDE	3.6 NJ	1900 NJ	µg/kg	SB-107	14 / 58	3.4 - 490	1900	NA	2000 c	2000	SSL[4]	No	BSL
	50-29-3	**4,4'-DDT**	**4.6 NJ**	**32000 J**	**µg/kg**	**SB-107**	**22 / 58**	**3.4 - 3900**	**32000**	**NA**	**1900 c**	**2000**	**SSL[4]**	**Yes**	**ASL**
	309-00-2	Aldrin	2.2 J-	2.2 J-	µg/kg	RHA-SS-10	1 / 58	1.7 - 250	2.2	NA	39 c	40	SSL[4]	No	IFD
	319-84-6	Alpha-BHC	2.2 NJ	2.2 NJ	µg/kg	RHA-SS-10	1 / 58	1.7 - 250	2.2	NA	86 c	100	SSL[4]	No	IFD
	5103-71-9	Alpha-Chlordane	2.2	78 NJ	µg/kg	RHA-SS-7	7 / 58	1.7 - 250	78	NA	1700 c[9]	200	SSL[4]	No	BSL
	12672-29-6	Aroclor 1248	78 J	3400 NJ	µg/kg	SB-110	4 / 89	34 - 390	3400	NA	230 c	200	SSL[4]	No	IFD
	11097-69-1	**Aroclor 1254**	**35 J**	**270000 J**	**µg/kg**	**SB-113**	**26 / 89**	**34 - 77000**	**270000**	**NA**	**120 n**	**200**	**SSL[4]**	**Yes**	**ASL**
	11096-82-5	**Aroclor 1260**	**20 J**	**540000 J**	**µg/kg**	**SB-113**	**48 / 89**	**34 - 77000**	**540000**	**NA**	**240 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	11100-14-4	Aroclor 1268	270 JN	860 J	µg/kg	SB-111	2 / 89	34 - 2000	860	NA	120 n[10]	200	SSL[4]	No	IFD
	319-85-7	Beta-BHC	2.8 NJ	5.3 J	µg/kg	SB-101	4 / 58	1.7 - 250	5.3	NA	300 c	400	SSL[4]	No	BSL
	319-86-8	**Delta-BHC**	**7.6 J**	**690 J**	**µg/kg**	**SB-107**	**5 / 58**	**1.7 - 250**	**690**	**NA**	**300 c[11]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	60-57-1	**Dieldrin**	**3.6**	**2400 J**	**µg/kg**	**SB-107**	**13 / 58**	**3.5 - 490**	**2400**	**NA**	**34 c**	**40**	**SSL[4]**	**Yes**	**ASL**
	959-98-8	Endosulfan I	5.1 NJ	7.3 NJ	µg/kg	SB-101	2 / 58	1.7 - 250	7.3	NA	47000 n[12]	470000	SSL[4]	No	IFD
	72-20-8	Endrin	7.5 J	780 J	µg/kg	SB-107	5 / 58	3.4 - 490	780	NA	1900 n	23000	SSL[4]	No	BSL
	7421-93-4	Endrin Aldehyde	3.8 J	14 NJ	µg/kg	SB-107	3 / 58	3.4 - 850	14	NA	1900 n[13]	NL	SSL[4]	No	BSL
	53494-70-5	Endrin Ketone	14 J-	14 J-	µg/kg	RHA-SS-10	1 / 58	3.4 - 490	14	NA	1900 n[13]	NL	SSL[4]	No	IFD
	58-89-9	Gamma-BHC (Lindane)	2.5 J	2.5 J	µg/kg	SB-101	1 / 58	1.7 - 250	2.5	NA	570 c	400	SSL[4]	No	IFD
	5103-74-2	Gamma-Chlordane	2.1 J-	67	µg/kg	RHA-SS-7	8 / 58	1.7 - 250	67	NA	1700 c[9]	200	SSL[4]	No	BSL
	76-44-8	Heptachlor	5.4	29 J	µg/kg	SB-107	4 / 58	1.7 - 250	29	NA	130 c	100	SSL[4]	No	BSL
	1024-57-3	**Heptachlor Epoxide**	**2 NJ**	**1600 J**	**µg/kg**	**SB-107**	**15 / 58**	**1.7 - 250**	**1600**	**NA**	**70 c**	**70**	**SSL[4]**	**Yes**	**ASL**
	72-43-5	Methoxychlor	19 NJ	560 J	µg/kg	SB-107	2 / 58	17 - 2500	560	NA	32000 n	390000	SSL[4]	No	IFD
	Inorganics														
	7429-90-5	**Aluminum**	**1020**	**11900**	**mg/kg**	**SB-109**	**78 / 78**	**14.5 - 27.4**	**11900**	**NA**	**7700 n**	**78000**	**SSL[4]**	**Yes**	**ASL**
	7440-36-0	**Antimony**	**0.21 J**	**465**	**mg/kg**	**SB-110**	**37 / 78**	**0.73 - 1.4**	**465**	**NA**	**3.1 n**	**31**	**SSL[4]**	**Yes**	**ASL**
	7440-38-2	**Arsenic**	**0.32 J**	**75.4 J**	**mg/kg**	**SB-118**	**78 / 78**	**0.36 - 0.69**	**75.4**	**NA**	**0.68 c**	**0.4**	**SSL[4]**	**Yes**	**ASL**
	7440-39-3	Barium	3 J	155	mg/kg	SB-107	64 / 78	3.6 - 1980	155	NA	1500 n	16000	SSL[4]	No	BSL
	7440-41-7	Beryllium	0.13 J	1	mg/kg	SB-118	24 / 78	0.36 - 0.69	1	NA	16 n	16	SSL[4]	No	BSL
	7440-43-9	**Cadmium**	**0.11 J**	**11.3**	**mg/kg**	**SB-101**	**34 / 78**	**0.36 - 0.69**	**11.3**	**NA**	**7.1 n**	**78**	**SSL[4]**	**Yes**	**ASL**
	7440-70-2	Calcium	167 J	30100 J	mg/kg	SB-101	50 / 78	363 - 686	30100	NA	NA	NL	SSL[4]	No	NUT
	7440-47-3	**Chromium**	**2.5 J**	**153 J**	**mg/kg**	**SB-101**	**78 / 78**	**0.73 - 1.4**	**153**	**NA**	**0.3 c[14]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7440-48-4	**Cobalt**	**0.37 J**	**11.3**	**mg/kg**	**SB-101**	**78 / 78**	**0.36 - 0.69**	**11.3**	**NA**	**2.3 n**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7440-50-8	**Copper**	**1.3**	**4070 J**	**mg/kg**	**SB-101**	**78 / 78**	**0.73 - 22.7**	**4070**	**NA**	**310 n**	**3100**	**SSL[4]**	**Yes**	**ASL**
	57-12-5	Cyanide	0.43 J	0.85	mg/kg	SB-116	3 / 78	0.5 - 0.67	0.85	NA	0.27 n	1600	SSL[4]	No	IFD
	7439-89-6	**Iron**	**1630 J**	**89300 J**	**mg/kg**	**SB-101**	**78 / 78**	**7.3 - 35**	**89300**	**NA**	**5500 n**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7439-92-1	**Lead**	**1.3 J**	**94100 J**	**mg/kg**	**SB-110**	**78 / 78**	**0.42 - 207**	**94100**	**NA**	**800 n[15]**	**400**	**SSL[4]**	**Yes**	**ASL**
	7439-95-4	Magnesium	169 J	7460	mg/kg	SB-107	73 / 78	363 - 686	7460	NA	NA	NL	SSL[4]	No	NUT
	7439-96-5	**Manganese**	**9.2**	**722**	**mg/kg**	**RHA-SS-2**	**78 / 78**	**0.37 - 23.7**	**722**	**NA**	**180 n**	**11000**	**SSL[4]**	**Yes**	**ASL**
	7439-97-6	**Mercury**	**0.023 J**	**2.9 J**	**mg/kg**	**SB-101**	**27 / 78**	**0.091 - 0.16**	**2.9**	**NA**	**2.3 n[16]**	**23**	**SSL[4]**	**Yes**	**ASL**

TABLE B-2.2a

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil - Matteo Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface / Subsurface Soil	**Inorganics continued**														
	7440-02-0	**Nickel**	**1.1 J**	**218 J**	**mg/kg**	**SB-101**	**78 / 78**	**0.36 - 0.69**	**218**	**NA**	**150 n[17]**	**1600**	**SSL[4]**	**Yes**	**ASL**
	7440-09-7	Potassium	173 J	1040	mg/kg	SB-118	44 / 78	363 - 686	1040	NA	NA	NL	SSL[4]	No	NUT
	7782-49-2	Selenium	0.11 J	0.44 J	mg/kg	RHA-SS-7	10 / 78	1.8 - 3.4	0.44	NA	39 n	390	SSL[4]	No	BSL
	7440-22-4	Silver	0.074 J	1.5	mg/kg	SB-110	12 / 78	0.36 - 0.69	1.5	NA	39 n	390	SSL[4]	No	BSL
	7440-23-5	Sodium	33.9 J	799	mg/kg	SB-101	12 / 78	363 - 686	799	NA	NA	NL	SSL[4]	No	NUT
	7440-28-0	**Thallium**	**0.03 J**	**0.33 J**	**mg/kg**	**SB-110**	**11 / 78**	**0.36 - 0.69**	**0.33**	**NA**	**0.078 n**	**5**	**SSL[4]**	**Yes**	**ASL**
	7440-62-2	**Vanadium**	**3.6**	**146**	**mg/kg**	**SB-117**	**78 / 78**	**1.8 - 3.4**	**146**	**NA**	**39 n[18]**	**78**	**SSL[4]**	**Yes**	**ASL**
	7440-66-6	**Zinc**	**4.1**	**13400**	**mg/kg**	**SB-109**	**78 / 78**	**0.73 - 47.4**	**13400**	**NA**	**2300 n**	**23000**	**SSL[4]**	**Yes**	**ASL**

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level
TOXB = group A carcinogen, but below screening level

Deletion Reason: BSL = below screening level
IFD = detection frequency less than 5%
NUT = essential nutrient
NTX = no screening level

[4] Potential ARAR/TBC value from New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard.

[5] screening value for 1,3-dichloropropene

[6] screening value for acenaphthene

[7] screening value for pyrene

[8] screening value for anthracene

[9] screening value for chlordane

[10] screening value for Aroclor 1254

[11] screening value for hexachlorocyclohexane, technical

[12] screening value for endosulfan

[13] screening value for endrin

[14] screening value for chromium VI

[15] Screening value is based on OSWER screening value for industrial soil. Lead is further screened in Table 3-2.

[16] screening value for mercuric chloride (and other mercury salts)

[17] screening value for nickel soluble salts

[18] screening value for vanadium and compounds

NA = not available
NL = not listed
n = screening toxicity value based on noncancer effects
c = screening toxicity value based on cancer effects
s = concentration may exceed saturation concentration
SSL = soil screening level
COPC = chemical of potential concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = qualifier for estimated value
J+ = qualifier for estimated value biased high
J- = qualifier for estimated value biased low
JN = qualifier for tentatively identified and estimated value
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
4,4'-DDD = p,p'-dichlorodiphenyldichloroethane
4,4'-DDE = p,p'-dichlorodiphenyldichloroethylene
4,4'-DDT = p,p'-dichlorodiphenyltrichloroethane
BHC = hexachlorocyclohexane
TEQ = toxicity equivalence

TABLE B-2.2b

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil - Willow Woods Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface / Subsurface Soil	**Volatile Organic Compounds**														
	67-64-1	Acetone	7.4 J	10 J	µg/kg	WW-SB-204	2 / 17	9.5 - 13	10	NA	6100000 n	70000000	SSL[4]	No	BSL
	Semi-volatile Organic Compounds														
	83-32-9	Acenaphthene	37 J	37 J	µg/kg	WW-SB-203	1 / 17	180 - 260	37	NA	360000 n	3400000	SSL[4]	No	BSL
	98-86-2	Acetophenone	60 J	60 J	µg/kg	WW-SB-210	1 / 17	180 - 260	60	NA	780000 n	2000	SSL[4]	No	BSL
	120-12-7	Anthracene	28 J	97 J	µg/kg	WW-SB-203	7 / 17	180 - 260	97	NA	1800000 n	17000000	SSL[4]	No	BSL
	100-52-7	Benzaldehyde	120 J	120 J	µg/kg	WW-SB-204	1 / 17	180 - 260	120	NA	780000 n	6100000	SSL[4]	No	BSL
	56-55-3	**Benzo(a)anthracene**	**71 J**	**620**	**µg/kg**	**WW-SB-201**	**8 / 17**	**180 - 260**	**620**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	50-32-8	**Benzo(a)pyrene**	**100 J**	**670**	**µg/kg**	**WW-SB-201**	**8 / 17**	**180 - 260**	**670**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	205-99-2	**Benzo(b)fluoranthene**	**47 J**	**1100 J**	**µg/kg**	**WW-SB-201/ WW-SB-205**	**9 / 17**	**180 - 260**	**1100**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	191-24-2	Benzo(g,h,i)perylene	110 J	570	µg/kg	WW-SB-205	8 / 17	180 - 260	570	NA	180000 n[5]	380000000	SSL[4]	No	BSL
	207-08-9	Benzo(k)fluoranthene	73 J	630 J	µg/kg	WW-SB-205	8 / 17	180 - 260	630	NA	1600 c	6000	SSL[4]	No	BSL
	117-81-7	Bis(2-Ethylhexyl)Phthalate	38 J	360	µg/kg	WW-SB-201	6 / 17	180 - 260	360	NA	39000 c	35000	SSL[4]	No	BSL
	86-74-8	Carbazole	43 J	92 J	µg/kg	WW-SB-203	4 / 17	180 - 260	92	NA	NA	24000	SSL[4]	No	NTX
	218-01-9	Chrysene	77 J	920	µg/kg	WW-SB-201	9 / 17	180 - 260	920	NA	16000 c	62000	SSL[4]	No	BSL
	53-70-3	**Dibenzo(a,h)anthracene**	**38 J**	**160 J**	**µg/kg**	**WW-SB-201/ WW-SB-205**	**7 / 17**	**180 - 260**	**160**	**NA**	**16 c**	**200**	**SSL[4]**	**Yes**	**ASL**
	84-74-2	Di-N-Butylphthalate	54 J	110 J	µg/kg	WW-SB-203	13 / 17	180 - 260	110	NA	630000 n	6100000	SSL[4]	No	BSL
	206-44-0	Fluoranthene	43 J	1400	µg/kg	WW-SB-205	10 / 17	180 - 260	1400	NA	240000 n	2300000	SSL[4]	No	BSL
	86-73-7	Fluorene	46 J	46 J	µg/kg	WW-SB-203	1 / 17	180 - 260	46	NA	240000 n	2300000	SSL[4]	No	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**89 J**	**480**	**µg/kg**	**WW-SB-205**	**8 / 17**	**180 - 260**	**480**	**NA**	**160 c**	**600**	**SSL[4]**	**Yes**	**ASL**
	85-01-8	Phenanthrene	58 J	950	µg/kg	WW-SB-203	9 / 17	180 - 260	950	NA	1800000 n[6]	NA	SSL[4]	No	BSL
	129-00-0	Pyrene	40 J	1500	µg/kg	WW-SB-201	10 / 17	180 - 260	1500	NA	180000 n	1700000	SSL[4]	No	BSL
	Pesticides/Polychlorinated Biphenyls														
	72-55-9	4,4'-DDE	10 J	10 J	µg/kg	WW-SB-208	1 / 17	3.5 - 5	10	NA	2000 c	2000	SSL[4]	No	BSL
	50-29-3	4,4'-DDT	7.4 J	8.4	µg/kg	WW-SB-208	2 / 17	3.5 - 5	8.4	NA	1900 c	2000	SSL[4]	No	BSL
	5103-71-9	Alpha-Chlordane	6.3 NJ	6.6 J	µg/kg	WW-SB-201	2 / 17	1.8 - 2.6	6.6	NA	1700 c[7]	200	SSL[4]	No	BSL
	11096-82-5	Aroclor 1260	110	110	µg/kg	WW-SB-205	1 / 17	34 - 50	110	NA	240 c	200	SSL[4]	No	BSL
	60-57-1	Dieldrin	5.7 J	5.7 J	µg/kg	WW-SB-205	1 / 17	3.5 - 5	5.7	NA	34 c	40	SSL[4]	No	BSL
	1031-07-8	Endosulfan Sulfate	8.8	8.8	µg/kg	WW-SB-205	1 / 17	3.5 - 5	8.8	NA	47000 n[8]	470000	SSL[4]	No	BSL
	7421-93-4	Endrin Aldehyde	6.2	6.2	µg/kg	WW-SB-205	1 / 17	3.5 - 5	6.2	NA	1900 n[9]	NL	SSL[4]	No	BSL
	5103-74-2	Gamma-Chlordane	2.1 J	5.6 J	µg/kg	WW-SB-203	3 / 17	1.8 - 2.6	5.6	NA	1700 c[7]	200	SSL[4]	No	BSL
	76-44-8	Heptachlor	4.3	4.3	µg/kg	WW-SB-205	1 / 17	1.8 - 2.6	4.3	NA	130 c	100	SSL[4]	No	BSL

TABLE B-2.2b

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil - Willow Woods Property

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface / Subsurface Soil	**Inorganics**														
	7429-90-5	Aluminum	1570 J	5750	mg/kg	WW-SB-207	17 / 17	20.7 - 23.8	5750	NA	7700 n	78000	SSL[4]	No	BSL
	7440-36-0	Antimony	0.21 J	0.57 J	mg/kg	WW-SB-208	5 / 17	1 - 1.2	0.57	NA	3.1 n	31	SSL[4]	No	BSL
	7440-38-2	**Arsenic**	**0.26 J**	**14.8**	**mg/kg**	**WW-SB-202**	**16 / 17**	**0.52 - 0.59**	**14.8**	**NA**	**0.68 c**	**0.4**	**SSL[4]**	**Yes**	**ASL**
	7440-39-3	Barium	6	18.2	mg/kg	WW-SB-209	16 / 17	5.2 - 5.9	18.2	NA	1500 n	16000	SSL[4]	No	BSL
	7440-41-7	Beryllium	0.27 J	0.27 J	mg/kg	WW-SB-209	1 / 17	0.52 - 0.59	0.27	NA	16 n	16	SSL[4]	No	BSL
	7440-43-9	Cadmium	0.12 J	0.42 J	mg/kg	WW-SB-205	4 / 17	0.52 - 0.59	0.42	NA	7.1 n	78	SSL[4]	No	BSL
	7440-70-2	Calcium	235 J	1230	mg/kg	WW-SB-205	13 / 17	517 - 594	1230	NA	NA	NL	SSL[4]	No	NUT
	7440-47-3	**Chromium**	**2.1**	**20.5**	**mg/kg**	**WW-SB-207**	**16 / 17**	**1 - 1.2**	**20.5**	**NA**	**0.3 c[10]**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7440-48-4	Cobalt	0.42 J	2.2	mg/kg	WW-SB-201	16 / 17	0.52 - 0.59	2.2	NA	2.3 n	1600	SSL[4]	No	BSL
	7440-50-8	Copper	1.3 J	10.2 J	mg/kg	WW-SB-205	16 / 17	1 - 1.2	10.2	NA	310 n	3100	SSL[4]	No	BSL
	7439-89-6	**Iron**	**4420 J**	**16500**	**mg/kg**	**WW-SB-207**	**17 / 17**	**10.3 - 11.9**	**16500**	**NA**	**5500 n**	**NL**	**SSL[4]**	**Yes**	**ASL**
	7439-92-1	Lead	1.9 J	75.5	mg/kg	WW-SB-205	16 / 17	0.52 - 0.59	75.5	NA	800 n[11]	400	SSL[4]	No	BSL
	7439-95-4	Magnesium	185 J	561	mg/kg	WW-SB-210	17 / 17	517 - 594	561	NA	NA	NL	SSL[4]	No	NUT
	7439-96-5	Manganese	16.9	73.6 J	mg/kg	WW-SB-208	16 / 17	0.52 - 0.59	73.6	NA	180 n	11000	SSL[4]	No	BSL
	7439-97-6	Mercury	0.024 J	0.12	mg/kg	WW-SB-209	2 / 17	0.099 - 0.12	0.12	NA	2.3 n[12]	23	SSL[4]	No	BSL
	7440-02-0	Nickel	1.3 J	6.5 J	mg/kg	WW-SB-205	16 / 17	0.52 - 0.59	6.5	NA	150 n[13]	1600	SSL[4]	No	BSL
	7440-09-7	Potassium	188 J	1160	mg/kg	WW-SB-207	10 / 17	517 - 594	1160	NA	NA	NL	SSL[4]	No	NUT
	7440-62-2	Vanadium	2.8 J	28.4	mg/kg	WW-SB-207	16 / 17	2.6 - 3	28.4	NA	39 n[14]	78	SSL[4]	No	BSL
	7440-66-6	Zinc	6	55.3	mg/kg	WW-SB-205	16 / 17	1 - 1.2	55.3	NA	2300 n	23000	SSL[4]	No	BSL

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level

Deletion Reason: BSL = below screening level

NTX = no screening level

NUT = essential nutrient

[4] Potential ARAR/TBC value from New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard.

[5] screening value for pyrene

[6] screening value for anthracene

[7] screening value for chlordane

[8] screening value for endosulfan

[9] screening value for endrin

[10] screening value for chromium VI

[11] Screening value is based on OSWER screening value for industrial soil. Lead is further screened in Table 3-2.

[12] screening value for mercuric chloride (and other mercury salts)

[13] screening value for nickel soluble salts

[14] screening value for vanadium and compounds

NA = not available

NL = not listed

n = screening toxicity value based on noncancer effects

c = screening toxicity value based on cancer effects

s = concentration may exceed saturation concentration

SSL = soil screening level

COPC = chemical of potential concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = qualifier for estimated value

JN = qualifier for tentatively identified and estimated value

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

4,4'-DDE = p,p'-dichlorodiphenyldichloroethylene

4,4'-DDT = p,p'-dichlorodiphenyltrichloroethane

CDM Smith

TABLE B-2.3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Groundwater	**Volatile Organic Compounds**														
	75-35-4	1,1-Dichloroethene	0.15 J	0.16 J	µg/L	MW-05	2 / 34	0.5 - 0.5	0.16	NA	28 n	1	NJGQS	No	BSL
	123-91-1	**1,4-Dioxane**	**0.21 J**	**4.1**	**µg/L**	**MW-18D**	**24 / 34**	**2 - 20**	**4.1**	**NA**	**0.46 c**	**10**	**NJGQS**	**Yes**	**ASL**
	75-15-0	Carbon Disulfide	0.12 J	0.16 J	µg/L	MW-03	2 / 34	0.5 - 0.5	0.16	NA	81 n	700	NJGQS	No	BSL
	108-90-7	Chlorobenzene	0.23 J	0.64	µg/L	MW-16S	3 / 34	0.5 - 0.5	0.64	NA	7.8 n	50	NJGQS	No	BSL
	156-59-2	**cis-1,2-Dichloroethene**	**0.1 J**	**21**	**µg/L**	**MW-25D**	**11 / 34**	**0.5 - 2.5**	**21**	**NA**	**3.6 n**	**70**	**NJGQS**	**Yes**	**ASL**
	1634-04-4	Methyl Tert-Butyl Ether	0.36 J	2	µg/L	MW-21D	2 / 34	0.5 - 0.5	2	NA	14 c	70	NJGQS	No	BSL
	127-18-4	Tetrachloroethene	0.3 J	3.9 J-	µg/L	MW-19D	2 / 34	0.5 - 0.5	3.9	NA	4.1 n	1	NJGQS	No	BSL
	79-01-6	**Trichloroethene**	**0.074 J**	**0.32 J**	**µg/L**	**MW-19D**	**6 / 34**	**0.5 - 0.5**	**0.32**	**NA**	**0.28 n**	**1**	**NJGQS**	**Yes**	**ASL**
	75-01-4	**Vinyl Chloride**	**0.15 J**	**36**	**µg/L**	**MW-20D**	**10 / 34**	**0.5 - 2.5**	**36**	**NA**	**0.019 c**	**1**	**NJGQS**	**Yes**	**TOXA**
	Semi-volatile Organic Compounds														
	88-75-5	2-Nitrophenol	0.31 J	0.31 J	µg/L	PW-2	1 / 34	5 - 50	0.31	NA	NA	NL	NJGQS	No	IFD
	83-32-9	Acenaphthene	0.85	0.85	µg/L	MW-16S	1 / 34	0.1 - 50	0.85	NA	53 n	400	NJGQS	No	IFD
	120-12-7	Anthracene	0.053 J	0.053 J	µg/L	MW-09	1 / 34	0.1 - 0.1	0.053	NA	180 n	2000	NJGQS	No	IFD
	50-32-8	Benzo(a)pyrene	0.012 J	0.012 J	µg/L	MW-05	1 / 34	0.1 - 0.1	0.012	NA	0.0034 c	0.1	NJGQS	No	IFD
	117-81-7	Bis(2-Ethylhexyl)Phthalate	0.4 J	0.68 J	µg/L	MW-17D	5 / 34	5 - 50	0.68	NA	5.6 c	3	NJGQS	No	BSL
	105-60-2	Caprolactam	1.3 J	1.3 J	µg/L	PW-1	1 / 34	5 - 50	1.3	NA	990 n	5000	NJGQS	No	IFD
	206-44-0	Fluoranthene	0.0054 J	0.17	µg/L	MW-16S	5 / 34	0.1 - 0.1	0.17	NA	80 n	300	NJGQS	No	BSL
	87-86-5	Pentachlorophenol	0.04 J	0.04 J	µg/L	MW-01	1 / 34	0.2 - 10	0.04	NA	0.04 c	0.3	NJGQS	No	IFD
	85-01-8	Phenanthrene	0.005 J	0.019 J	µg/L	MW-05	6 / 34	0.1 - 0.1	0.019	NA	180 n[4]	100	NJGQS	No	BSL
	108-95-2	Phenol	0.66 J	1.9 J	µg/L	MW-07D	3 / 34	5 - 50	1.9	NA	580 n	2000	NJGQS	No	BSL
	129-00-0	Pyrene	0.03 J	0.11	µg/L	MW-16S	2 / 34	0.1 - 0.1	0.11	NA	12 n	200	NJGQS	No	BSL
	Pesticides/Polychlorinated Biphenyls														
	72-54-8	4,4'-DDD	0.0028 J	0.0028 J	µg/L	MW-05	1 / 34	0.091 - 0.1	0.0028	NA	0.031 c	0.1	NJGQS	No	IFD
	72-55-9	4,4'-DDE	0.0079 J	0.0079 J	µg/L	MW-05	1 / 34	0.091 - 0.1	0.0079	NA	0.046 c	0.1	NJGQS	No	IFD
	50-29-3	4,4'-DDT	0.0005 J	0.0093 J	µg/L	MW-05	5 / 34	0.091 - 0.1	0.0093	NA	0.23 c	0.1	NJGQS	No	BSL
	319-84-6	Alpha-BHC	0.0014 J	0.0014 J	µg/L	MW-16D	1 / 34	0.045 - 0.05	0.0014	NA	0.0071 c	0.02	NJGQS	No	IFD
	5103-71-9	Alpha-Chlordane	0.0057 J	0.0057 J	µg/L	MW-02	1 / 34	0.045 - 0.05	0.0057	NA	0.045 c[5]	0.5	NJGQS	No	IFD
	60-57-1	**Dieldrin**	**0.0009 J**	**0.0073 J**	**µg/L**	**MW-02**	**2 / 34**	**0.091 - 0.1**	**0.0073**	**NA**	**0.0017 c**	**0.03**	**NJGQS**	**Yes**	**ASL**
	33213-65-9	Endosulfan II	0.0019 J	0.014 J	µg/L	MW-05	2 / 34	0.091 - 0.1	0.014	NA	10 n[6]	40	NJGQS	No	BSL
	5103-74-2	Gamma-Chlordane	0.0017 J	0.0027 J	µg/L	MW-02	3 / 34	0.045 - 0.05	0.0027	NA	0.045 c[5]	0.5	NJGQS	No	BSL
	72-43-5	Methoxychlor	0.0019 J	0.0025 J	µg/L	MW-18D/ PW-1/ MW-03	4 / 34	0.45 - 0.5	0.0025	NA	3.7 n	40	NJGQS	No	BSL
	Inorganics							-							
	7429-90-5	Aluminum	8.5 J	1700	µg/L	MW-15S	34 / 35	20 - 20	1700	NA	2000 n	200	NJGQS	No	BSL
	7440-36-0	**Antimony**	**2.4**	**400**	**µg/L**	**MW-18S**	**6 / 35**	**2 - 2**	**400**	**NA**	**0.78 n**	**6**	**NJGQS**	**Yes**	**ASL**
	7440-38-2	**Arsenic**	**0.39 J**	**76 J**	**µg/L**	**MW-13D**	**34 / 35**	**0.2 - 0.2**	**76**	**NA**	**0.052 c**	**3**	**NJGQS**	**Yes**	**ASL**
	7440-39-3	Barium	6.9 J	223 J	µg/L	MW-16S	33 / 35	10 - 10	223	NA	380 n	6000	NJGQS	No	BSL
	7440-41-7	Beryllium	0.3 J	0.45 J	µg/L	MW-20D	2 / 35	1 - 1	0.45	NA	2.5 n	1	NJGQS	No	BSL
	7440-43-9	**Cadmium**	**0.6**	**1.5**	**µg/L**	**MW-04**	**4 / 35**	**0.25 - 0.25**	**1.5**	**NA**	**0.92 n**	**4**	**NJGQS**	**Yes**	**ASL**
	7440-70-2	Calcium	59.1 J	215000 J	µg/L	MW-16S	35 / 35	500 - 2500	215000	NA	NA	NL	NJGQS	No	NUT
	7440-47-3	**Chromium**	**0.6 J**	**5.8**	**µg/L**	**MW-14D**	**28 / 35**	**2 - 2**	**5.8**	**NA**	**0.035 c[7]**	**70**	**NJGQS**	**Yes**	**ASL**

TABLE B-2.3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Groundwater	**Inorganics continued**														
	7440-48-4	**Cobalt**	**0.29 J**	**7.9**	**µg/L**	**MW-04**	**27 / 35**	**1 - 1**	**7.9**	**NA**	**0.6 n**	**100**	**NJGQS**	**Yes**	**ASL**
	7440-50-8	Copper	0.61 J	40.6	µg/L	MW-05	27 / 35	2 - 2	40.6	NA	80 n	1300	NJGQS	No	BSL
	57-12-5	**Cyanide**	**2.2 J**	**3.6 J**	**µg/L**	**MW-05**	**4 / 35**	**10 - 10**	**3.6**	**NA**	**0.15 n**	**100**	**NJGQS**	**Yes**	**ASL**
	7439-89-6	**Iron**	**38.3 J**	**62300**	**µg/L**	**MW-13D**	**35 / 35**	**200 - 1000**	**62300**	**NA**	**1400 n**	**300**	**NJGQS**	**Yes**	**ASL**
	7439-92-1	**Lead**	**0.31 J**	**573 J**	**µg/L**	**MW-05**	**35 / 35**	**1 - 2**	**573**	**NA**	**5 [8]**	**5**	**NJGQS**	**Yes**	**ASL**
	7439-95-4	Magnesium	361 J	17500	µg/L	MW-13S	34 / 35	500 - 500	17500	NA	NA	NL	NJGQS	No	NUT
	7439-96-5	**Manganese**	**0.69 J**	**816 J**	**µg/L**	**MW-13D**	**35 / 35**	**1 - 5**	**816**	**NA**	**43 n**	**50**	**NJGQS**	**Yes**	**ASL**
	7439-97-6	Mercury	0.15	0.28 J	µg/L	MW-17D	30 / 35	0.1 - 0.1	0.28	NA	0.57 n[9]	2	NJGQS	No	BSL
	7440-02-0	Nickel	0.35 J	23.3 J	µg/L	MW-04	34 / 35	1 - 1	23.3	NA	39 n[10]	100	NJGQS	No	BSL
	7440-09-7	Potassium	581 J	30600 J	µg/L	MW-13S	35 / 35	500 - 500	30600	NA	NA	NL	NJGQS	No	NUT
	7782-49-2	Selenium	1.5 J	1.5 J	µg/L	MW-01	1 / 35	5 - 5	1.5	NA	10 n	40	NJGQS	No	IFD
	7440-23-5	Sodium	1290	146000	µg/L	PW-2	35 / 35	500 - 5000	146000	NA	NA	50000	NJGQS	No	NUT
	7440-62-2	**Vanadium**	**1.1 J**	**10.5**	**µg/L**	**MW-06D**	**21 / 35**	**5 - 5**	**10.5**	**NA**	**8.6 n[11]**	**NL**	**NJGQS**	**Yes**	**ASL**
	7440-66-6	**Zinc**	**2**	**3880 J**	**µg/L**	**MW-04**	**35 / 35**	**2 - 10**	**3880**	**NA**	**600 n**	**2000**	**NJGQS**	**Yes**	**ASL**

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for tap water, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level
TOXA = group A carcinogen and above screening level

Deletion Reason: BSL = below screening level
IFD = detection frequency less than 5%
NUT = essential nutrient

[4] screening value for anthracene

[5] screening value for chlordance

[6] screening value for endosulfan

[7] screening value for chromium VI

[8] Screening value is based on New Jersey Groundwater Quality Standards Class IIA Water. Lead is further screened in Table 3-2.

[9] screening value for mercuric chloride (and other mercury salts)

[10] screening value for nickel soluble salts

[11] screening value for vanadium and compounds

NA = not available
n = screening toxicity value based on noncancer effects
c = screening toxicity value based on cancer effects
NJGQS = New Jersey Groundwater Quality Standards Class IIA Water
COPC = chemical of potential concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = qualifier for estimated value
J- = qualifier for estimated value biased low
µg/L = micrograms per liter
4,4'-DDD = p,p'-dichlorodiphenyldichloroethane
4,4'-DDE = p,p'-dichlorodiphenyldichloroethylene
4,4'-DDT = p,p'-dichlorodiphenyltrichloroethane
BHC = hexachlorocyclohexane

TABLE B-2.4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Surface Water
Exposure Medium:	Surface Water

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Surface Water	**Semi-volatile Organic Compounds**														
	56-55-3	**Benzo(a)anthracene**	**0.1**	**0.18 J**	**µg/L**	**T1-SW-01**	**2 / 27**	**0.05 - 0.05**	**0.18**	**NA**	**0.012 c**	**0.038**	**NJSWQC-HH**	**Yes**	**ASL**
	50-32-8	**Benzo(a)pyrene**	**0.2**	**0.32 J**	**µg/L**	**T1-SW-01**	**2 / 27**	**0.05 - 0.05**	**0.32**	**NA**	**0.0034 c**	**0.0038**	**NJSWQC-HH**	**Yes**	**ASL**
	205-99-2	**Benzo(b)fluoranthene**	**0.23**	**0.38 J**	**µg/L**	**T1-SW-01**	**2 / 27**	**0.05 - 0.05**	**0.38**	**NA**	**0.034 c**	**0.038**	**NJSWQC-HH**	**Yes**	**ASL**
	207-08-9	Benzo(k)fluoranthene	0.091	0.15 J	µg/L	T1-SW-01	2 / 27	0.05 - 0.05	0.15	NA	0.34 c	0.38	NJSWQC-HH	No	BSL
	117-81-7	Bis(2-Ethylhexyl)Phthalate	1.2	2.4	µg/L	T4-SW-02	6 / 27	1 - 1	2.4	NA	5.6 c	0.03	NJSWQC-HH	No	BSL
	218-01-9	Chrysene	0.17	0.32 J	µg/L	T1-SW-01	2 / 27	0.05 - 0.05	0.32	NA	3.4 c	3.8	NJSWQC-HH	No	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**0.097**	**0.15 J**	**µg/L**	**T1-SW-01**	**2 / 27**	**0.05 - 0.05**	**0.15**	**NA**	**0.034 c**	**0.038**	**NJSWQC-HH**	**Yes**	**ASL**
	87-86-5	**Pentachlorophenol**	**0.82 J**	**3.8 J**	**µg/L**	**T33-SW-01**	**4 / 27**	**0.2 - 0.2**	**3.8**	**NA**	**0.04 c**	**0.27**	**NJSWQC-HH**	**Yes**	**ASL**
	Pesticides/Polychlorinated Biphenyls														
	72-54-8	4,4'-DDD	0.055 J	0.055 J	µg/L	T2-SW-01	1 / 27	0.1 - 0.1	0.055	NA	0.031 c	0.00031	NJSWQC-HH	No	IFD
	5103-74-2	Gamma-Chlordane	0.027 J	0.027 J	µg/L	T11-SW-01	1 / 27	0.05 - 0.05	0.027	NA	0.045 c[4]	0.0008	NRWQC-HH	No	IFD
	Inorganics														
	7429-90-5	**Aluminum**	**55.2**	**28300**	**µg/L**	**T1-SW-01**	**11 / 27**	**5 - 200**	**28300**	**NA**	**2000 n**	**NL**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-36-0	**Antimony**	**0.51**	**7.1**	**µg/L**	**T1-SW-01**	**2 / 27**	**0.043 - 0.5**	**7.1**	**NA**	**0.78 n**	**5.6**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-38-2	**Arsenic**	**0.23 J**	**46.6**	**µg/L**	**T1-SW-01**	**26 / 27**	**0.025 - 0.25**	**46.6**	**NA**	**0.052 c**	**0.017**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-39-3	**Barium**	**21.8**	**1380**	**µg/L**	**T1-SW-01**	**27 / 27**	**2.5 - 2.5**	**1380**	**NA**	**380 n**	**2000**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-41-7	**Beryllium**	**0.045 J**	**11.4**	**µg/L**	**T1-SW-01**	**3 / 27**	**0.015 - 0.25**	**11.4**	**NA**	**2.5 n**	**6**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-43-9	**Cadmium**	**0.033 J**	**12.7**	**µg/L**	**T1-SW-01**	**12 / 27**	**0.028 - 0.25**	**12.7**	**NA**	**0.92 n**	**3.4**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-70-2	Calcium	9740	40300	µg/L	T1-SW-01	27 / 27	125 - 5000	40300	NA	NA	NL	NJSWQC-HH	No	NUT
	7440-47-3	**Chromium**	**1.2 J**	**76.7 J**	**µg/L**	**T1-SW-01**	**11 / 27**	**0.5 - 0.5**	**76.7**	**NA**	**0.035 c[5]**	**92**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-48-4	**Cobalt**	**0.26**	**67.5**	**µg/L**	**T1-SW-01**	**22 / 27**	**0.013 - 0.25**	**67.5**	**NA**	**0.6 n**	**NL**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-50-8	**Copper**	**1.8**	**150**	**µg/L**	**T1-SW-01**	**27 / 27**	**0.5 - 0.5**	**150**	**NA**	**80 n**	**1300**	**NJSWQC-HH**	**Yes**	**ASL**
	57-12-5	**Cyanide**	**3.2 J**	**3.5 J**	**µg/L**	**T1-SW-01**	**2 / 27**	**10 - 10**	**3.5**	**NA**	**0.15 n**	**NL**	**NJSWQC-HH**	**Yes**	**ASL**
	7439-89-6	**Iron**	**176**	**220000**	**µg/L**	**T1-SW-01**	**19 / 27**	**50 - 100**	**220000**	**NA**	**1400 n**	**300**	**NRWQC-HH**	**Yes**	**ASL**
	7439-92-1	**Lead**	**1.3**	**654**	**µg/L**	**T1-SW-01**	**27 / 27**	**0.25 - 0.25**	**654**	**NA**	**5 [6]**	**5**	**NJSWQC-HH**	**Yes**	**ASL**
	7439-95-4	Magnesium	4760	17900	µg/L	T1-SW-01	27 / 27	125 - 5000	17900	NA	NA	NL	NJSWQC-HH	No	NUT
	7439-96-5	**Manganese**	**34.2**	**1270**	**µg/L**	**T1-SW-01**	**27 / 27**	**0.25 - 0.25**	**1270**	**NA**	**43 n**	**NL**	**NJSWQC-HH**	**Yes**	**ASL**
	7439-97-6	**Mercury**	**0.61**	**0.68**	**µg/L**	**T1-SW-01**	**2 / 27**	**0.097 - 0.2**	**0.68**	**NA**	**0.57 n[7]**	**0.05**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-02-0	**Nickel**	**1.3 J**	**229 J**	**µg/L**	**T1-SW-01**	**19 / 27**	**0.25 - 0.25**	**229**	**NA**	**39 n[8]**	**500**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-09-7	Potassium	1700	5400	µg/L	T1-SW-01	19 / 27	125 - 5000	5400	NA	NA	NL	NJSWQC-HH	No	NUT
	7782-49-2	Selenium	0.19 J	3.2	µg/L	T1-SW-01	22 / 27	0.16 - 1.2	3.2	NA	10 n	170	NJSWQC-HH	No	BSL
	7440-22-4	Silver	1	1	µg/L	T1-SW-01	1 / 27	0.018 - 0.25	1	NA	9.4 n	170	NJSWQC-HH	No	IFD
	7440-23-5	Sodium	11500	21900	µg/L	T33-SW-01	27 / 27	125 - 5000	21900	NA	NA	NL	NJSWQC-HH	No	NUT
	7440-28-0	Thallium	0.53	0.53	µg/L	T1-SW-01	1 / 27	0.018 - 0.25	0.53	NA	0.02 n	0.24	NJSWQC-HH	No	IFD
	7440-62-2	**Vanadium**	**1.6**	**155**	**µg/L**	**T1-SW-01**	**3 / 27**	**0.028 - 1.2**	**155**	**NA**	**8.6 n[9]**	**NL**	**NJSWQC-HH**	**Yes**	**ASL**
	7440-66-6	**Zinc**	**7**	**2210**	**µg/L**	**T1-SW-01**	**27 / 27**	**0.5 - 0.5**	**2210**	**NA**	**600 n**	**7400**	**NJSWQC-HH**	**Yes**	**ASL**

TABLE B-2.4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

(1) Maximum detected concentration used for screening.

(2) Screened against Regional Screening Levels, June 2015, for tap water, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

(3) Rationale Codes:

Selection Reason: ASL = above screening level

Deletion Reason: BSL = below screening level
IFD = detection frequency less than 5%
NUT = essential nutrient

(4) screening value for chlordane

(5) screening value for chromium VI

(6) Screening value is based on New Jersey Surface Water Quality Criteria for Fresh Water (Human Health). Lead is further screened in Table 3-2.

(7) screening value for mercuric chloride (and other mercury salts)

(8) screening value for nickel soluble salts

(9) screening value for vanadium and compounds

NA = not available

NL = not listed

n = screening toxicity value based on noncancer effects

c = screening toxicity value based on cancer effects

COPC = chemical of potential concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = qualifier for estimated value

µg/L = micrograms per liter

NJSWQC-HH = NJDEP Surface Water Quality Criteria for Fresh Water

NRWQC-HH = National Recommended Water Quality Criteria

4,4'-DDD = p,p'-dichlorodiphenyldichloroethane

TABLE B-2.5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Sediment	**Dioxins/Furans**														
	--	Dioxin/Furan TEQ	0.89	4.25	ng/kg	SD-ST4	4 / 4	NA - NA	4.25	NA	4.8 c	NA	NA	No	BSL
	Pesticides/Polychlorinated Biphenyls														
	12672-29-6	**Aroclor 1248**	**10**	**340**	**µg/kg**	**SD-T14-F**	**13 / 46**	**1.8 - 7.0**	**340**	**NA**	**230 c**	**NA**	**NA**	**Yes**	**ASL**
	11097-69-1	**Aroclor 1254**	**2.1 J**	**670 J**	**µg/kg**	**SD-T14-F**	**42 / 46**	**1.8 - 7.0**	**670**	**NA**	**120 n**	**NA**	**NA**	**Yes**	**ASL**
	11100-14-4	**Aroclor 1268**	**4.9 JN**	**150 J**	**µg/kg**	**SD-T17-B**	**22 / 46**	**1.8 - 7.0**	**150**	**NA**	**120 n[4]**	**NA**	**NA**	**Yes**	**ASL**
	Inorganics														
	7429-90-5	**Aluminum**	**189**	**22800 J**	**mg/kg**	**SD-T1-D**	**60 / 60**	**13.8 - 54.9**	**22800**	**NA**	**7700 n**	**NA**	**NA**	**Yes**	**ASL**
	7440-36-0	**Antimony**	**0.041 J**	**10.4**	**mg/kg**	**SD-T14-E**	**54 / 60**	**0.004 - 0.71**	**10.4**	**NA**	**3.1 n**	**NA**	**NA**	**Yes**	**ASL**
	7440-38-2	**Arsenic**	**0.29 J**	**42 J**	**mg/kg**	**SD-T25-E**	**60 / 60**	**0.69 - 2.7**	**42**	**NA**	**0.68 c**	**NA**	**NA**	**Yes**	**ASL**
	7440-39-3	Barium	3.1	251 J	mg/kg	SD-T30-A	59 / 60	0.021 - 48.7	251	NA	1500 n	NA	NA	No	BSL
	7440-41-7	Beryllium	0.15 J	3.6 J	mg/kg	SD-T1-D	59 / 60	0.34 - 1.4	3.6	NA	16 n	NA	NA	No	BSL
	7440-43-9	**Cadmium**	**0.017 J**	**8.6 J**	**mg/kg**	**SD-T30-A**	**59 / 60**	**0.002 - 1.2**	**8.6**	**NA**	**7.1 n**	**NA**	**NA**	**Yes**	**ASL**
	7440-70-2	Calcium	354 J	6640 J	mg/kg	SD-T22-D	54 / 60	344 - 1370	6640	NA	NA	NA	NA	No	NUT
	7440-47-3	**Chromium**	**1.5**	**229 J**	**mg/kg**	**SD-T30-E**	**60 / 60**	**0.69 - 2.7**	**229**	**NA**	**0.3 c[5]**	**NA**	**NA**	**Yes**	**ASL**
	7440-48-4	**Cobalt**	**0.75 J**	**28 J**	**mg/kg**	**SD-T1-D**	**52 / 60**	**0.025 - 13.7**	**28**	**NA**	**2.3 n**	**NA**	**NA**	**Yes**	**ASL**
	7440-50-8	Copper	0.55 J	158	mg/kg	SD-T14-F	60 / 60	1.7 - 6.9	158	NA	310 n	NA	NA	No	BSL
	57-12-5	**Cyanide**	**0.07 J**	**2.6 J**	**mg/kg**	**SD-T17-A**	**16 / 60**	**0.54 - 2.3**	**2.6**	**NA**	**0.27 n**	**NA**	**NA**	**Yes**	**ASL**
	7439-89-6	**Iron**	**621**	**44100**	**mg/kg**	**SD-T14-E**	**60 / 60**	**6.9 - 80.7**	**44100**	**NA**	**5500 n**	**NA**	**NA**	**Yes**	**ASL**
	7439-92-1	Lead	2.4 J	6430 J-	mg/kg	SD-T14-E	60 / 60	0.69 - 2.7	6430	NA	400 n[6]	NA	NA	No	BSL
	7439-95-4	Magnesium	775	5040 J	mg/kg	SD-T4-G	50 / 60	344 - 1370	5040	NA	NA	NA	NA	No	NUT
	7439-96-5	**Manganese**	**11.8**	**1080 J+**	**mg/kg**	**SD-T14-E**	**60 / 60**	**1 - 4.1**	**1080**	**NA**	**180 n**	**NA**	**NA**	**Yes**	**ASL**
	7439-97-6	Mercury	0.02 J	0.97 J	mg/kg	SD-T14-H	51 / 60	0.1 - 0.4	0.97	NA	2.3 n[7]	NA	NA	No	BSL
	7440-02-0	Nickel	0.55 J	62.7 J	mg/kg	SD-T30-A	59 / 60	0.12 - 11	62.7	NA	150 n[8]	NA	NA	No	BSL
	7440-09-7	Potassium	610	2030 J	mg/kg	SD-T4-G	43 / 60	344 - 1370	2030	NA	NA	NA	NA	No	NUT
	7782-49-2	Selenium	0.032 J	8.1 J	mg/kg	SD-T30-A	60 / 60	0.005 - 8.5	8.1	NA	39 n	NA	NA	No	BSL
	7440-22-4	Silver	0.3	4.6 J	mg/kg	SD-T30-A	40 / 60	9E-04 - 2.4	4.6	NA	39 n	NA	NA	No	BSL
	7440-23-5	Sodium	39.1 J	571 J	mg/kg	SD-T2-A	39 / 60	344 - 1370	571	NA	NA	NA	NA	No	NUT
	7440-28-0	**Thallium**	**0.019 J**	**0.36 J**	**mg/kg**	**SD-T1-D**	**53 / 60**	**0.002 - 0.18**	**0.36**	**NA**	**0.078 n**	**NA**	**NA**	**Yes**	**ASL**
	7440-62-2	**Vanadium**	**6.3 J**	**212 J**	**mg/kg**	**SD-T30-A**	**59 / 60**	**3.4 - 13.7**	**212**	**NA**	**39 n[9]**	**NA**	**NA**	**Yes**	**ASL**
	7440-66-6	Zinc	9.3	900 J	mg/kg	SD-T4-E	60 / 60	4.1 - 16.5	900	NA	2300 n	NA	NA	No	BSL

[1] Maximum detected concentration used for screening.

[2] Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3] Rationale Codes:

Selection Reason: ASL = above screening level

Deletion Reason: BSL = below screening level

NUT = essential nutrient

[4] screening value for Aroclor 1254

[5] screening value for chromium VI

[6] Screening value is based on OSWER screening value for residential soil. Mean lead concentration is further screened in Table 3-2.

[7] screening value for mercuric chloride (and other mercury salts)

[8] screening value for nickel soluble salts

[9] screening value for vanadium and compounds

NA = not available

n = screening toxicity value based on noncancer effects

c = screening toxicity value based on cancer effects

COPC = chemical of potential concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = qualifier for estimated value

J+ = qualifier for estimated value biased high

J- = qualifier for estimated value biased low

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

ng/kg = nanograms per kilogram

TEQ = toxicity equivalence

TABLE B-2.6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Whole-body Fish
Exposure Medium:	Whole-body Fish

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening [1]	Background Value	Screening Toxicity Value (n/c) [2]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Yes/No)	Rationale for Selection or Deletion [3]
Whole-body Fish	**Polychlorinated Biphenyls**														
	12672-29-6	**Aroclor 1248**	**0.035**	**0.11**	**mg/kg-ww**	**9F2L**	**6 / 6**	**NA - NA**	**0.11**	**NA**	**0.0021 c**	**NA**	**NA**	**Yes**	**ASL**
	11097-69-1	**Aroclor 1254**	**0.12**	**0.28**	**mg/kg-ww**	**9F2L**	**6 / 6**	**NA - NA**	**0.28**	**NA**	**0.0021 c**	**NA**	**NA**	**Yes**	**ASL**
	11096-82-5	**Aroclor 1260**	**0.069**	**0.29 J**	**mg/kg-ww**	**4F3J**	**6 / 6**	**NA - NA**	**0.29**	**NA**	**0.0021 c**	**NA**	**NA**	**Yes**	**ASL**
	Inorganics														
	7439-92-1	**Lead**	**0.17 J**	**0.61**	**mg/kg-ww**	**9F3L**	**6 / 6**	**NA - NA**	**0.61**	**NA**	**0.10 n [4]**	**NA**	**NA**	**Yes**	**ASL**

[1] Maximum detected concentration used for screening. Data were obtained from Final Aquatic Biota Study Report (December 2004) performed by Louis Berger Group, Inc. on behalf of NJDEP.

[2] Screened against Region 3 Risk-based Concentrations, June 2015, for fish consumption, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1.

[3] Rationale Codes:

Selection Reason: ASL = above screening level

[4] The screening level for lead was developed by the EPA Region 2 for the Raritan Bay Slag Superfund Site. Lead is further screened in Table 3-2.

NA = not available

n = screening toxicity value based on noncancer effects

c = screening toxicity value based on cancer effects

COPC = chemical of potential concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = qualifier for estimated value

mg/kg-ww = milligrams per kilogram wet weight

NJDEP = New Jersey Departement of Environmental Protection

TABLE B-3.1a
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Scrapyard Area

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration (1)	Upper Confidence Limit (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration (2)			
						Value	Unit	Statistic	Rationale (3)
Surface Soil	**Volatile Organic Compounds**								
	Trichloroethene	µg/kg	NA	NA	2.4 J	2.4	µg/kg	Max	<4 detected values
	Semi-volatile Organic Compounds								
	Benzo(a)anthracene	µg/kg	361	525	610	525	µg/kg	UCL-NP	95% KM (t) UCL
	Benzo(a)pyrene	µg/kg	336	496	630	496	µg/kg	UCL-NP	95% KM (t) UCL
	Benzo(b)fluoranthene	µg/kg	434	659	820	659	µg/kg	UCL-NP	95% KM (t) UCL
	Dibenzo(a,h)anthracene	µg/kg	120	175	230 J	175	µg/kg	UCL-NP	95% KM (t) UCL
	Indeno(1,2,3-cd)pyrene	µg/kg	276	412	540	412	µg/kg	UCL-NP	95% KM (t) UCL
	Dioxins/Furans								
	Dioxin/Furan TEQ	ng/kg	15.49	29.21	48.37	29.21	ng/kg	UCL-NP	95% Student's-t UCL
	Pesticides/Polychlorinated Biphenyls								
	4,4'-DDT	µg/kg	4583	14075	32000 J	14075	µg/kg	UCL-NP	95% KM (t) UCL
	Aroclor 1248	µg/kg	NA	NA	480 J	480	µg/kg	Max	<4 detected values
	Aroclor 1260	µg/kg	28641	322781	200000	200000	µg/kg	Max	UCL>Max
	Delta-BHC	µg/kg	NA	NA	690 J	690	µg/kg	Max	<4 detected values
	Dieldrin	µg/kg	NA	NA	2400 JN	2400	µg/kg	Max	<4 detected values
	Heptachlor Epoxide	µg/kg	NA	NA	1600 J	1600	µg/kg	Max	<4 detected values
	Inorganics								
	Aluminum	mg/kg	3807	9681	11800 J	9681	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Antimony	mg/kg	5.1	12.0	25.2 J	12.0	mg/kg	UCL-NP	95% KM (t) UCL
	Arsenic	mg/kg	3.5	4.7	6.1 J	4.7	mg/kg	UCL-N	95% Student's-t UCL
	Cadmium	mg/kg	2.9	6.0	11.3	6.0	mg/kg	UCL-NP	95% KM (t) UCL
	Chromium	mg/kg	34.9	184	153 J	153	mg/kg	Max	UCL>Max
	Cobalt	mg/kg	3.6	6.3	11.3	6.3	mg/kg	UCL-N	95% Student's-t UCL
	Copper	mg/kg	737	8160	4070 J	4070	mg/kg	Max	UCL>Max
	Cyanide	mg/kg	NA	NA	0.59 J	0.59	mg/kg	Max	<4 detected values
	Iron	mg/kg	22756	45337	89300 J	45337	mg/kg	UCL-N	95% Student's-t UCL
	Manganese	mg/kg	223	404	674	404	mg/kg	UCL-N	95% Student's-t UCL
	Mercury	mg/kg	0.6	1.4	2.9 J	1.4	mg/kg	UCL-NP	95% Student's-t UCL
	Nickel	mg/kg	43	270	218 J	218	mg/kg	Max	UCL>Max
	Zinc	mg/kg	1420	15248	8760 J	8760	mg/kg	Max	UCL>Max

µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
ng/kg = nanograms per kilogram

J = qualifier for estimated value
JN = qualifier for tentatively identified and estimated value

NA = not available
TEQ = toxicity equivalence

Notes:
(1) Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
(2) Exposure point concentration is the lower value of the maximum concentration and the UCL.
(3) Rationale: UCL-G = upper confidence limit of mean of gamma distribution
UCL-N = upper confidence limit of mean of normal distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
Max = maximum detected concentration

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TABLE B-3.1b
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Open Field / Waste Disposal Area

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration [1]	Upper Confidence Limit [1]	Maximum Concentration (Qualifier)	Exposure Point Concentration [2]			
						Value	Unit	Statistic	Rationale [3]
Surface Soil	**Volatile Organic Compounds**								
	Trichloroethene	µg/kg	NA	NA	7 J+	7	µg/kg	Max	<4 detected values
	Semi-volatile Organic Compounds								
	Benzo(a)anthracene	µg/kg	260	607	1300 J+	607	µg/kg	UCL-NP	95% KM (t) UCL
	Benzo(a)pyrene	µg/kg	117	242	440	242	µg/kg	UCL-NP	95% KM (t) UCL
	Benzo(b)fluoranthene	µg/kg	287	569	1000	569	µg/kg	UCL-NP	95% KM (t) UCL
	Dibenzo(a,h)anthracene	µg/kg	NA	NA	140 J	140	µg/kg	Max	<4 detected values
	Indeno(1,2,3-cd)pyrene	µg/kg	NA	NA	340	340	µg/kg	Max	<4 detected values
	Dioxins/Furans								
	Dioxin/Furan TEQ	ng/kg	9.21	18.39	36.25	18.4	ng/kg	UCL-G	95% Student's-t UCL
	Pesticides/Polychlorinated Biphenyls								
	Aroclor 1254	µg/kg	190	305	1200 J	305	µg/kg	UCL-NP	95% KM (Percentile Bootstrap) UCL
	Aroclor 1260	µg/kg	280	851	3000	851.4	µg/kg	UCL-G	95% GROS Adjusted Gamma UCL
	Heptachlor Epoxide	µg/kg	NA	NA	120 J	120	µg/kg	Max	<4 detected values
	Inorganics								
	Aluminum	mg/kg	2431	3442	11900	3442	mg/kg	UCL-N	95% Modified-t UCL
	Antimony	mg/kg	3.1	7.8	18.6	7.8	mg/kg	UCL-G	95% GROS Adjusted Gamma UCL
	Arsenic	mg/kg	3.2	4.2	8 J	4.2	mg/kg	UCL-G	95% Adjusted Gamma UCL
	Cadmium	mg/kg	0.9	1.8	9.5	1.8	mg/kg	UCL-NP	95% KM (Percentile Bootstrap) UCL
	Chromium	mg/kg	8.4	17.8	39.9 J	17.8	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cobalt	mg/kg	1.4	2.6	4.4	2.6	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cyanide	mg/kg	NA	NA	0.85	0.85	mg/kg	Max	<4 detected values
	Iron	mg/kg	13798	36979	85300 J	36979	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Lead	mg/kg	1153	7807	10100 J	1153	mg/kg	UCL-NP	Mean[4]
	Manganese	mg/kg	97.8	216	427 J	216	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Vanadium	mg/kg	14.2	46.2	146	46.2	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Zinc	mg/kg	833	7821	13400	7821	mg/kg	UCL-NP	99% Chebyshev (Mean, Sd) UCL

µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
ng/kg = nanograms per kilogram
J = qualifier for estimated value
J+ = qualifier for estimated value biased high
NA = not available
TEQ = toxicity equivalence

Notes:
[1] Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
[2] Exposure point concentration (EPC) is the lower value of the maximum concentration and the UCL.
[3] Rationale: UCL-G = upper confidence limit of mean of gamma distribution
UCL-N = upper confidence limit of mean of normal distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
Max = maximum detected concentration
[4] Lead EPC is based on the mean concentration.

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TABLE B-3.1c
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Medium:	Soil
Exposure Medium:	Surface Soil - Rental Home Area

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration (1)	Upper Confidence Limit (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration (2)			
						Value	Unit	Statistic	Rationale (3)
Surface Soil	**Semi-volatile Organic Compounds**								
	Benzo(a)anthracene	µg/kg	13089	143144	130000	130000	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Benzo(a)pyrene	µg/kg	7989	86984	79000	79000	µg/kg	Max	UCL>Max
	Benzo(b)fluoranthene	µg/kg	11135	121116	110000 J	110000	µg/kg	Max	UCL>Max
	Benzo(k)fluoranthene	µg/kg	6386	71431	63000	63000	µg/kg	Max	UCL>Max
	Chrysene	µg/kg	11110	121119	110000	110000	µg/kg	Max	UCL>Max
	Dibenzo(a,h)anthracene	µg/kg	NA	NA	23000	23000	µg/kg	Max	<4 detected values
	Indeno(1,2,3-cd)pyrene	µg/kg	3579	39679	35000	35000	µg/kg	Max	UCL>Max
	Pyrene	µg/kg	18147	197083	180000	180000	µg/kg	Max	UCL>Max
	Pesticides/Polychlorinated Biphenyls								
	Aroclor 1254	µg/kg	NA	NA	210 J	210	µg/kg	Max	<4 detected values
	Inorganics								
	Antimony	mg/kg	1.2	1.7	3.2	1.7	mg/kg	UCL-NP	95% KM (t) UCL
	Arsenic	mg/kg	2.3	2.6	3.7	2.6	mg/kg	UCL-N	95% Student's-t UCL
	Chromium	mg/kg	12	26	40	26	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cobalt	mg/kg	1.7	2.0	2.6	2.0	mg/kg	UCL-N	95% Student's-t UCL
	Iron	mg/kg	9196	10786	13300	10786	mg/kg	UCL-N	95% Student's-t UCL
	Manganese	mg/kg	154	432	722	432	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Thallium	mg/kg	0.046	0.058	0.084 J	0.0576	mg/kg	UCL-G	95% Adjusted Gamma UCL

µg/kg = microgram per kilogram
J = qualifier for estimated value
NA = not available
mg/kg = milligram per kilogram

Notes:
(1) Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
(2) Exposure point concentration is the lower value of the maximum concentration and the UCL.
(3) Rationale: UCL-G = upper confidence limit of mean of gamma distribution
UCL-N = upper confidence limit of mean of normal distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
Max = maximum detected concentration
(4) Lead EPC is based on the mean concentration.

TABLE B-3.1d
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface Soil - Willow Woods Property

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration (1)	Upper Confidence Limit (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration (2)			
						Value	Unit	Statistic	Rationale (3)
Surface Soil	**Semi-volatile Organic Compounds**								
	Benzo(a)anthracene	µg/kg	294	408	620	408	µg/kg	UCL-NP	95% KM (t) UCL
	Benzo(a)pyrene	µg/kg	351	484	670	484	µg/kg	UCL-NP	95% KM (t) UCL
	Benzo(b)fluoranthene	µg/kg	556	799	1100 J	799	µg/kg	UCL-NP	95% KM (t) UCL
	Dibenzo(a,h)anthracene	µg/kg	107	140	160 J	140	µg/kg	UCL-NP	95% KM (t) UCL
	Indeno(1,2,3-cd)pyrene	µg/kg	260	359	480	359	µg/kg	UCL-NP	95% KM (t) UCL
	Inorganics								
	Arsenic	mg/kg	3.7	10.0	14.8	10.0	mg/kg	UCL-NP	95% GROS Adjusted Gamma UCL
	Chromium	mg/kg	4.9	6.9	13.3	6.9	mg/kg	UCL-NP	95% KM (t) UCL
	Iron	mg/kg	7168	9210	16500	9210	mg/kg	UCL-N	95% Student's-t UCL

µg/kg = microgram per kilogram
J = qualifier for estimated value
mg/kg = milligram per kilogram
Notes:
(1) Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
(2) Exposure point concentration is the lower value of the maximum concentration and the UCL.
(3) Rationale: UCL-G = upper confidence limit of mean of gamma distribution
UCL-N = upper confidence limit of mean of normal distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution

TABLE B-3.1e
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface Soil - Matteo Property

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration (1)	Upper Confidence Limit (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration (2)			
						Value	Unit	Statistic	Rationale (3)
Surface Soil	**Volatile Organic Compounds**								
	Trichloroethene	µg/kg	NA	NA	7 J+	7	µg/kg	Max	<4 detected values
	Semi-volatile Organic Compounds								
	Benzo(a)anthracene	µg/kg	5619	59740	130000	59740	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Benzo(a)pyrene	µg/kg	3451	36497	79000	36497	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Benzo(b)fluoranthene	µg/kg	4836	50597	110000 J	50597	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Benzo(k)fluoranthene	µg/kg	2815	29348	63000	29348	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Chrysene	µg/kg	4817	50586	110000	50586	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Dibenzo(a,h)anthracene	µg/kg	1042	7233	23000	7233	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Indeno(1,2,3-cd)pyrene	µg/kg	1600	16325	35000	16325	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Pyrene	µg/kg	7764	82603	180000	82603	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Dioxins/Furans								
	Dioxin/Furan TEQ	ng/kg	12.35	26.99	48.37	26.99	ng/kg	UCL-G	95% Adjusted Gamma UCL
	Pesticides/Polychlorinated Biphenyls								
	4,4'-DDT	µg/kg	1302	14447	32000 J	14447	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Aroclor 1254	µg/kg	132	199	1200 J	199	µg/kg	UCL-NP	95% KM (t) UCL
	Aroclor 1260	µg/kg	5199	36696	200000	36696	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Delta-BHC	µg/kg	NA	NA	690 J	690	µg/kg	Max	<4 detected values
	Dieldrin	µg/kg	105	1170	2400 J	1170	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Heptachlor Epoxide	µg/kg	72	744	1600 J	744	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Inorganics								
	Aluminum	mg/kg	3106	4833	11900	4833	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Antimony	mg/kg	2.9	4.5	25.2 J	4.5	mg/kg	UCL-NP	95% KM (BCA) UCL
	Arsenic	mg/kg	3.0	3.5	8 J	3.5	mg/kg	UCL-G	95% Modified-t UCL
	Cadmium	mg/kg	1.1	3.7	11.3	3.7	mg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Chromium	mg/kg	14.5	33.8	153 J	33.8	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cobalt	mg/kg	1.9	3.3	11.3	3.3	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Copper	mg/kg	173	670	4070 J	670	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cyanide	mg/kg	NA	NA	0.85	0.85	mg/kg	Max	<4 detected values
	Iron	mg/kg	14262	29880	89300 J	29880	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Lead	mg/kg	767	2323	10100 J	767	mg/kg	UCL-NP	Mean(4)
	Manganese	mg/kg	138	265	722	265	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Mercury	mg/kg	0.2	0.7	2.9 J	0.7	mg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Nickel	mg/kg	15.1	42.6	218 J	42.6	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Thallium	mg/kg	0.046	0.055	0.084 J	0.055	mg/kg	UCL-NP	95% KM (t) UCL
	Vanadium	mg/kg	12.4	29.3	146	29.3	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Zinc	mg/kg	736	2638	13400	2638	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL

µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
ng/kg = nanograms per kilogram

J = qualifier for estimated value
J+ = qualifier for estimated value biased high

NA = not available
TEQ = toxicity equivalence

Notes:

(1) Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.

(2) Exposure point concentration (EPC) is the lower value of the maximum concentration and the UCL.

(3) Rationale: UCL-G = upper confidence limit of mean of gamma distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
Max = maximum detected concentration

(4) Lead EPC is based on the mean concentration.

TABLE B-3.2a
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil - Matteo Property

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration [1]	Upper Confidence Limit [1]	Maximum Concentration (Qualifier)	Exposure Point Concentration [2]			
						Value	Unit	Statistic	Rationale [3]
Surface/ Subsurface Soil	**Volatile Organic Compounds**								
	Trichloroethene	µg/kg	NA	NA	7 J+	7	µg/kg	Max	<4 detected values
	Semi-volatile Organic Compounds								
	Benzo(a)anthracene	µg/kg	2153	10800	130000	10800	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Benzo(a)pyrene	µg/kg	1347	6619	79000	6619	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Benzo(b)fluoranthene	µg/kg	1872	9189	110000 J	9189	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Benzo(k)fluoranthene	µg/kg	1098	5312	63000	5312	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Chrysene	µg/kg	1863	9177	110000	9177	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Dibenzo(a,h)anthracene	µg/kg	429	1985	23000	1985	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Indeno(1,2,3-cd)pyrene	µg/kg	648	1711	35000	1711	µg/kg	UCL-NP	95% KM (BCA) UCL
	Pyrene	µg/kg	2969	14941	180000	14941	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Dioxins/Furans								
	Dioxin/Furan TEQ	ng/kg	12.35	26.99	48.37	26.99	ng/kg	UCL-G	95% Adjusted Gamma UCL
	Pesticides/Polychlorinated Biphenyls								
	4,4'-DDT	µg/kg	660	6281	32000 J	6281	µg/kg	UCL-NP	99% KM Chebyshev UCL
	Aroclor 1254	µg/kg	5351	27935	270000 J	27935	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Aroclor 1260	µg/kg	15476	65457	540000 J	65457	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Delta-BHC	µg/kg	18	42	690 J	42	µg/kg	UCL-NP	95% KM (Percentile Bootstrap) UCL
	Dieldrin	µg/kg	68	547	2400 J	547	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Heptachlor Epoxide	µg/kg	48	187	1600 J	187	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Inorganics								
	Aluminum	mg/kg	2804	3159	11900	3159	mg/kg	UCL-N	95% Modified-t UCL
	Antimony	mg/kg	8.0	34	465	34	mg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Arsenic	mg/kg	4.6	9.7	75.4 J	9.7	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cadmium	mg/kg	0.8	1.3	11.3	1.3	mg/kg	UCL-NP	95% KM (BCA) UCL
	Chromium	mg/kg	11.3	20.8	153 J	20.8	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cobalt	mg/kg	1.7	2.4	11.3	2.4	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Copper	mg/kg	94	327	4070 J	327	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Iron	mg/kg	10199	17832	89300 J	17832	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Lead	mg/kg	1707	6999	94100 J	1707	mg/kg	UCL-NP	Mean[4]
	Manganese	mg/kg	83	147	722	147	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Mercury	mg/kg	0.2	0.3	2.9 J	0.3	mg/kg	UCL-NP	95% KM (BCA) UCL
	Nickel	mg/kg	9.4	22.5	218 J	22.5	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Thallium	mg/kg	0.07	0.12	0.33 J	0.12	mg/kg	UCL-NP	95% KM (% Bootstrap) UCL
	Vanadium	mg/kg	11.6	20.2	146	20.2	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Zinc	mg/kg	452	1398	13400	1398	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL

µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
ng/kg = nanograms per kilogram
J = qualifier for estimated value
J+ = qualifier for estimated value biased high
NA = not available
TEQ = toxicity equivalence

Notes:
[1] Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
[2] Exposure point concentration (EPC) is the lower value of the maximum concentration and the UCL.
[3] Rationale:
UCL-G = upper confidence limit of mean of gamma distribution
UCL-N = upper confidence limit of mean of normal distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
Max = maximum detected concentration
[4] Lead EPC is based on the mean concentration.

CDM Smith

TABLE B-3.2b
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe	Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil - Willow Woods Property

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration [1]	Upper Confidence Limit [1]	Maximum Concentration (Qualifier)	Exposure Point Concentration [2]			
						Value	Unit	Statistic	Rationale [3]
Surface/ Subsurface Soil	**Semi-volatile Organic Compounds**								
	Benzo(a)anthracene	µg/kg	217	298	620	298	µg/kg	UCL-NP	95% KM (Percentile Bootstrap) UCL
	Benzo(a)pyrene	µg/kg	258	351	670	351	µg/kg	UCL-NP	95% KM (Percentile Bootstrap) UCL
	Benzo(b)fluoranthene	µg/kg	367	541	1100 J	541	µg/kg	UCL-NP	95% KM (t) UCL
	Dibenzo(a,h)anthracene	µg/kg	107	139	160 J	139	µg/kg	UCL-NP	95% KM (t) UCL
	Indeno(1,2,3-cd)pyrene	µg/kg	192	269	480	269	µg/kg	UCL-NP	95% KM (Percentile Bootstrap) UCL
	Inorganics								
	Arsenic	mg/kg	3.2	7.0	14.8	7.0	mg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Chromium	mg/kg	5.8	9.6	20.5	9.6	mg/kg	UCL-G	95% GROS Adjusted Gamma UCL
	Iron	mg/kg	7847	9506	16500	9506	mg/kg	UCL-N	95% Modified-t UCL

µg/kg = microgram per kilogram
J = qualifier for estimated value
mg/kg = milligram per kilogram

Notes:
[1] Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
[2] Exposure point concentration is the lower value of the maximum concentration and the UCL.
[3] Rationale: UCL-N = upper confidence limit of mean of normal distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
UCL-G = upper confidence limit of mean of gamma distribution

TABLE B-3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration [1]	Upper Confidence Limit [1]	Maximum Concentration (Qualifier)	Exposure Point Concentration [2]			
						Value	Unit	Statistic	Rationale [3]
Groundwater	**Volatile Organic Compounds**								
	1,4-Dioxane	µg/L	0.8	1.1	4.1	1.1	µg/L	UCL-NP	95% KM (BCA) UCL
	cis-1,2-Dichloroethene	µg/L	1.3	3.7	21	3.7	µg/L	UCL-NP	95% Adjusted Gamma KM-UCL
	Trichloroethene	µg/L	0.13	0.20	0.32 J	0.20	µg/L	UCL-NP	95% KM (t) UCL
	Vinyl Chloride	µg/L	2.1	7.0	36	7.0	µg/L	UCL-NP	95% Adjusted Gamma KM-UCL
	Pesticides/Polychlorinated Biphenyls								
	Dieldrin	µg/L	NA	NA	0.0073 J	0.0073	µg/L	Max	<4 detected values
	Inorganics								
	Antimony	µg/L	13.6	90.2	400	90.2	µg/L	UCL-NP	97.5% Chebyshev (Mean, Sd) UCL
	Arsenic	µg/L	12.9	26.7	76 J	26.7	µg/L	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cadmium	µg/L	0.3	0.4	1.5	0.4	µg/L	UCL-NP	95% KM (t) UCL
	Chromium	µg/L	2	2.4	5.8	2.4	µg/L	UCL-NP	95% KM (Percentile Bootstrap) UCL
	Cobalt	µg/L	1.1	1.6	7.9	1.6	µg/L	UCL-NP	95% Adjusted Gamma KM-UCL
	Cyanide	µg/L	2.6	3.2	3.6 J	3.2	µg/L	UCL-NP	95% KM (t) UCL
	Iron	µg/L	11797	19505	62300	19505	µg/L	UCL-G	95% Adjusted Gamma UCL
	Lead	µg/L	18.5	89.6	573 J	18.5	µg/L	UCL-NP	Mean[4]
	Manganese	µg/L	156	243	816 J	243	µg/L	UCL-G	95% Adjusted Gamma UCL
	Vanadium	µg/L	3.1	3.9	10.5	3.9	µg/L	UCL-NP	95% KM (t) UCL
	Zinc	µg/L	140	621	3880 J	621	µg/L	UCL-NP	95% Chebyshev (Mean, Sd) UCL

µg/L = microgram per liter J = qualifier for estimated value NA = not available

Notes:
[1] Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
[2] Exposure point concentration (EPC) is the lower value of the maximum concentration and the UCL.
[3] Rationale: UCL-G = upper confidence limit of mean of gamma distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
[4] Lead EPC is based on the mean concentration.
Max = maximum detected concentration

TABLE B-3.4
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Surface Water
Exposure Medium:	Surface Water

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration (1)	Upper Confidence Limit (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration (2)			
						Value	Unit	Statistic	Rationale (3)
Surface Water	**Semi-volatile Organic Compounds**								
	Benzo(a)anthracene	µg/L	NA	NA	0.18 J	0.18	µg/L	Max	<4 detected values
	Benzo(a)pyrene	µg/L	NA	NA	0.32 J	0.32	µg/L	Max	<4 detected values
	Benzo(b)fluoranthene	µg/L	NA	NA	0.38 J	0.38	µg/L	Max	<4 detected values
	Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	0.15 J	0.15	µg/L	Max	<4 detected values
	Pentachlorophenol	µg/L	0.5	0.8	3.8 J	0.8	µg/L	UCL-NP	95% KM (t) UCL
	Inorganics								
	Aluminum	µg/L	1231	7929	28300	7929	µg/L	UCL-NP	97.5% Chebyshev (Mean, Sd) UCL
	Antimony	µg/L	NA	NA	7.1	7.1	µg/L	Max	<4 detected values
	Arsenic	µg/L	2.4	13.0	46.6	13.0	µg/L	UCL-NP	97.5% Chebyshev (Mean, Sd) UCL
	Barium	µg/L	79	297	1380	297	µg/L	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Beryllium	µg/L	NA	NA	11.4	11.4	µg/L	Max	<4 detected values
	Cadmium	µg/L	0.5	3.5	12.7	3.5	µg/L	UCL-NP	97.5% Chebyshev (Mean, Sd) UCL
	Chromium	µg/L	9.1	38.6	76.7 J	38.6	µg/L	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cobalt	µg/L	2.9	18.5	67.5	18.5	µg/L	UCL-NP	97.5% Chebyshev (Mean, Sd) UCL
	Copper	µg/L	7.8	31.7	150	31.7	µg/L	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Cyanide	µg/L	NA	NA	3.5 J	3.5	µg/L	Max	<4 detected values
	Iron	µg/L	12600	127354	220000	127354	µg/L	UCL-NP	99% Chebyshev (Mean, Sd) UCL
	Lead	µg/L	27.4	133	654	27.4	µg/L	UCL-N	Mean(4)
	Manganese	µg/L	110	306	1270	306	µg/L	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Mercury	µg/L	0.23	0.29	0.68	0.29	µg/L	UCL-NP	95% KM (t) UCL
	Nickel	µg/L	14.5	66.5	229 J	66.5	µg/L	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Vanadium	µg/L	NA	NA	155	155	µg/L	Max	<4 detected values
	Zinc	µg/L	94.1	449	2210	449	µg/L	UCL-T	95% Chebyshev (Mean, Sd) UCL

µg/L = microgram per liter J = qualifier for estimated value NA = not available

Notes:
(1) Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
(2) Exposure point concentration (EPC) is the lower value of the maximum concentration and the UCL.
(3) Rationale: UCL-N = upper confidence limit of mean of normal distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
Max = maximum detected concentration
(4) Lead EPC is based on the mean concentration.

TABLE B-3.5
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration (1)	Upper Confidence Limit (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration (2)			
						Value	Unit	Statistic	Rationale (3)
Sediment	**Pesticides/Polychlorinated Biphenyls**								
	Aroclor 1248	µg/kg	26.0	41.5	340	41.5	µg/kg	UCL-NP	95% KM (Percentile Bootstrap) UCL
	Aroclor 1254	µg/kg	134	230	670 J	230	µg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Aroclor 1268	µg/kg	17.3	33.7	150 J	33.7	µg/kg	UCL-NP	95% GROS Adjusted Gamma UCL
	Inorganics								
	Aluminum	mg/kg	11673	13001	22800 J	13001	mg/kg	UCL-N	95% Student's-t UCL
	Antimony	mg/kg	2.1	3.3	10.4	3.3	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
	Arsenic	mg/kg	15.2	17.2	42 J	17.2	mg/kg	UCL-N	95% Student's-t UCL
	Cadmium	mg/kg	2.9	3.4	8.6 J	3.4	mg/kg	UCL-NP	95% KM (t) UCL
	Chromium	mg/kg	78	91	229 J	91	mg/kg	UCL-N	95% Student's-t UCL
	Cobalt	mg/kg	11.9	13.4	28 J	13.4	mg/kg	UCL-NP	95% KM (t) UCL
	Cyanide	mg/kg	0.36	0.48	2.6 J	0.48	mg/kg	UCL-NP	95% KM (t) UCL
	Iron	mg/kg	23452	25875	44100	25875	mg/kg	UCL-N	95% Student's-t UCL
	Manganese	mg/kg	319	363	1080 J+	363	mg/kg	UCL-N	95% Student's-t UCL
	Thallium	mg/kg	0.16	0.19	0.4 J	0.19	mg/kg	UCL-NP	95% KM (t) UCL
	Vanadium	mg/kg	63.6	90.3	212 J	90.3	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL

µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
J = qualifier for estimated value
J+ = qualifier for estimated value biased high

Notes:
(1) Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.
(2) Exposure point concentration is the lower value of the maximum concentration and the UCL.
(3) Rationale: UCL-N = upper confidence limit of mean of normal distribution
UCL-NP = upper confidence limit of mean of non-parametric distribution
(4) Lead EPC is based on the mean concentration.

TABLE B-3.6
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Whole-body Fish
Exposure Medium:	Whole-body Fish

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration (1)	Upper Confidence Limit (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration (2)			
						Value	Unit	Statistic	Rationale (3)
Fish Tissue	**Pesticides/Polychlorinated Biphenyls**								
	Aroclor 1248	mg/kg-ww	0.08	0.10	0.11	0.10	mg/kg-ww	UCL-N	95% Student's-t UCL
	Aroclor 1254	mg/kg-ww	0.21	0.26	0.28	0.26	mg/kg-ww	UCL-N	95% Student's-t UCL
	Aroclor 1260	mg/kg-ww	0.12	0.19	0.29 J	0.19	mg/kg-ww	UCL-N	95% Student's-t UCL
	Inorganics								
	Lead	mg/kg-ww	0.44	0.59	0.61	0.44	mg/kg-ww	UCL-N	Mean(4)

mg/kg-ww = milligram per kilogram wet weight J = qualifier for estimated value

Notes:

(1) Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.

(2) Exposure point concentration (EPC) is the lower value of the maximum concentration and the UCL.

(3) Rationale: UCL-G = upper confidence limit of mean of gamma distribution
UCL-N = upper confidence limit of mean of normal distribution

(4) Lead EPC is based on the mean concentration.

TABLE B-4.1

VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS

Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Intake Equation/ Model Name
							Value	Rationale/Reference	Value	Rationale/Reference	
Ingestion	Site Worker	Adult	Scrapyard Area	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1a	Table B-3.1a	Table B-3.1a	Table B-3.1a	Daily Intake (mg/kg-day) =
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	CS x CF x IR-S x EF x ED x
				IR-S	Ingestion Rate of Soil	mg/day	100	EPA 2002	50	1997	1/BW x 1/AT
				RBA	Relative Bioavailability of Arsenic	unitless	0.6	EPA 2012	0.6	EPA 2012	
				EF	Exposure Frequency	days/year	250	EPA 2004	219	EPA 2004	
				ED	Exposure Duration	years	25	EPA 2004	9	EPA 2004	
				BW	Body Weight	kg	70	EPA 1991	70	EPA 1991	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	9,125	EPA 1989	3,285	EPA 1989	
	Trespasser	Adolescent (6 - 18 yrs)	Open Field / Waste Disposal Area	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1b	Table B-3.1b	Table B-3.1b	Table B-3.1b	Daily Intake (mg/kg-day) =
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	CS x CF x IR-S x EF x ED x
				IR-S	Ingestion Rate of Soil	mg/day	100	EPA 1989[1]	50	[1]	1/BW x 1/AT
				RBA	Relative Bioavailability of Arsenic	unitless	0.6	EPA 2012	0.6	EPA 2012	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				BW	Body Weight	kg	44	EPA 2011[3]	44	EPA 2011[3]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	4,380	EPA 1989	4,380	EPA 1989	
	Recreational User	Adolescent (6 - 18 yrs)	Open Field / Waste Disposal Area	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1b	Table B-3.1b	Table B-3.1b	Table B-3.1b	Daily Intake (mg/kg-day) =
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	CS x CF x IR-S x EF x ED x
				IR-S	Ingestion Rate of Soil	mg/day	100	EPA 1989[1]	50	[1]	1/BW x 1/AT
				RBA	Relative Bioavailability of Arsenic	unitless	0.6	EPA 2012	0.6	EPA 2012	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				BW	Body Weight	kg	44	EPA 2011[3]	44	EPA 2011[3]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	4,380	EPA 1989	4,380	EPA 1989	
	Resident	Adult and Child (0-6 yrs)	Rental Home Area / Matteo Property / Willow Woods Property	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Daily Intake (mg/kg-day):
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	for nonmutagen =
				$IR\text{-}S_a$	Ingestion Rate of Soil - adult	mg/day	100	EPA 1991	50	[2]	CS x CF x {($IR\text{-}S_a x ED_a/BW_a$) +
				$IR\text{-}S_c$	Ingestion Rate of Soil - child	mg/day	200	EPA 1991	100	EPA 1991	($IR\text{-}S_c x ED_c/BW_c$)} x EF x 1/AT
				RBA	Relative Bioavailability of Arsenic	unitless	0.6	EPA 2012	0.6	EPA 2012	
				EF	Exposure Frequency	days/year	350	EPA 2002	350	EPA 2002	
				ED_a	Exposure Duration - adult	years	24	EPA 2002	9	EPA 1997	for mutagen =
				ED_c	Exposure Duration - child	years	6	EPA 2002	6	EPA 2002	for RME: CS x {(2x$IR\text{-}S_c$x10/BW_c)+
				BW_a	Body Weight - adult	kg	70	EPA 1991	70	EPA 1991	(4x$IR\text{-}S_c$x3/BW_c)+(10x$IR\text{-}S_a$x3/BW_a)
				BW_c	Body Weight - child	kg	15	EPA 1991	15	EPA 1991	+(14x$IR\text{-}S_a$x1/BW_a)} x EF x CF / AT
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	for CTE: CS x {(2x$IR\text{-}S_c$x10/BW_c)+
				$AT\text{-}N_a$	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	(4x$IR\text{-}S_c$x3/BW_c)+(9x$IR\text{-}S_a$x3/BW_a)}
				$AT\text{-}N_c$	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	x EF x CF / AT
	Construction Worker	Adult	Matteo Property / Willow Woods Property	CS	Chemical Concentration in Soil	mg/kg	Table B-3.2a or B-3.2b	Table B-3.2a or B-3.2b	Not Evaluated		Daily Intake (mg/kg-day) =
				CF	Conversion Factor	kg/mg	1E-06	--			CS x CF x IR-S x EF x ED x
				IR-S	Ingestion Rate of Soil	mg/day	330	EPA 2002			1/BW x 1/AT
				RBA	Relative Bioavailability of Arsenic	unitless	0.6	EPA 2012			
				EF	Exposure Frequency	days/year	100	[4]			
				ED	Exposure Duration	years	1	[4]			
				BW	Body Weight	kg	70	EPA 1991			
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989			
				AT-N	Averaging Time (Noncancer)	days	365	EPA 1989			

TABLE B-4.1

VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS

Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Intake Equation/ Model Name
							Value	Rationale/Reference	Value	Rationale/Reference	
Dermal Contact	Site Worker	Adult	Scrapyard	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1a	Table B-3.1a	Table B-3.1a	Table B-3.1a	Daily Intake (mg/kg-day) =
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	CS x CF x SA x AF x ABS x
				SA	Skin Surface Area Available for Contact	cm^2	3,300	EPA 2004	3,300	EPA 2004	EF x ED x 1/BW x 1/AT
				AF	Adherence Factor	mg/cm^2	0.2	EPA 2004	0.02	EPA 2004	
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.6	chemical specific	Table B-4.6	
				EF	Exposure Frequency	days/year	250	EPA 2002	219	EPA 2004	
				ED	Exposure Duration	years	25	EPA 2002	9	EPA 2004	
				BW	Body Weight	kg	70	EPA 1991	70	EPA 1991	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	9,125	EPA 1989	3,285	EPA 1989	
	Trespasser	Adolescent (6 - 18 yrs)	Open Field / Waste Disposal Area	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1b	Table B-3.1b	Table B-3.1b	Table B-3.1b	Daily Intake (mg/kg-day) =
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	CS x CF x SA x AF x ABS x
				SA	Skin Surface Area Available for Contact	cm^2	4,200	EPA 2011[5]	4,200	EPA 2011[5]	EF x ED x 1/BW x 1/AT
				AF	Adherence Factor	mg/cm^2	0.07	EPA 2011[6]	0.04	EPA 2011[6]	
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.6	chemical specific	Table B-4.6	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				BW	Body Weight	kg	44	EPA 2011[3]	44	EPA 2011[3]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	4,380	EPA 1989	4,380	EPA 1989	
	Recreational User	Adolescent (6 - 18yrs)	Open Field / Waste Disposal Area	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1a or B-3.1b	Table B-3.1a or B-3.1b	Table B-3.1a or B-3.1b	Table B-3.1a or B-3.1b	Daily Intake (mg/kg-day) =
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	CS x CF x SA x AF x ABS x
				SA	Skin Surface Area Available for Contact	cm^2	4,200	EPA 2011[5]	4,200	EPA 2011[5]	EF x ED x 1/BW x 1/AT
				AF	Adherence Factor	mg/cm^2	0.07	EPA 2011[6]	0.04	EPA 2011[6]	
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.6	chemical specific	Table B-4.6	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				BW	Body Weight	kg	44	EPA 2011[3]	44	EPA 2011[3]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	4,380	EPA 1989	4,380	EPA 1989	
	Resident	Adult and Child (0-6 yrs)	Rental Home Area / Matteo Property / Willow Woods Property	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Daily Intake (mg/kg-day):
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	for nonmutagen =
				SA_a	Skin Surface Area Available for Contact - adult	cm^2	5,700	EPA 2004	5,700	EPA 2004	CS x CF x {(SA_axAF_axED_ax1/BWa) +
				SA_c	Skin Surface Area Available for Contact - child	cm^2	2,800	EPA 2004	2,800	EPA 2004	(SA_cxAF_cxED_cx1/BW_c)} x ABS x
				AF_a	Adherence Factor - adult	mg/cm^2	0.07	EPA 2004	0.01	EPA 2004	EF x 1/AT
				AF_c	Adherence Factor - child	mg/cm^2	0.2	EPA 2004	0.04	EPA 2004	
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.6	chemical specific	Table B-4.6	for mutagen =
				EF	Exposure Frequency	days/year	350	EPA 2004	350	EPA 2004	for RME: CS x {(2xSA_cxAF_cx10/BW_c)+
				ED_a	Exposure Duration - adult	years	24	EPA 2004	9	EPA 2004	(4xSA_cxAF_cx3/BW_c)+(10xSA_axAF_ax3/BW_a)+
				ED_c	Exposure Duration - child	years	6	EPA 2004	6	EPA 2002	(14xSA_axAF_ax1/BW_a)} x ABS x EF x CF / AT
				BW_a	Body Weight - adult	kg	70	EPA 1991	70	EPA 1991	for CTE: CS x {(2xSA_cxAF_cx10/BW_c)+
				BW_c	Body Weight - child	kg	15	EPA 1991	15	EPA 1991	(4xSA_cxAF_cx3/BW_c)+(9xSA_axAF_ax3/BW_a)}
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	x ABS x EF x CF / AT
				$AT\text{-}N_a$	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	
				$AT\text{-}N_c$	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	

TABLE B-4.1

VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS

Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Intake Equation/ Model Name
							Value	Rationale/Reference	Value	Rationale/Reference	
Dermal Contact continued	Construction Worker	Adult	Matteo Property / Willow Woods Property	CS	Chemical Concentration in Soil	mg/kg	Table B-3.2a or B-3.2b	Table B-3.2a or B-3.2b	Not Evaluated		Daily Intake (mg/kg-day) = CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
				CF	Conversion Factor	kg/mg	1E-06	--			
				SA	Skin Surface Area Available for Contact	cm^2	3,300	EPA 2004			
				AF	Adherence Factor	mg/cm^2	0.3	EPA 2004			
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.6			
				EF	Exposure Frequency	days/year	100	(4)			
				ED	Exposure Duration	years	1	(4)			
				BW	Body Weight	kg	70	EPA 2004			
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989			
				AT-N	Averaging Time (Noncancer)	days	365	EPA 1989			
Inhalation	Site Worker	Adult	Scrapyard Area	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1a	Table B-3.1a	Table B-3.1a	Table B-3.1a	Exposure Concentration (mg/m^3) = CA x ET x EF x ED x 1/AT
				CA	Chemical Concentration in Air	mg/m^3	calculated	calculated	calculated	calculated	where:
				ET	Exposure Time	hrs/day	8	EPA 2009	4	(2)	CA = CS/PEF
				EF	Exposure Frequency	days/year	250	EPA 2002	219	EPA 2004	
				ED	Exposure Duration	years	25	EPA 2002	9	EPA 2004	
				PEF	Particulate Emission Factor	m^3/kg	1.08E+10	Table B-4.7	1.08E+10	Table B-4.7	
				AT-C	Averaging Time (Cancer)	hrs	613,200	EPA 1989	613,200	EPA 1989	
				AT-N	Averaging Time (Noncancer)	hrs	219,000	EPA 1989	78,840	EPA 1989	
	Trespasser	Adolescent (6 - 18yrs)	Open Field / Waste Disposal Area	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1b	Table B-3.1b	Table B-3.1b	Table B-3.1b	Exposure Concentration (mg/m^3): for cancer = CA x ET x EF x ED x 1/AT
				CA	Chemical Concentration in Air	mg/m^3	calculated	calculated	calculated	calculated	
				ET	Exposure Time	hrs/day	2	EPA 2009	1	EPA 2009	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	(2)	for noncancer = CA
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				PEF	Particulate Emission Factor	m^3/kg	2.17E+10	Table B-4.7	2.17E+10	Table B-4.7	where:
				AT-C	Averaging Time (Cancer)	hrs	613,200	EPA 1989	613,200	EPA 1989	CA = CS/PEF
				AT-N	Averaging Time (Noncancer)	hrs	105,120	EPA 1989	105,120	EPA 1989	
	Recreational User	Adolescent (6 - 18yrs)	Open Field / Waste Disposal Area	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1b	Table B-3.1b	Table B-3.1b	Table B-3.1b	Exposure Concentration (mg/m^3): for cancer = CA x ET x EF x ED x 1/AT
				CA	Chemical Concentration in Air	mg/m^3	calculated	calculated	calculated	calculated	
				ET	Exposure Time	hrs/day	2	EPA 2009	1	EPA 2009	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	(2)	for noncancer = CA
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				PEF	Particulate Emission Factor	m^3/kg	2.17E+10	Table B-4.7	2.17E+10	Table B-4.7	where:
				AT-C	Averaging Time (Cancer)	hrs	613,200	EPA 1989	613,200	EPA 1989	CA = CS/PEF
				AT-N	Averaging Time (Noncancer)	hrs	105,120	EPA 1989	105,120	EPA 1989	
	Resident	Adult and Child (0-6 yrs)	Rental Home Area / Matteo Property / Willow Woods Property	CS	Chemical Concentration in Soil	mg/kg	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Table B-3.1c to B-3.1e	Exposure Concentration (mg/m^3) = for nonmutagen = CA x ET x EF x ED x 1/AT
				CA	Chemical Concentration in Air	mg/m^3	calculated	calculated	calculated	calculated	
				ET_a	Exposure Time - adult	hrs/day	24	EPA 2009	24	EPA 2009	
				ET_c	Exposure Time - child	hrs/day	24	EPA 2009	24	EPA 2009	for mutagen =
				EF	Exposure Frequency	days/year	350	EPA 2002	350	EPA 2002	for RME: CA x {(2 x 10)+(4 x 3)+(10 x 3)+ (14 x 1)} x ET x EF / AT
				ED_a	Exposure Duration - adult	years	24	EPA 2002	9	EPA 1997	
				ED_c	Exposure Duration - child	years	6	EPA 2002	6	EPA 2002	for CTE: CA x {(2 x 10)+(4 x 3)+(9 x 3)} x ET x EF / AT
				PEF	Particulate Emission Factor - Rental Home Area	m^3/kg	3.30E+10	Table B-4.7	3.30E+10	Table B-4.7	
				PEF	Particulate Emission Factor - Matteo Property	m^3/kg	1.70E+10	Table B-4.7	1.70E+10	Table B-4.7	
					Particulate Emission Factor - Willow Woods Property	m^3/kg	8.02E+09	Table B-4.7	8.02E+09	Table B-4.7	
				AT-C	Averaging Time (Cancer)	hrs	613,200	EPA 1989	613,200	EPA 1989	where:
				$AT\text{-}N_a$	Averaging Time (Noncancer) - adult	hrs	210,240	EPA 1989	78,840	EPA 1989	CA = CS/PEF
				$AT\text{-}N_c$	Averaging Time (Noncancer) - child	hrs	52,560	EPA 1989	52,560	EPA 1989	

TABLE B-4.1

VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS

Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Intake Equation/ Model Name
							Value	Rationale/Reference	Value	Rationale/Reference	
Inhalation	Construction	Adult	Matteo	CS	Chemical Concentration in Soil	mg/kg	Table B-3.2a or B-3.2b	Table B-3.2a or B-3.2b	Not Evaluated		Exposure Concentration (mg/m^3) =
continued	Worker		Property /	CA	Chemical Concentration in Air	mg/m^3	calculated	calculated			CA x ET x EF x ED x 1/AT
			Willow Woods	ET	Exposure Time	hrs/day	8	EPA 2009			where:
			Property	EF	Exposure Frequency	days/year	100	(4)			CA = CS/PEF
				ED	Exposure Duration	years	1	(4)			
				PEF	Particulate Emission Factor - Matteo Property	m^3/kg	1.70E+10	Table B-4.7			
					Particulate Emission Factor - Willow Woods Property	m^3/kg	8.02E+09	Table B-4.7			
				AT-C	Averaging Time (Cancer)	hrs	613,200	EPA 1989			
				AT-N	Averaging Time (Noncancer)	hrs	8,760	EPA 1989			

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure
Matteo Property = Scrapyard Area / Open Field/ Waste Disposal Area

Notes:

(1) based on the recommended soil ingestion rate for the age group older than 6 years (EPA 1989 Exhibit 6-14). CTE is assumed to be one half the RME value

(2) assumes one-half RME exposure frequency or time

(3) based on the weighted average weight for children 6 to <21 years in age (EPA 2011)

(4) assumes 5 months (100 workdays) per year for one year

(5) based on the weighted average surface area for head, hands, forearms, and lower legs for children ages 6 to 18 years (Table 7-2, EPA 2011)

(6) based on the weighted adherence factors on soil activity under RME scenario and daycare for CTE scenario for head, hands, forearms, and lower legs for children ages 6 to <21 years (Table 7-4, EPA 2011)

Sources:

EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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EPA 2011: Exposure Factors Handbook. ORD. EPA/600/R-10/030. October.

EPA 2012. Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil. December.

TABLE B-4.2
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR GROUNDWATER EXPOSURE PATHWAYS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Intake Equation/ Model Name
							Value	Rationale/ Reference	Value	Rationale/ Reference	
Ingestion	Resident	Adult/Child	Tap Water	CW	Chemical Concentration in Water	µg/L	Table B-3.3	Table B-3.3	Table B-3.3	Table B-3.3	Daily Intake (mg/kg-day):
				CF1	Conversion Factor 1	mg/µg	0.001	--	0.001	--	for nonmutagen =
				$IR\text{-}W_a$	Ingestion Rate of Water, adult	L/day	2	EPA 1991	1	EPA 2011[1]	$CW \times CF1 \times \{(IR\text{-}W_a \times ED_a \times 1/BW_a +$
				$IR\text{-}W_c$	Ingestion Rate of Water, child	L/day	1	EPA 1989	0.3	EPA 2011[1]	$IR\text{-}W_c \times ED_c \times 1/BW_c)\} \times EF \times 1/AT$
				BW_a	Body Weight, adult	kg	70	EPA 1991	70	EPA 1991	for mutagen =
				BW_c	Body Weight, child	kg	15	EPA 1991	15	EPA 1991	for RME: $CW \times CF1 \times \{(2xIR\text{-}W_c x10/BW_c)+$
				ED_a	Exposure Duration, adult	years	24	EPA 2004	9	EPA 2004	$(4xIR\text{-}W_c x3/BW_c)+(10xIR\text{-}W_a x3/BW_a)+$
				ED_c	Exposure Duration, child	years	6	EPA 2004	6	EPA 1991	$(14xIR\text{-}W_a x1/BW_a)\} \times EF \times 1/AT$
				EF	Exposure Frequency	days/year	350	EPA 2002	350	EPA 2002	for CTE: $CW \times CF1 \times \{(2xIR\text{-}W_c x10/BW_c)+$
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	$(4xIR\text{-}W_c x3/BW_c)+(9xIR\text{-}W_a x3/BW_a)\} \times EF \times 1/AT$
				$AT\text{-}N_a$	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	for vinyl chloride =
				$AT\text{-}N_c$	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	$CW \times CF1 \times \{(IR\text{-}W_a \times ED_a \times 1/BW_a + IR\text{-}W_c \times ED_c \times 1/BW_c) \times EF \times 1/AT + (IR\text{-}W_c \times 1/BW_c)\}$
Dermal Contact	Resident	Adult/Child	Tap Water (Showering and Bathing)	CW	Chemical Concentration in Water	µg/L	Table B-3.3	Table B-3.3	Table B-3.3	Table B-3.3	Dermally Absorbed Dose (mg/kg-day) =
				CF1	Conversion Factor 1	mg/µg	0.001	--	0.001	--	for nonmutagen =
				SA_a	Skin Surface Area Available for Contact - adult	cm^2	18,000	EPA 2004	18,000	EPA 2004	$\{(SA_a xDA_{event\text{-}a} xED_a x1/BW_a)+$
				SA_c	Skin Surface Area Available for Contact - child	cm^2	6,600	EPA 2004	6,600	EPA 2004	$(SA_c xDA_{event\text{-}c} xED_c x1/BW_c)\} \times EF \times EV \times 1/AT$
				DA_{event}	Absorbed dose	mg/cm^2	chemical specific	Table B-4.6	chemical specific	Table B-4.6	
				ET_a	Exposure Time - adult	hr/day	0.25	EPA 2004[2]	0.10	EPA 2004[2]	for mutagen =
				ET_c	Exposure Time - child	hr/day	0.45	EPA 2004[2]	0.14	EPA 2004[2]	for RME: $\{(2xSA_c xDA_{event\text{-}c} x10/BW_c)+$
				EF	Exposure Frequency	days/year	350	EPA 2004	350	EPA 2004	$(4xSA_c xDA_{event\text{-}c} x3/BW_c)+(10xSA_a xDA_{event\text{-}a} x3/BW_a)$
				ED_a	Exposure Duration - adult	years	24	EPA 2004	9	EPA 2004	$+(14xSA_a xDA_{event\text{-}a} x1/BW_a)\} \times EF \times EV \times 1/AT$
				ED_c	Exposure Duration - child	years	6	EPA 2004	6	EPA 1991	for CTE: $\{(2xSA_c xDA_{event\text{-}c} x10/BW_c)+$
				EV	Event Frequency	events/day	1	EPA 2004	1	EPA 2004	$(4xSA_c xDA_{event\text{-}c} x3/BW_c)+(9xSA_a xDA_{event\text{-}a} x3/BW_a)\}$
				BW_a	Body Weight	kg	70	EPA 1991	70	EPA 1991	$\times EF \times EV \times 1/AT$
				BW_c	Body Weight - child	kg	15	EPA 1991	15	EPA 1991	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	for vinyl chloride:
				$AT\text{-}N_a$	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	$Da_{event} x((EF xEV xDFW_{adj})/(AT\text{-}C)+(Sa_c \cdot EV/(BW_c))$
				$AT\text{-}N_c$	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	
Inhalation	Resident	Adult/Child	Tap Water (Showering and Bathing)	CW	Chemical concentration in groundwater	µg/L	Table B-3.3	Table B-3.3	Table B-3.3	Table B-3.3	Exposure Concentration (mg/m^3) =
				CA	Chemical concentration in air	$µg/m^3$	Table D-3 or D-4	Table D-3 or D-4	Table D-3 or D-4	Table D-3 or D-4	$CA \times CF \times \{(ET_a \times ED_a)+(ET_c \times ED_c)\} \times EF \times 1/AT$
				CF	Conversion factor	mg/µg	0.001	-	0.001	-	
				ET_a	Exposure time - adult	hr/day	0.58	EPA 2004[3]	0.25	EPA 2004[3]	EC (mg/m^3) for mutagen =
				ET_c	Exposure time - child	hr/day	1	EPA 2004[3]	0.33	EPA 2004[3]	for RME: $CF \times \{(CA_c x2x10xET_c)+(CA_c x4x3xET_c)+$
				EF	Exposure frequency	days/yr	350	EPA 2004	350	EPA 2004	$(CA_a x10x3xET_a)+(CA_a x14x1xET_a)\} \times EF / AT$
				ED_a	Exposure Duration, adult	years	24	EPA 2004	9	EPA 1997	
				ED_c	Exposure duration, child	years	6	EPA 2004	6	EPA 1991	for CTE: $CF \times \{(CA_c x2x10xET_c)+(CA_c x4x3xET_c)+$
				AT-C	Averaging time (Cancer)	hrs	613,200	EPA 2009	613,200	EPA 2009	$(CA_a x9x3xET_a)\} \times EF / AT$
				$AT\text{-}N_a$	Averaging time (Noncancer) - adult	hrs	210,240	EPA 2009	78,840	EPA 2009	EC (mg/m3) for vinyl chloride =
				$AT\text{-}N_c$	Averaging time (Noncancer) - child	hrs	52,560	EPA 2009	52,560	EPA 2009	$EF \times ((Ca_a \times Ed_a \times Et_a) + (Ca_c \times Ed_c \times Et_c)) * (1/At_c) + (Ca_c)$

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure

TABLE B-4.2
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR GROUNDWATER EXPOSURE PATHWAYS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Notes:
[(1)] based on the mean drinking water ingestion rate for adult (≥21 years) and children (0 to <6 years) (Table 3-1, EPA 2011)
[(2)] based on time of shower
[(3)] based on combined value of time of shower and time after shower in bathroom

Sources:

EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002
EPA 1991. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03
EPA 1997. Exposure Factors Handbook, Vols. I, II, and III. EPA/600/P-95/002Fa, 002Fb, and 002Fc.
EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24
EPA 2004. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment Final. EPA/540/R/99/005
EPA 2009. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. EPA-540-R-070-002
EPA 2011: Exposure Factors Handbook. ORD. EPA/600/R-10/030. October.

TABLE B-4.3
VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Surface Water
Exposure Medium:	Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Chronic Daily Intake (CDI)
							Value	Rationale/ Reference	Value	Rationale/ Reference	
Ingestion	Trespasser	Adolescent (6 -18 yrs)	Woodbury Creek / Hessian Run	CW	Chemical Concentration in Water	µg/L	Table B-3.4	Table B-3.4	Table B-3.4	Table B-3.4	Daily Intake (mg/kg-day) = CW x CF1 x IR-W x EF x ED x ET x 1/BW x 1/AT
				CF1	Conversion Factor 1	mg/µg	0.001	--	0.001	--	
				IR-W	Ingestion Rate of Water	L/hr	0.0049	EPA 2011[1]	0.0049	EPA 2011[1]	
				ET	Exposure Time	hr/day	2	EPA 2009	2	EPA 2009	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				BW	Body Weight	kg	44	EPA 2011[3]	44	EPA 2011[3]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	4,380	EPA 1989	4,380	EPA 1989	
	Resident	Adult/Child	Woodbury Creek / Hessian Run	CW	Chemical Concentration in Water	µg/L	Table B-3.4	Table B-3.4	Table B-3.4	Table B-3.4	Daily Intake (mg/kg-day): CW x CF1 x {(IR-W_a x ED_a x 1/BW_a + IR-W_c x ED_c x 1/BW_c)} x EF x ET x 1/AT
				CF1	Conversion Factor 1	mg/µg	0.001	--	0.001	--	
				IR-W_a	Ingestion Rate of Water, adult	L/hr	0.0021	EPA 2011[4]	0.0021	EPA 2011[4]	
				IR-W_c	Ingestion Rate of Water, child	L/hr	0.0049	EPA 2011[1]	0.0049	EPA 2011[1]	
				BW_a	Body Weight, adult	kg	70	EPA 1991	70	EPA 1991	
				BW_c	Body Weight, child	kg	15	EPA 1991	15	EPA 1991	
				ED_a	Exposure Duration, adult	years	24	EPA 2004	9	EPA 2004	
				ED_c	Exposure Duration, child	years	6	EPA 2004	6	EPA 1991	
				ET	Exposure Time	hr/day	2	EPA 2009	2	EPA 2009	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N_a	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	
				AT-N_c	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	
Dermal Contact	Trespasser	Adolescent (6 -18 yrs)	Woodbury Creek / Hessian Run	CW	Chemical Concentration in Water	µg/L	Table B-3.4	Table B-3.4	Table B-3.4	Table B-3.4	Dermally Absorbed Dose (mg/kg-day) = SA x DA_{event} x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	cm^2	5,200	EPA 2011[5]	5,200	EPA 2011[5]	
				DA_{event}	Absorbed dose	mg/cm^2	chemical specific	Table B-4.5	chemical specific	Table B-4.5	
				ET	Exposure Time	hr/day	2	EPA 2009	1	[2]	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				BW	Body Weight	kg	44	EPA 2011[3]	44	EPA 2011[3]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	4,380	EPA 1989	4,380	EPA 1989	

TABLE B-4.3
VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Surface Water
Exposure Medium:	Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Chronic Daily Intake (CDI)
							Value	Rationale/ Reference	Value	Rationale/ Reference	
Dermal Contact continued	Resident	Adult/Child	Woodbury Creek / Hessian Run	CW	Chemical Concentration in Water	µg/L	Table B-3.4	Table B-3.4	Table B-3.4	Table B-3.4	Dermally Absorbed Dose (mg/kg-day) = $\{(SA_a x DA_{event-a} x ED_a x 1/BW_a) + (SA_c x DA_{event-c} x ED_c x 1/BW_c)\}$ x EF x 1/AT
				SA_a	Skin Surface Area Available for Contact - adult	cm^2	6,925	EPA 2004 (6)	6,925	EPA 2004 (6)	
				SA_c	Skin Surface Area Available for Contact - child	cm^2	2,800	EPA 2004 (7)	2,800	EPA 2004 (7)	
				DA_{event}	Absorbed dose	mg/cm^2	chemical specific	Table B-4.5	chemical specific	Table B-4.5	
				ET	Exposure Time	hr/day	2	EPA 2009	1	(2)	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	(2)	
				ED_a	Exposure Duration - adult	years	24	EPA 2002	9	EPA 1997	
				ED_c	Exposure Duration - child	years	6	EPA 2002	6	EPA 2002	
				BW_a	Body Weight	kg	70	EPA 1991	70	EPA 1991	
				BW_c	Body Weight - child	kg	15	EPA 1991	15	EPA 1991	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				$AT\text{-}N_a$	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	
				$AT\text{-}N_c$	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure

Notes:

(1) based on one-tenth the mean water ingestion rate for children while swimming (Table 3-5, EPA 2011)

(2) assumes one-half RME exposure frequency or time

(3) based on the weighted average weight for children 6 to <21 years in age (EPA 2011)

(4) based on one-tenth the recommended mean water ingestion rate for adults while swimming (Table 3-5, EPA 2011)

(5) based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages 6 to 21 years (Table 7-2, EPA 2011)

(6) based on the weighted average surface area for head, hands, forearms, lower legs, and feet for adult (Exhibits 3-5 and C-1, EPA 2004)

(7) based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages <6 years (Exhibit 3-5, EPA 2004)

Sources:

EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002

EPA 1991. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03

EPA 1997. Exposure Factors Handbook, Vols. I, II, and III. EPA/600/P-95/002Fa, 002Fb, and 002Fc.

EPA 2004. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment Final. EPA/540/R/99/005

EPA 2009. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. EPA-540-R-070-002

EPA 2011: Exposure Factors Handbook. ORD. EPA/600/R-10/030. October.

TABLE B-4.4
VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Chronic Daily Intake (CDI)
							Value	Rationale/ Reference	Value	Rationale/ Reference	
Ingestion	Trespasser	Adolescent (6-18 yrs)	Woodbury Creek / Hessian Run	CS	Chemical Concentration in Sediment	mg/kg	Table B-3.5	Table B-3.5	Table B-3.5	Table B-3.5	Daily Intake (mg/kg-day) =
				CF	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	CS x CF x IR-S x EF x ED x
				IR-S	Ingestion Rate of Sediment	mg/day	100	EPA 2008[1]	50	[1]	1/BW x 1/AT
				RBA	Relative Bioavailability of Arsenic	unitless	0.6	EPA 2012	0.6	EPA 2012	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				BW	Body Weight	kg	44	EPA 2011[3]	44	EPA 2011[3]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	4,380	EPA 1989	4,380	EPA 1989	
	Resident	Adult/Child	Woodbury Creek / Hessian Run	CS	Chemical Concentration in Sediment	mg/kg	Table B-3.5	Table B-3.5	Table B-3.5	Table B-3.5	Daily Intake (mg/kg-day) =
				CF	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	noncancer: CS x CF x IR-S x EF x
				$IR\text{-}S_a$	Ingestion Rate of Sediment - adult	mg/day	100	EPA 1991	50	[2]	ED x 1/BW x 1/AT
				$IR\text{-}S_c$	Ingestion Rate of Sediment - child	mg/day	200	EPA 1991	100	EPA 1991	cancer: CS x CF x {(IR-SaxEDa/BWa) +
				RBA	Relative Bioavailability of Arsenic	unitless	0.6	EPA 2012	0.6	EPA 2012	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[3]	(IR-ScxEDc/BWc)} x EF x 1/AT
				ED_a	Exposure Duration - adult	years	24	EPA 2002	9	EPA 1997	for mutagen =
				ED_c	Exposure Duration - child	years	6	EPA 2002	6	EPA 2002	for RME: CS x {(2xIR-S_cx10/BW_c)+
				BW_a	Body Weight - adult	kg	70	EPA 1991	70	EPA 1991	(4xIR-S_cx3/BW_c)+(10xIR-S_ax3/BW_a)
				BW_c	Body Weight - child	kg	15	EPA 1991	15	EPA 1991	+(14xIR-S_ax1/BW_a)} x EF x CF / AT
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	for CTE: CS x {(2xIR-S_cx10/BW_c)+
				$AT\text{-}N_a$	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	(4xIR-S_cx3/BW_c)+(9xIR-S_ax3/BW_a)}
				$AT\text{-}N_c$	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	x EF x CF / AT
Dermal Contact	Trespasser	Adolescent (6-18 yrs)	Woodbury Creek / Hessian Run	CS	Chemical Concentration in Sediment	mg/kg	Table B-3.5	Table B-3.5	Table B-3.5	Table B-3.5	Daily Intake (mg/kg-day) =
				CF	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	CS x CF x SA x AF x ABS x
				SA	Skin Surface Area Available for Contact	cm^2	5,200	EPA 2011[4]	5,200	EPA 2011[4]	EF x ED x 1/BW x 1/AT
				AF	Adherence Factor	mg/cm^2	4.4	EPA 2011[5]	0.2	EPA 2004[5]	
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.5	chemical specific	Table B-4.5	
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	
				ED	Exposure Duration	years	12	EPA 1989	12	EPA 1989	
				BW	Body Weight	kg	44	EPA 2011[3]	44	EPA 2011[3]	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	4,380	EPA 1989	4,380	EPA 1989	

TABLE B-4.4
VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Chronic Daily Intake (CDI)
							Value	Rationale/ Reference	Value	Rationale/ Reference	
Dermal Contact continued	Resident	Adult/Child	Woodbury Creek / Hessian Run	CS	Chemical Concentration in Sediment	mg/kg	Table B-3.5	Table B-3.5	Table B-3.5	Table B-3.5	Daily Intake (mg/kg-day):
				CF	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	for nonmutagen =
				SA_a	Skin Surface Area Available for Contact - adult	cm^2	6,925	EPA 2004 [6]	6,925	EPA 2004 [6]	CS x CF x {(SA_axAF_axED_ax1/BWa) +
				SA_c	Skin Surface Area Available for Contact - child	cm^2	2,800	EPA 2004 [7]	2,800	EPA 2004 [7]	(SA_cxAF_cxED_cx1/BW_c)} x ABS x
				AF_a	Adherence Factor - adult	mg/cm^2	0.3	EPA 2004[8]	0.07	EPA 2004[8]	EF x 1/AT
				AF_c	Adherence Factor - child	mg/cm^2	1.8	EPA 2011[9]	0.2	EPA 2004[10]	
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.5	chemical specific	Table B-4.5	for mutagen =
				EF	Exposure Frequency	days/year	100	EPA 2009	50	[2]	for RME: CS x {(2xSA_cxAF_cx10/BW_c)+
				ED_a	Exposure Duration - adult	years	24	EPA 2004	9	EPA 2004	(4xSA_cxAF_cx3/BW_c)+(10xSA_axAF_ax3/BW_a)+
				ED_c	Exposure Duration - child	years	6	EPA 2004	6	EPA 2002	(14xSA_axAF_ax1/BW_a)} x ABS x EF x CF / AT
				BW_a	Body Weight - adult	kg	70	EPA 1991	70	EPA 1991	
				BW_c	Body Weight - child	kg	15	EPA 1991	15	EPA 1991	for CTE: CS x {(2xSA_cxAF_cx10/BW_c)+
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	(4xSA_cxAF_cx3/BW_c)+(9xSA_axAF_ax3/BW_a)}
				AT-N_a	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	x ABS x EF x CF / AT
				AT-N_c	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure

Notes:
[1] based on the central tendency soil/dust ingestion rate for children 6 to <21 years in age (Table 5-1, EPA 2008). CTE is assumed to be one half the RME value.
[2] assumes one-half RME exposure frequency
[3] based on the weighted average weight for children 6 to <21 years in age (EPA 2011)
[4] based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages 6 to <21 years (Table 7-2, EPA 2011)
[5] The RME value is based on surface area weighted adherence factor for children aged 6 to <21 years playing in sediment, assuming head, hands, forearms, lower legs, and feet are exposed (Table 7-4, EPA 2011). The CTE value is based on children playing in wet soil. (Exhibit 3-3, EPA 2004)
[6] based on the weighted average surface area for head, hands, forearms, lower legs, and feet for adult (Exhibits 3-5 and C-1, EPA 2004)
[7] based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages <6 years (Exhibit 3-5, EPA 2004)
[8] RME value is based on the geometric mean soil adherence factor for reed gatherers and CTE value is based on the geometric mean soil adherence factor for gardeners (Exhibit 3-3, EPA 2004)
[9] Based on surface area weighted adherence factor for children aged 0 to 6 years playing in sediment, assuming head, hands, forearms, lower legs, and feet are exposed (Exhibit 3-5, EPA 2004).
[10] Based on adherence factor for children playing in wet soil. (Exhibit 3-3, EPA 2004)

Sources:

EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002
EPA 1997. Exposure Factors Handbook, Vols. I, II, and III. EPA/600/P-95/002Fa, 002Fb, and 002Fc.
EPA 2004. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment Final. EPA/540/R/99/005
EPA 2008. Child-Specific Exposure Factors Handbook (Final Report) 2008. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-06/096F, 2008.
EPA 2009. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. EPA-540-R-070-002
EPA 2011: Exposure Factors Handbook. ORD. EPA/600/R-10/030. October.
EPA 2012. Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil. December.

TABLE B-4.5

VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Whole-body Fish
Exposure Medium:	Whole-body Fish

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Chronic Daily Intake (CDI)
							Value	Rationale/ Reference	Value	Rationale/ Reference	
Ingestion of Fish	Angler	Adult	Hessian Run / Woodbury Creek	CS	Chemical Concentration in Fish	mg/kg	Table B-3.6	Table B-3.6	Table B-3.6	Table B-3.6	Daily Intake (mg/kg-day) = CS x CF1 x IR-F x EF x ED x 1/BW x 1/AT
				CF1	Conversion Factor 1	kg/g	1E-03	--	1E-03	--	
				IR-F	Ingestion Rate of Fish	g/day	34.6	(1)	3.85	(2)	
				EF	Exposure Frequency	days/year	365	EPA 2011	365	EPA 2011	
				ED	Exposure Duration	years	24	EPA 1991	9	EPA 1997	
				BW	Body Weight	kg	70	EPA 1991	70	EPA 1991	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	8,760	EPA 1989	3,285	EPA 1989	
		Child (0-6 yrs)	Hessian Run / Woodbury Creek	CS	Chemical Concentration in Fish	mg/kg	Table B-3.6	Table B-3.6	Table B-3.6	Table B-3.6	Daily Intake (mg/kg-day) = CS x CF1 x IR-F x EF x ED x 1/BW x 1/AT
				CF1	Conversion Factor 1	kg/g	1E-03	--	1E-03	--	
				IR-F	Ingestion Rate of Fish	g/day	11.5	(3)	1.28	(3)	
				EF	Exposure Frequency	days/year	365	EPA 2011	365	EPA 2011	
				ED	Exposure Duration	years	6	EPA 1989	6	EPA 1989	
				BW	Body Weight	kg	15	EPA 1991	15	EPA 1991	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer)	days	2,190	EPA 1989	2,190	EPA 1989	

TABLE B-4.5

VALUES AND EQUATIONS USED FOR DAILY INTAKE CALCULATIONS

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Whole-body Fish
Exposure Medium:	Whole-body Fish

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE		Chronic Daily Intake (CDI)
							Value	Rationale/ Reference	Value	Rationale/ Reference	
Ingestion of Fish	Resident	Adult and child	Hessian Run / Woodbury Creek	CS	Chemical Concentration in Fish	mg/kg	Table B-3.6	Table B-3.6	Table B-3.6	Table B-3.6	Daily Intake (mg/kg-day) = CS x CF1 x IR-F x EF x ED x 1/BW x 1/AT
				CF1	Conversion Factor 1	kg/g	1E-03	--	1E-03	--	
				$IR\text{-}F_a$	Ingestion Rate of Fish (adult)	g/day	34.6	(1)	3.85	(2)	
				$IR\text{-}F_c$	Ingestion Rate of Fish (child)	g/day	11.53	(3)	1.28	(3)	
				EF	Exposure Frequency	days/year	365	EPA 2011	365	EPA 2011	
				ED_a	Exposure Duration (adult)	years	24	EPA 1991	9	EPA 1997	
				Ed_c	Exposure Duration (child)	years	6	EPA 1989	6	EPA 1989	
				BW_a	Body Weight (adult)	kg	70	EPA 1991	70	EPA 1991	
				BW_c	Body Weight (child)	kg	15	EPA 1991	15	EPA 1991	
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	
				AT-N	Averaging Time (Noncancer) - adult	days	8,760	EPA 1989	3,285	EPA 1989	
				AT-N	Averaging Time (Noncancer) - child	days	2,190	EPA 1989	2,190	EPA 1989	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure

(1) RME value is based on the averaging 90th percentile fish ingestion values from Connelly et al. (1992) and Burger (2002) studies (EPA Region 2 2012).

(2) CTE value is based on the average of 50th percentile values from the Connelly et al. (1992) and Burger (2002) studies (EPA Region 2 2012).

(3) The fish ingestion rates for children are assumed to be 1/3 of adult ingestion rates.

Sources:

Burger, J. 2002. Consumption Patterns and Why People Fish. Environmental Research Section A, 90, 125-135.

Connelly, N.A., Knuth, B.A., Bisogni, C.A. 1992. Effects of the Health Advisory and Advisory Changes on Fishing and Fish Consumption in New York Fisheries. Human Dimension Research Unit, Department of Natural resources, New York State College of Agriculture and Life Sciences, Cornell University, Ithaca, New York.

EPA 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA 2011: Exposure Factors Handbook. ORD. EPA/600/R-10/030. October.

EPA Region 2. 2012. Appendix G. USEPA's technical memorandum on Fish and Crab Consumption Rates for the LPRSA Human Health Risk Assessment. February.

TABLE B-4.6
CHEMICAL-SPECIFIC INFORMATION USED FOR DAILY INTAKE CALCULATIONS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical	Dermal Absorption Fraction [1] (Unitless)	Permeability Coefficient [1] (cm/hr)	Fraction absorbed water[1] (Unitless)	Lag time per event[1] (hr/event)	Time to reach steady state[1] (hr)	B[1] (Unitless)	DA_{event}[2] Trespasser (6-18 yrs) (mg/cm^2)	DA_{event}[2] Resident (surface water) (mg/cm^2)	DA_{event}[2] Resident (groundwater) Adult (mg/cm^2)	DA_{event}[2] Resident (groundwater) Child (0-6 years) (mg/cm^2)	Henry's Law Constant[3] (atm-m^3/mole)	Diffusivity in Air[3] (cm^2/s)	Diffusivity in Water[3] (cm^2/s)	Soil Organic Carbon Partition Coefficient[3] (cm^3/g)	Soil-Water Partition Coefficient (cm^3/g)	Apparent Diffusivity[4] (cm^2/s)	Volatilization factor[4] (m^3/kg)	Fraction Volatilized[5] Unitless
Volatile Organic Compounds																		
1,4-Dioxane	NA	3.3E-04	1.0E+00	3.3E-01	8.0E-01	0.0E+00	NA	NA	2.9E-10	3.8E-10	4.8E-06	8.7E-02	1.1E-05	2.6E+00	1.6E-02	8.2E-06	5.9E+04	5.4E-01
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.1E-03	8.8E-02	1.1E-05	4.0E+01	2.4E-01	2.1E-03	3.8E+03	5.6E-01
Trichloroethene	NA	1.2E-02	1.0E+00	5.8E-01	1.4E+00	1.0E-01	NA	NA	2.5E-09	3.4E-09	9.9E-03	6.9E-02	1.0E-05	6.1E+01	3.6E-01	2.7E-03	3.3E+03	5.3E-01
Vinyl Chloride	NA	5.6E-03	1.0E+00	2.4E-01	5.7E-01	0.0E+00	NA	NA	2.7E-08	3.6E-08	2.8E-02	1.1E-01	1.2E-05	2.2E+01	1.3E-01	1.4E-02	1.4E+03	5.9E-01
Semi-volatile Organic Compounds																		
Benzo(a)anthracene	1.3E-01	4.7E-01	1.0E+00	2.0E+00	8.5E+00	2.8E+00	4.7E-07	4.7E-07	NA	NA	1.2E-05	2.6E-02	6.7E-06	1.8E+05	1.1E+03	6.7E-10	NA	NA
Benzo(a)pyrene	1.3E-01	7.0E-01	1.0E+00	2.7E+00	1.2E+01	4.3E+00	1.4E-06	1.4E-06	NA	NA	4.6E-07	4.8E-02	5.6E-06	5.9E+05	3.5E+03	2.3E-11	NA	NA
Benzo(b)fluoranthene	1.3E-01	7.0E-01	1.0E+00	2.8E+00	1.2E+01	9.7E+00	1.7E-06	1.7E-06	NA	NA	6.6E-07	4.8E-02	5.6E-06	6.0E+05	3.6E+03	2.8E-11	NA	NA
Benzo(k)fluoranthene	1.3E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8E-07	4.8E-02	5.6E-06	5.9E+05	3.5E+03	2.7E-11	NA	NA
Chrysene	1.3E-01	4.7E-01	1.0E+00	2.0E+00	8.5E+00	2.8E+00	NA	NA	NA	NA	5.2E-06	2.6E-02	6.7E-06	1.8E+05	1.1E+03	3.1E-10	NA	NA
Dibenzo(a,h)anthracene	1.3E-01	1.5E+00	6.0E-01	3.9E+00	1.8E+01	9.7E+00	NA	NA	NA	NA	1.4E-07	4.5E-02	5.2E-06	1.9E+06	1.1E+04	4.1E-12	NA	NA
Indeno(1,2,3-cd)pyrene	1.3E-01	1.0E+00	6.0E-01	3.8E+00	1.7E+01	6.7E+00	6.8E-07	6.8E-07	NA	NA	3.5E-07	4.5E-02	5.2E-06	2.0E+06	1.2E+04	5.7E-12	NA	NA
Pentachlorophenol	2.5E-01	3.9E-01	9.0E-01	3.3E+00	1.4E+01	2.5E+00	1.9E-06	1.9E-06	NA	NA	2.5E-08	3.0E-02	8.0E-06	5.0E+03	3.0E+01	1.8E-09	NA	NA
Pyrene	1.3E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2E-05	2.8E-02	7.2E-06	5.4E+04	3.3E+02	2.3E-09	NA	NA
Dioxins/Furans																		
Dioxin/Furan TEQ	3.0E-02	8.1E-01	5.0E-01	6.8E+00	3.0E+01	5.6E+00	NA	NA	NA	NA	5.0E-05	4.7E-02	6.8E-06	2.5E+05	1.5E+03	3.4E-09	NA	NA
Pesticides/Polychlorinated Biphenyls																		
4,4'-DDT	3.0E-02	2.7E-01	7.0E-01	1.0E+01	4.3E+01	1.9E+00	NA	NA	NA	NA	8.3E-06	3.8E-02	4.4E-06	1.7E+05	1.0E+03	6.9E-10	NA	NA
Aroclor 1248	1.4E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.4E-04	2.4E-02	6.2E-06	7.7E+04	4.6E+02	4.9E-08	NA	NA
Aroclor 1254	1.4E-01	1.4E-01	NA	NA	NA	NA	NA	NA	NA	NA	2.8E-04	2.4E-02	6.1E-06	1.3E+05	7.8E+02	1.8E-08	NA	NA
Aroclor 1260	1.4E-01	1.4E-01	NA	NA	NA	NA	NA	NA	NA	NA	3.4E-04	2.2E-02	5.6E-06	3.5E+05	2.1E+03	7.5E-09	NA	NA
Aroclor 1268	1.4E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delta-BHC	1.0E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.1E-06	4.3E-02	5.1E-06	2.8E+03	1.7E+01	3.0E-08	NA	NA
Dieldrin	1.0E-01	1.2E-02	8.0E-01	1.5E+01	3.5E+01	1.0E-01	NA	NA	3.7E-10	5.0E-10	1.0E-05	2.3E-02	6.0E-06	2.0E+04	1.2E+02	4.4E-09	NA	NA
Heptachlor Epoxide	1.0E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.1E-05	2.4E-02	6.2E-06	1.0E+04	6.1E+01	1.8E-08	NA	
Inorganics																		
Aluminum	NA	1.0E-03	NA	NA	NA	NA	1.6E-05	1.6E-05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	1.0E-03	NA	NA	NA	NA	1.4E-08	1.4E-08	2.3E-08	4.1E-08	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	3.0E-02	1.0E-03	NA	NA	NA	NA	2.6E-08	2.6E-08	6.7E-09	1.2E-08	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	1.0E-03	NA	NA	NA	NA	5.9E-07	5.9E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	1.0E-03	NA	NA	NA	NA	2.3E-08	2.3E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1.0E-03	1.0E-03	NA	NA	NA	NA	7.0E-09	7.0E-09	1.0E-10	1.9E-10	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	1.0E-03	NA	NA	NA	NA	7.7E-08	7.7E-08	6.0E-10	1.1E-09	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	4.0E-04	NA	NA	NA	NA	1.5E-08	1.5E-08	1.6E-10	2.9E-10	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	1.0E-03	NA	NA	NA	NA	6.3E-08	6.3E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	1.0E-03	NA	NA	NA	NA	7.0E-09	7.0E-09	8.0E-10	1.4E-09	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	1.0E-03	NA	NA	NA	NA	2.5E-04	2.5E-04	4.9E-06	8.8E-06	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	1.0E-04	NA	NA	NA	NA	5.5E-09	5.5E-09	4.6E-10	8.3E-10	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	1.0E-03	NA	NA	NA	NA	6.1E-07	6.1E-07	6.1E-08	1.1E-07	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	1.0E-03	NA	NA	NA	NA	5.7E-10	5.7E-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	2.0E-04	NA	NA	NA	NA	2.7E-08	2.7E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	1.0E-03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	1.0E-03	NA	NA	NA	NA	3.1E-07	3.1E-07	9.7E-10	1.7E-09	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	6.0E-04	NA	NA	NA	NA	5.4E-07	5.4E-07	9.3E-08	1.7E-07	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not applicable

TEQ = toxicity equivalence

TABLE B-4.6
CHEMICAL-SPECIFIC INFORMATION USED FOR DAILY INTAKE CALCULATIONS
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Notes:
(1) Source: EPA 2004. Risk Assessment Guidance for Superfund. Part E.
(2) Absorbed dose per event is calculated using Equations 3.2, 3.3, and 3.4 from EPA 2004) (p.3-4)
for organics:

$$\text{If } t_{event} \le t^*, DA_{event} = 2FA \times K_p \times C_W \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}} \qquad \text{If } t_{event} > t^*, DA_{event} = FA \times K_p \times C_W \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

for inorganics:

$$DA_{event} = K_p \times C_W \times t_{event}$$

Where:

DA_{event} = absorbed dose per event, mg/cm^2
FA = fraction absorbed water
K_p = permeability coefficient, cm/hr
CW = chemical concentration in water, µg/L (Tables B-3.3 and B-3.4)
τ_{event} = lag time per event, hr
t_{event} = event duration, hr
t* = time to reach steady-state, hr
B = dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis

(3) Source: EPA 2015. Regional Screening Levels for Chemical Contaminanats at Superfund Sites. June.
(4) Volatilization Factor is calculated using Equation 8 from SSG (EPA 2002) (p.4-24)

$$D_A = \frac{(\theta_a^{10/3} D_i H' + \theta_w^{10/3} D_w)/n^2}{\rho_b K_d + \theta_w + \theta_a H'}$$

$$VF = \frac{Q/C \times (3.14 \div Q/C \times (3.14 \times D_A \times T)^{1/2} \times 10^{-4}\ (m^2/cm^2)}{(2 \times \rho_b \times D_A)}$$

where:

VF = volatilization factor, m^3/kg
Di = diffusion coefficient in air, cm^2/s
Dw = diffusion coefficient in water, cm^2/s
K_d = soil-water partition coefficient, cm^3/g = K_{oc} x f_{oc}
f_{oc} = fraction organic carbon in soil, g/g = 0.006
K_{oc} = soil organic carbon partition coefficient, cm^3/g
T = exposure interval, s = 9.5 x 10^8
H' = Dimensionless Henry's law constant
D_A = apparent diffusivity, cm^2/s
θ_a = air filled soil porosity = n - θ_w = 0.28
θ_w = water-filled soil porosity = 0.15
n = total porosity = 1 - ρ_b/ρ_s = 0.43
ρ_b = dry soil bulk density, g/cm^3 = 1.5
ρ_s = soil particle density, g/cm^3 = 2.65

(5) Estimated for volatile chemicals using Equation 5 from Schaum et al (1994) (p. 308), with radon as the reference chemical (j):

$$f_i = f_j \times \frac{\left(2.5/D_W^{0.67} + RT/D_a^{0.67}H\right)_j}{\left(2.5/D_W^{0.67} + RT/D_a^{0.67}H\right)_i}$$

Where:

f_i = volatilization fraction for chemical i
f_j = volatilization fraction for chemical j = Radon
D_a = diffusion coefficient in air, m^2/s
D_w = diffusion coefficient in water, m^2/s
D_a for Radon = 2.0 x 10^{-5}
D_w for Radon = 1.4 x 10^{-9}
R = gas constant, atm-m^3/mol-K = 8.21 x 10^{-5}
H = Henry's law constant, atm-m^3/mol
T = temperature, K = 293

TABLE B-4.7
PARTICULATE EMISSION FACTOR
Matteo & Sons, Inc. Site
Thorofare, New Jersey

$$Q/C = A \times \exp \frac{(\ln A_{site} - B)^2}{C}$$

A,B,C constant based on Zone 8, Philadephia, PA[1]

A =	14.0111	(unitless)
B =	19.6154	(unitless)
C =	225.3397	(unitless)

$$PEF = Q/C \times \frac{3{,}600 \text{ s/h}}{0.036 \times (1-V) \times (U_m/U_t)^3 \times F(x)}$$

			Reference
U_m =	1.8	m/s	based on the mean annual wind speed for 2011 for Sewell New Jersey, the closest station to the site
U_t =	11.32	m/s	EPA 2002
F(x) =	0.194	(unitless)	EPA 2002

	Scrapyard	Open Field / Waste Disposal Area	Rental Home Area	Willow Woods Property	Matteo Property [2]
A_{site} (acres)	10	53	2.3	15	65
Q/C_{wind} (g/m^2 -s per kg/m^3)	52.98	41.52	67.05	50.02	40.34
V =	0.37	0.75	0.74	0.20	0.70
PEF (m^3/kg)	**1.08E+10**	**2.17E+10**	**3.30E+10**	**8.02E+09**	**1.70E+10**

[1] EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Exhibit D-2.

[2] This includes the scrapyard area, the open field/waste disposal area, and the rental home area.

TABLE B-5.1

NONCANCER TOXICITY DATA - ORAL/DERMAL

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal [1]	Absorbed RfD for Dermal [2]		Primary Target Organ	Combined Uncertainty/ Modifying Factor	Source	Date [3]
		Value	Unit		Value	Unit				
Volatile Organic Compounds										
1,4-Dioxane	Chronic	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Liver/Kidney	300	IRIS	7/8/2015
cis-1,2-Dichloroethene	Chronic	2.0E-03	mg/kg-day	1	2.0E-03	mg/kg-day	Kidney	3,000	IRIS	7/21/2012
Trichloroethene	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Heart/ Immune System/ Developmental/Kidney	10 to 1,000	IRIS	7/8/2015
Vinyl Chloride	Chronic	3.0E-03	mg/kg-day	1	3.0E-03	mg/kg-day	Liver	30	IRIS	7/21/2012
Semi-volatile Organic Compounds										
Benzo(a)anthracene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Chrysene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Pentachlorophenol	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Liver	300	IRIS	7/21/2012
Pyrene	Chronic	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Kidney	3,000	IRIS	7/8/2015
Dioxins/Furans										
Dioxin/Furan TEQ[4]	Chronic	7.0E-10	mg/kg-day	1	7.0E-10	mg/kg-day	Reproduction	30	IRIS	7/21/2012
Pesticides/Polychlorinated Biphenyls										
4,4'-DDT	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	100	IRIS	7/8/2015
Aroclor 1248	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Aroclor 1254	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye / Finger Nail / Immune System	300	IRIS	7/21/2012
Aroclor 1260[5]	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye / Finger Nail / Immune System	300	IRIS	7/21/2012
Aroclor 1268[5]	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye / Finger Nail / Immune System	300	IRIS	7/21/2012
Delta-BHC	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Dieldrin	Chronic	5.0E-05	mg/kg-day	1	5.0E-05	mg/kg-day	Liver	100	IRIS	7/21/2012
Heptachlor Epoxide	Chronic	1.3E-05	mg/kg-day	1	1.3E-05	mg/kg-day	Liver	1,000	IRIS	7/8/2015
Inorganics										
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/23/2006
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Longevity / Blood	1000	IRIS	7/21/2012
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin	3	IRIS	7/21/2012
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidney	300	IRIS	12/2/2011
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Intestine	300	IRIS	7/21/2012
Cadmium[6]	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidney	10	IRIS	7/21/2012
Chromium[7]	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None reported	300	IRIS	7/21/2012
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Thyroid	3,000	PPRTV	8/25/2008
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	GI Tract	NA	HEAST	7/1/1997
Cyanide	Chronic	6.0E-04	mg/kg-day	1	6.0E-04	mg/kg-day	None reported	NA	IRIS	7/21/2012
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	GI Tract	1.5	PPRTV	9/11/2006
Lead	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Manganese	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1	IRIS	7/21/2012

TABLE B-5.1

NONCANCER TOXICITY DATA - ORAL/DERMAL

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal [1]	Absorbed RfD for Dermal [2]		Primary Target Organ	Combined Uncertainty/ Modifying Factor	Source	Date [3]
		Value	Unit		Value	Unit				
Mercury[8]	Chronic	3.0E-04	mg/kg-day	0.07	2.1E-05	mg/kg-day	Immune System	1000	IRIS	7/21/2012
Nickel[9]	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ Weight	300	IRIS	7/21/2012
Thallium	Chronic	1.0E-05	mg/kg-day	1	1.0E-05	mg/kg-day	Skin/Hair	3,000	PPRTV-S	10/8/2010
Vanadium	Chronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Kidney	3,000	PPRTV	9/30/2009
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Blood	3	IRIS	7/21/2012

[1] Oral Absorption Efficiency for Dermal from Risk Assessment Guidance for Superfund Part E, Supplemental Guidance for Dermal Risk Assessment

[2] Adjusted RfD for Dermal = Oral RfD x Oral Absorption Efficiency for Dermal.

[3] Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/
Date shown for other sources is the publication date.

[4] based on 2,3,7,8-tetrachlorodibenzo-p-dioxin

[5] based on Aroclor 1254

[6] based on cadmium (diet)

[7] Toxicity values are not available for total chromium. Hexavalent chromium is used as a surrogate.

[8] based on mercuric chloride

[9] based on nickel, soluble salts

Definition:

ATSDR = Agency for Toxic Substances and Disease Registry

CNS = central nervous system

GI = gastrointestinal

HEAST = Health Effect Assessment Summary Tables

IRIS = Integrated Risk Information System

mg/kg-day = milligram per kilogram per day

NA = not available

PPRTV = Provisional Peer Reviewed Toxicity Value

PPRTV-S = Screening Provisional Peer Reviewed Toxicity Value

RfD = reference dose

TABLE B-5.2a
NONCANCER TOXICITY DATA - INHALATION (CHRONIC)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Volatile Organic Compounds						
1,4-Dioxane	3.0E-02	mg/m^3	Respiratory	1,000	IRIS	7/8/2015
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
Trichloroethene	2.0E-03	mg/m^3	Heart/Immune System/Liver	10 to 100	IRIS	7/8/2015
Vinyl Chloride	1.0E-01	mg/m^3	Liver	30	IRIS	7/21/2012
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Dioxins/Furans						
Dioxin/Furan TEQ	4.0E-08	mg/m^3	Liver/Reproductive/Development/ Endocrine System/Respiratory/ Blood	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Aroclor 1260	NA	NA	NA	NA	NA	NA
Aroclor 1268	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Aluminum	5.0E-03	mg/m^3	Neurological	300	PPRTV	10/23/2006
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	1.5E-05	mg/m^3	Developmental/Cardiovascular System/CNS/Lung/Skin	30	Cal/EPA	9/2009
Barium	5.0E-04	mg/m^3	Fetus	1,000	HEAST	7/1/1997
Beryllium	2.0E-05	mg/m^3	Lung	10	IRIS	7/21/2012
Cadmium	1.0E-05	mg/m^3	Kidney	9	ATSDR	2/2012
Chromium[3]	1.0E-04	mg/m^3	Lung	300	IRIS	7/21/2012
Cobalt	6.0E-06	mg/m^3	Respiratory System/Lung	300	PPRTV	8/25/2008
Copper	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Manganese	5.0E-05	mg/m^3	CNS	1,000	IRIS	7/21/2012

TABLE B-5.2a
NONCANCER TOXICITY DATA - INHALATION (CHRONIC)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Mercury[4]	3.0E-04	mg/m^3	Nervous System	30	IRIS	7/21/2012
Nickel	9.0E-05	mg/m^3	Respiratory	30	ATSDR	2/2012
Thallium	NA	NA	NA	NA	NA	NA
Vanadium	1.0E-04	mg/m^3	Respiratory System	30	ATSDR	2/2012
Zinc	NA	NA	NA	NA	NA	NA

[1] ATSDR chronic inhalation minimal risk level (MRL)
MRL is converted from units in ppmv to mg/m^3 using the following equation:
$MRL\ (mg/m^3) = (ppmv)(1\ kg/1000\ g)(P/RT)(molecular\ weight)$
where:
P = ambient air pressure, 1 atmosphere (atm)
R = ideal gas constant, 8.2×10^{-5} atm-m^3/mol-^{0}K
T = absolute temperature, 298.15 Kelvin (^{0}K)

[2] Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/
Date shown for other sources is the publication date.

[3] Toxicity values are not available for total chromium.
Hexavalent chromium particulate is used as a surrogate.

[4] based on mercury (inorganic)

Definition:
ATSDR = Agency for Toxic Substances and Disease Registry
Cal/EPA = California Environmental Protection Agency
CNS = central nervous system
IRIS = Integrated Risk Information System
mg/m^3 = milligram per cubic meter
NA = not available
ppmv = part per million by volume
PPRTV = Provisional Peer Reviewed Toxicity Value
RfC = reference concentration

TABLE B-5.2b
NONCANCER TOXICITY DATA - INHALATION (SUBCHRONIC)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Volatile Organic Compounds						
1,4-Dioxane	7.2E-01	mg/m^3	Respiratory	100	ATSDR	4/2015
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
Trichloroethene	2.1E-03	mg/m^3	Developmental/Immune System	10 to 100	ATSDR	4/2015
Vinyl Chloride	7.7E-02	mg/m^3	Liver	30	ATSDR	2/2012
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Dioxins/Furans						
Dioxin/Furan TEQ	NA	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Aroclor 1260	NA	NA	NA	NA	NA	NA
Aroclor 1268	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Aluminum	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA
Chromium[3]	3.0E-04	mg/m^3	Respiratory	30	ATSDR	2/2012
Cobalt	2.0E-05	mg/m^3	Respiratory System/Lung	100	PPRTV	8/25/2008
Copper	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA

TABLE B-5.2b
NONCANCER TOXICITY DATA - INHALATION (SUBCHRONIC)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Mercury	NA	NA	NA	NA	NA	NA
Nickel	2.0E-04	mg/m^3	Respiratory	30	ATSDR	2/2012
Thallium	NA	NA	NA	NA	NA	NA
Vanadium[4]	1.0E-04	mg/m^3	Lung	1,000	PPRTV	4/30/2008
Zinc	NA	NA	NA	NA	NA	NA

[1] ATSDR chronic inhalation minimal risk level (MRL)
MRL is converted from units in ppmv to mg/m^3 using the following equation:

$$MRL\ (mg/m^3) = (ppmv)(1\ kg/1000\ g)(P/RT)(molecular\ weight)$$

where:
P = ambient air pressure, 1 atmosphere (atm)
R = ideal gas constant, 8.2×10^{-5} atm-m^3/mol-^{0}K
T = absolute temperature, 298.15 Kelvin (^{0}K)

[2] Date shown is the publication date.

[3] Toxicity values are not available for total chromium.
Hexavalent chromium particulate is used as a surrogate.

[4] based on vanadium pentoxide

Definition:
ATSDR = Agency for Toxic Substances and Disease Registry
mg/m^3 = milligram per cubic meter
NA = not available
ppmv = part per million by volume
PPRTV = Provisional Peer Reviewed Toxicity Value
RfC = reference concentration

TABLE B-5.2c
NONCANCER TOXICITY DATA - INHALATION (ACUTE)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Volatile Organic Compounds						
1,4-Dioxane	7.2E+00	mg/m^3	Eye	10	ATSDR	4/2015
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA
Vinyl Chloride	1.8E+02	mg/m^3	CNS/Eye/Respiratory System	10	Cal/EPA	9/2009
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Dioxins/Furans						
Dioxin/Furan TEQ	NA	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Aroclor 1260	NA	NA	NA	NA	NA	NA
Aroclor 1268	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Aluminum	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	2.0E-04	mg/m^3	Developmental/Cardiovascular System/CNS	1,000	Cal/EPA	9/2009
Barium	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium[3]	3.0E-05	mg/m^3	Respiratory System	300	ATSDR	2/2012
Chromium	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA
Copper	1.0E-01	mg/m^3	Respiratory System	10	Cal/EPA	9/2009
Cyanide	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Manganese	1.7E-04	mg/m^3	CNS	300	Cal/EPA	9/2009

TABLE B-5.2c
NONCANCER TOXICITY DATA - INHALATION (ACUTE)
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source [1]	Date [2]
Mercury[4]	6.0E-04	mg/m^3	Nervous system	3,000	Cal/EPA	9/2009
Nickel	2.0E-04	mg/m^3	Immune System	1,000	Cal/EPA	2/2012
Thallium	NA	NA	NA	NA	NA	NA
Vanadium[5]	3.0E-02	mg/m^3	Respiratory System/Eyes	10	Cal/EPA	9/2009
Zinc	NA	NA	NA	NA	NA	NA

[1] ATSDR chronic inhalation minimal risk level (MRL)

MRL is converted from units in ppmv to mg/m^3 using the following equation:

$MRL\ (mg/m^3) = (ppmv)(1\ kg/1000\ g)(P/RT)(molecular\ weight)$

where:

P = ambient air pressure, 1 atmosphere (atm)

R = ideal gas constant, 8.2×10^{-5} atm-m^3/mol-^{0}K

T = absolute temperature, 298.15 Kelvin (^{0}K)

[2] Date shown is the publication date.

[3] based on cadmium (diet)

[4] based on mercury (inorganic)

[5] based on vanadium pentoxide

Definition:

ATSDR = Agency for Toxic Substances and Disease Registry

Cal/EPA = California Environmental Protection Agency

CNS = central nervous system

mg/m^3 = milligram per cubic meter

NA = not available

ppmv = part per million by volume

RfC = reference concentration

TABLE B-6.1

CANCER TOXICITY DATA - ORAL/DERMAL

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Chemical of Potential Concern	Oral Slope Factor		Oral Absorption Efficiency for Dermal [1]	Absorbed Slope Factor for Dermal [2]		Mutagen [3]	Weight of Evidence/ Cancer Guideline Description	Source	Date [4]
	Value	Unit		Value	Unit				
Volatile Organic Compounds									
1,4-Dioxane	1.0E-01	$(mg/kg\text{-}day)^{-1}$	1	1.0E-01	$(mg/kg\text{-}day)^{-1}$	--	likely to be carcinogenic to humans	IRIS	7/8/2015
cis-1,2-Dichloroethene	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	IRIS	7/21/2012
Trichloroethene	4.6E-02	$(mg/kg\text{-}day)^{-1}$	1	4.6E-02	$(mg/kg\text{-}day)^{-1}$	M	carcinogenic to humans	IRIS	7/8/2015
Vinyl Chloride	7.2E-01	$(mg/kg\text{-}day)^{-1}$	1	7.2E-01	$(mg/kg\text{-}day)^{-1}$	M	A	IRIS	7/21/2012
Semi-volatile Organic Compounds									
Benzo(a)anthracene	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1	7.3E-01	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Benzo(a)pyrene	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1	7.3E+00	$(mg/kg\text{-}day)^{-1}$	M	B2	IRIS	7/21/2012
Benzo(b)fluoranthene	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1	7.3E-01	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Benzo(k)fluoranthene	7.3E-02	$(mg/kg\text{-}day)^{-1}$	1	7.3E-02	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Chrysene	7.3E-03	$(mg/kg\text{-}day)^{-1}$	1	7.3E-03	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Dibenzo(a,h)anthracene	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1	7.3E+00	$(mg/kg\text{-}day)^{-1}$	M	B2	EPA	7/1/1993
Indeno(1,2,3-cd)pyrene	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1	7.3E-01	$(mg/kg\text{-}day)^{-1}$	M	B2	IRIS	7/21/2012
Pentachlorophenol	4.0E-01	$(mg/kg\text{-}day)^{-1}$	1	4.0E-01	$(mg/kg\text{-}day)^{-1}$	--	likely to be carcinogenic to humans	IRIS	7/21/2012
Pyrene	NA	NA	1	NA	NA	--	D	IRIS	7/8/2015
Dioxins/Furans									
Dioxin/Furan TEQ	1.3E+05	$(mg/kg\text{-}day)^{-1}$	1	1.3E+05	$(mg/kg\text{-}day)^{-1}$	--	B2	CalEPA	7/2009
Pesticides/Polychlorinated Biphenyls									
4,4'-DDT	3.4E-01	$(mg/kg\text{-}day)^{-1}$	1	3.4E-01	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/8/2015
Aroclor 1248 [5]	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1254 [5]	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1260 [5]	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1268 [5]	2.0E+00	$(mg/kg\text{-}day)^{-1}$	1	2.0E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Delta-BHC [6]	1.8E+00	$(mg/kg\text{-}day)^{-1}$	1	1.8E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/8/2015
Dieldrin	1.6E+01	$(mg/kg\text{-}day)^{-1}$	1	1.6E+01	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/21/2012
Heptachlor Epoxide	9.1E+00	$(mg/kg\text{-}day)^{-1}$	1	9.1E+00	$(mg/kg\text{-}day)^{-1}$	--	B2	IRIS	7/8/2015
Inorganics									
Aluminum	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	10/23/2006
Antimony	NA	NA	0.15	NA	NA	--	inadequate information to assess the cancer potential	PPRTV	8/5/2008
Arsenic	1.5E+00	$(mg/kg\text{-}day)^{-1}$	0.03	1.5E+00	$(mg/kg\text{-}day)^{-1}$	--	A	IRIS	7/21/2012
Barium	NA	NA	0.07	NA	NA	--	D	IRIS	12/2/2011
Beryllium	NA	NA	0.007	NA	NA	--	carcinogenic potential cannot be determined	IRIS	7/21/2012
Cadmium	NA	NA	0.025	NA	NA	--	NA	NA	NA
Chromium [7]	5.0E-01	$(mg/kg\text{-}day)^{-1}$	1	5.0E-01	$(mg/kg\text{-}day)^{-1}$	--	likely to be carcinogenic to humans	NJDEP	4/8/2009
Cobalt	NA	NA	1	NA	NA	--	NA	NA	NA
Copper	NA	NA	1	NA	NA	--	D	IRIS	7/21/2012
Cyanide	NA	NA	1	NA	NA	--	D	IRIS	7/21/2012
Iron	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/11/2006
Lead	NA	NA	1	NA	NA	--	NA	NA	NA

TABLE B-6.1

CANCER TOXICITY DATA - ORAL/DERMAL

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Chemical of Potential Concern	Oral Slope Factor		Oral Absorption Efficiency for Dermal [1]	Absorbed Slope Factor for Dermal [2]		Mutagen [3]	Weight of Evidence/ Cancer Guideline Description	Source	Date [4]
	Value	Unit		Value	Unit				
Manganese	NA	NA	0.04	NA	NA	--	D	IRIS	7/21/2012
Mercury	NA	NA	1	NA	NA	--	NA	NA	NA
Nickel	NA	NA	0.04	NA	NA	--	NA	NA	NA
Thallium	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	10/8/2010
Vanadium	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/30/2009
Zinc	NA	NA	1	NA	NA	--	D	IRIS	7/21/2012

[1] Oral Absorption Efficiency for Dermal from Risk Assessment Guidance for Superfund Part E, Supplemental Guidance for Dermal Risk Assessment

[2] Oral cancer slope factor (CSF) for Dermal = Oral CSF

[3] Identified as a mutagen on the Regional Screening Level (RSL) Table, June 2011 http://www.epa.gov/region09/waste/sfund/prg/index.html

[4] Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/ Date shown for other sources is the publication date.

[5] based on oral slope factor for high risk and persistent polychlorinated biphenyls

[6] based on technical hexachlorocyclohexane

[7] Toxicity values are not available for total chromium. Hexavalent chromium particulate is used as a surrogate.

EPA Weight of Evidence (EPA 1986, EPA 1996):

A - Human Carcinogen

B1 - Probable human carcinogen indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as human carcinogen

Definition:

Cal/EPA = California Environmental Protection Agency

EPA = EPA Provisional Guidance for Quantitative Assessment of Polycyclic Aromatic Hydrocarbons

IRIS = Integrated Risk Information System

M = mutagen

mg/kg-day = milligram per kilogram per day

NA = not available

NJDEP = New Jersey Department of Environmental Protection

PPRTV = Provisional Peer Reviewed Toxicity Value

EPA Weight of Evidence Narrative (EPA 2005):

Carcinogenic to human

Likely to be carcinogenic to humans

Suggestive evidence of carcinogenic potential

Inadequate information to assess carcinogenic potential

Not likely to be carcinogenic to humans

TABLE B-6.2
CANCER TOXICITY DATA - INHALATION
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation Unit Risk		Mutagen [1]	Weight of Evidence/ Cancer Guideline Description	Inhalation Unit Risk	
	Value	Unit			Source	Date [2]
Volatile Organic Compounds						
1,4-Dioxane	5.0E-06	$(\mu g/m^3)^{-1}$	--	likely to be carcinogenic to humans	IRIS	7/8/2015
cis-1,2-Dichloroethene	NA	NA	--	inadequate information to assess the carcinogenic potential	IRIS	7/21/2012
Trichloroethene	4.1E-06	$(\mu g/m^3)^{-1}$	M	carcinogenic to humans	IRIS	7/8/2015
Vinyl Chloride	4.4E-06	$(\mu g/m^3)^{-1}$	M	A	IRIS	7/21/2012
Semi-volatile Organic Compounds						
Benzo(a)anthracene	1.1E-04	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/2009
Benzo(a)pyrene	1.1E-03	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/2009
Benzo(b)fluoranthene	1.1E-04	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	5/2009
Benzo(k)fluoranthene	1.1E-04	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/17/2014
Chrysene	1.1E-05	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/18/2014
Dibenzo(a,h)anthracene	1.2E-03	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	7/2009
Indeno(1,2,3-cd)pyrene	1.1E-04	$(\mu g/m^3)^{-1}$	M	B2	Cal/EPA	5/2009
Pentachlorophenol	5.1E-06	$(\mu g/m^3)^{-1}$	--	B2	Cal/EPA	7/2009
Pyrene	NA	NA	--	D	IRIS	7/8/2015
Dioxins/Furans						
Dioxin/Furan TEQ	3.8E+01	$(\mu g/m^3)^{-1}$	--	B2	Cal/EPA	7/2009
Pesticides/Polychlorinated Biphenyls						
4,4'-DDT	9.7E-05	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/8/2015
Aroclor 1248 [3]	5.7E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1254 [3]	5.7E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1260 [3]	5.7E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Aroclor 1268 [3]	5.7E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Delta-BHC	5.1E-04	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/8/2015
Dieldrin	4.6E-03	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/21/2012
Heptachlor Epoxide	2.6E-03	$(\mu g/m^3)^{-1}$	--	B2	IRIS	7/8/2015
Inorganics						
Aluminum	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	10/23/2006
Antimony	NA	NA	--	suggestive evidence of the cancer potential	PPRTV	8/5/2008
Arsenic	4.3E-03	$(\mu g/m^3)^{-1}$	--	A	IRIS	7/21/2012
Barium	NA	NA	--	D	IRIS	12/2/2011
Beryllium	2.4E-03	$(\mu g/m^3)^{-1}$	--	known/likely human carcinogen	IRIS	7/21/2012
Cadmium	1.8E-03	$(\mu g/m^3)^{-1}$	--	B1	IRIS	7/21/2012
Chromium[4]	1.2E-02	$(\mu g/m^3)^{-1}$	--	A	IRIS	7/21/2012
Cobalt	9.0E-03	$(\mu g/m^3)^{-1}$	--	likely to be carcinogenic to humans	PPRTV	8/25/2008
Copper	NA	NA	--	D	IRIS	7/21/2012
Cyanide	NA	NA	--	D	IRIS	7/21/2012
Iron	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/11/2006
Lead	NA	NA	--	NA	NA	NA

TABLE B-6.2
CANCER TOXICITY DATA - INHALATION
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Chemical of Potential Concern	Inhalation Unit Risk		Mutagen [1]	Weight of Evidence/ Cancer Guideline Description	Inhalation Unit Risk	
	Value	Unit			Source	Date [2]
Manganese	NA	NA	--	D	IRIS	7/21/2012
Mercury	NA	NA	--	NA	NA	NA
Nickel	2.6E-04	$(\mu g/m^3)^{-1}$		A	Cal/EPA	7/2009
Thallium	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	10/8/2010
Vanadium[5]	8.3E-03	$(\mu g/m^3)^{-1}$	--	suggestive evidence of carcinogenic potential	PPRTV	4/30/2008
Zinc	NA	NA	--	D	IRIS	7/21/2012

[1] Idenitified as a mutagen on the Regional Screening Level (RSL) Table, June 2011, http://www.epa.gov/region09/waste/sfund/prg/index.html

[2] Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/ Date shown for other sources is the publication date.

[3] based on inhalation unit risk of high risk and persistent polychlorinated biphenyls

[4] Toxicity values are not available for total chromium. Hexavalent chromium particulate is used as a surrogate.

[5] based on vanadium pentoxide

EPA Weight of Evidence (EPA 1986, EPA 1996):
A - Human Carcinogen
B1 - Probable human carcinogen
indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen

Definition:
Cal/EPA = California Environmental Protection Agency
IRIS = Integrated Risk Information System
M = mutagen
NA = not available
PPRTV = Provisional Peer Reviewed Toxicity Value
$\mu g/m^3$ = microgram per cubic meter

EPA Weight of Evidence Narrative (EPA 2005):
Carcinogenic to human
Likely to be carcinogenic to humans
Suggestive evidence of carcinogenic potential
Inadequate information to assess carcinogenic potential
Not likely to be carcinogenic to humans

TABLE B-7.0.1

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

SURFACE SOIL FOR CURRENT/FUTURE TRESPASSER (ADOLESCENT [6 - 18 YEARS] AT OPEN FIELD/ WASTE DISPOSAL AREA

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Common Exposure Parameters

Soil Concentration (CS)	7.0E-03	mg/kg
Exposure Frequency (EF)	100	days

Ingestion

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	mg/day	mg/kg	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	CS	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2 x 10^{-6} kg/mg)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2 x 10^{-6} kg/mg)*	*(C9 + C12)*
Age group	Body Weight	Ingestion Rate	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
6 to <16 years	44	100	7.0E-03	10	3.9E-02	9.3E-03	3	**1.7E-11**	4.6E-02	3.7E-02	**2.3E-11**	**4.0E-11**
16 to <18 years	44	100	7.0E-03	2	7.8E-03	9.3E-03	1	**1.2E-12**	4.6E-02	3.7E-02	**4.6E-12**	**5.7E-12**
											Total Ingestion Risk	**4.6E-11**

Inhalation

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	hr/day	m^3/kg	$\mu g/m^3$	yr	-	$(\mu g/m^3)^{-1}$	-	-	$(\mu g/m^3)^{-1}$	$(\mu g/m^3)^{-1}$	-	-
Equation	-	-	*(CS / C3 x 1000 µg/mg)*	-	*(C5 / 70 yr x C2 / 24 hrs x EF / 365 days)*	-	-	*(C4 x C6 x C7 x C8)*	-	*(C10 − C7)*	*(C4 x C6 x C11)*	*(C9 + C12)*
Age group	Exposure Time	Volatilization Factor	Chemical Concentration in Air	Age Group Duration	Duration Adjustment	Kidney Unit Risk	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Unit Risk	NHL+Liver Unit Risk	**NHL+Liver Partial Risk**	**Total Partial Risk**
6 to <16 years	2	3.3E+03	2.1E-03	10	3.3E-03	1.0E-06	3	**2.1E-11**	4.1E-06	3.1E-06	**2.1E-11**	**4.2E-11**
16 to <18 years	2	3.3E+03	2.1E-03	2	6.5E-04	1.0E-06	1	**1.4E-12**	4.1E-06	3.1E-06	**4.3E-12**	**5.7E-12**
											Total Inhalation Risk	**4.8E-11**

ADAF = age-dependent adjustment factors

Source:

(1) EPA 2011. Toxicological Review of Trichloroethylene (CAS No. 79-01-6) in Support of Summary Information on the Integrated Risk Information System (IRIS). September

TABLE B-7.0.2

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

SURFACE SOIL FOR CURRENT/FUTURE RECREATIONAL USER (ADOLESCENT [6 - 18 YEARS] AT OPEN FIELD/ WASTE DISPOSAL AREA

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Common Exposure Parameters

Soil Concentration (CS)	7.0E-03	mg/kg
Exposure Frequency (EF)	100	days

Ingestion

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	mg/day	mg/kg	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	CS	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2 x 10^{-6} kg/mg)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2 x 10^{-6} kg/mg)*	*(C9 + C12)*
Age group	Body Weight	Ingestion Rate	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
6 to <16 years	44	100	7.0E-03	10	3.9E-02	9.3E-03	3	**1.7E-11**	4.6E-02	3.7E-02	**2.3E-11**	**4.0E-11**
16 to <18 years	44	100	7.0E-03	2	7.8E-03	9.3E-03	1	**1.2E-12**	4.6E-02	3.7E-02	**4.6E-12**	**5.7E-12**
											Total Ingestion Risk	**4.6E-11**

Inhalation

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	hr/day	m^3/kg	$\mu g/m^3$	yr	-	$(\mu g/m^3)^{-1}$	-	-	$(\mu g/m^3)^{-1}$	$(\mu g/m^3)^{-1}$	-	-
Equation	-	-	*(CS / C3 x 1000 µg/mg)*	-	*(C5 / 70 yr x C2 / 24 hrs x EF / 365 days)*	-	-	*(C4 x C6 x C7 x C8)*	-	*(C10 − C7)*	*(C4 x C6 x C11)*	*(C9 + C12)*
Age group	Exposure Time	Volatilization Factor	Chemical Concentration in Air	Age Group Duration	Duration Adjustment	Kidney Unit Risk	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Unit Risk	NHL+Liver Unit Risk	**NHL+Liver Partial Risk**	**Total Partial Risk**
6 to <16 years	2	3.3E+03	2.1E-03	10	3.3E-03	1.0E-06	3	**2.1E-11**	4.1E-06	3.1E-06	**2.1E-11**	**4.2E-11**
16 to <18 years	2	3.3E+03	2.1E-03	2	6.5E-04	1.0E-06	1	**1.4E-12**	4.1E-06	3.1E-06	**4.3E-12**	**5.7E-12**
											Total Inhalation Risk	**4.8E-11**

ADAF = age-dependent adjustment factors

Source:

(1) EPA 2011. Toxicological Review of Trichloroethylene (CAS No. 79-01-6) in Support of Summary Information on the Integrated Risk Information System (IRIS). September

TABLE B-7.0.3

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

SURFACE SOIL FOR FUTURE RESIDENT AT MATTEO PROPERTY

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Common Exposure Parameters

Soil Concentration (CS)	7.0E-03	mg/kg
Exposure Frequency (EF)	350	days

Ingestion

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	mg/day	mg/kg	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	CS	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2 x 10^{-6} kg/mg)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2 x 10^{-6} kg/mg)*	*(C9 + C12)*
Age group	Body Weight	Ingestion Rate	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	15	200	7.0E-03	2	2.7E-02	9.3E-03	10	**2.4E-10**	4.6E-02	3.7E-02	**9.4E-11**	**3.3E-10**
2 to <6 years	15	200	7.0E-03	4	5.5E-02	9.3E-03	3	**1.4E-10**	4.6E-02	3.7E-02	**1.9E-10**	**3.3E-10**
6 to <16 years	70	100	7.0E-03	10	1.4E-01	9.3E-03	3	**3.8E-11**	4.6E-02	3.7E-02	**5.0E-11**	**8.8E-11**
16 to <30 years	70	100	7.0E-03	14	1.9E-01	9.3E-03	1	**1.8E-11**	4.6E-02	3.7E-02	**7.0E-11**	**8.8E-11**
											Total Ingestion Risk	**8.4E-10**

Inhalation

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	hr/day	m^3/kg	$\mu g/m^3$	yr	-	$(\mu g/m^3)^{-1}$	-	-	$(\mu g/m^3)^{-1}$	$(\mu g/m^3)^{-1}$	-	-
Equation	-	-	*(CS / C3 x 1000 µg/mg)*	-	*(C5 / 70 yr x C2 / 24 hrs x EF / 365 days)*	-	-	*(C4 x C6 x C7 x C8)*	-	*(C10 − C7)*	*(C4 x C6 x C11)*	*(C9 + C12)*
Age group	Exposure Time	Volatilization Factor	Chemical Concentration in Air	Age Group Duration	Duration Adjustment	Kidney Unit Risk	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Unit Risk	NHL+Liver Unit Risk	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	24	3.3E+03	2.1E-03	2	2.7E-02	1.0E-06	10	**5.8E-10**	4.1E-06	3.1E-06	**1.8E-10**	**7.6E-10**
2 to <6 years	24	3.3E+03	2.1E-03	4	5.5E-02	1.0E-06	3	**3.5E-10**	4.1E-06	3.1E-06	**3.6E-10**	**7.1E-10**
6 to <16 years	24	3.3E+03	2.1E-03	10	1.4E-01	1.0E-06	3	**8.7E-10**	4.1E-06	3.1E-06	**9.0E-10**	**1.8E-09**
16 to <30 years	24	3.3E+03	2.1E-03	14	1.9E-01	1.0E-06	1	**4.1E-10**	4.1E-06	3.1E-06	**1.3E-09**	**1.7E-09**
											Total Inhalation Risk	**4.9E-09**

ADAF = age-dependent adjustment factors

Source:

(1) EPA 2011. Toxicological Review of Trichloroethylene (CAS No. 79-01-6) in Support of Summary Information on the Integrated Risk Information System (IRIS). September

TABLE B-7.0.4

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

GROUNDWATER FOR CURRENT/FUTURE RESIDENT

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Common Exposure Parameters

Groundwater Concentration (CW)	0.20	µg/L	
Exposure Frequency	350	days	(Table B-4.2)
Permeability Coefficient	0.012	cm/hr	(Table B-4.6)
Fraction Absorbed Water	1		(Table B-4.6)
Lag time	0.58	hr/day	(Table B-4.6)
Exposure Time - child	0.45	hr/day	(Table B-4.2)
Exposure Time - adult	0.25	hr/day	(Table B-4.2)

Ingestion

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	L/day	mg/L	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	CW/1000	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2)*	*(C9 + C12)*
Age group	Body Weight	Ingestion Rate	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	15	1	0.00020	2	2.7E-02	9.3E-03	10	**3.4E-08**	4.6E-02	3.7E-02	**1.3E-08**	**4.7E-08**
2 to <6 years	15	1	0.00020	4	5.5E-02	9.3E-03	3	**2.0E-08**	4.6E-02	3.7E-02	**2.7E-08**	**4.7E-08**
6 to <16 years	70	2	0.00020	10	1.4E-01	9.3E-03	3	**2.2E-08**	4.6E-02	3.7E-02	**2.8E-08**	**5.0E-08**
16 to <26 years	70	2	0.00020	10	1.4E-01	9.3E-03	1	**7.2E-09**	4.6E-02	3.7E-02	**2.8E-08**	**3.6E-08**
											Total Ingestion Risk	**1.8E-07**

Dermal Contact

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	cm^2/day	mg/cm^2	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	*Table B-4.6*	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2)*	*(C9 + C12)*
Age group	Body Weight	Skin Surface Area	Dermal Absorbed (DA_{event})	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	15	6,600	3.4E-09	2	2.7E-02	9.3E-03	10	**3.8E-09**	4.6E-02	3.7E-02	**1.5E-09**	**5.2E-09**
2 to <6 years	15	6,600	3.4E-09	4	5.5E-02	9.3E-03	3	**2.3E-09**	4.6E-02	3.7E-02	**3.0E-09**	**5.2E-09**
6 to <16 years	70	18,000	2.5E-09	10	1.4E-01	9.3E-03	3	**2.5E-09**	4.6E-02	3.7E-02	**3.2E-09**	**5.7E-09**
16 to <30 years	70	18,000	2.5E-09	14	1.9E-01	9.3E-03	1	**1.1E-09**	4.6E-02	3.7E-02	**4.5E-09**	**5.7E-09**
											Total Dermal Risk	**2.2E-08**

TABLE B-7.0.4

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

GROUNDWATER FOR CURRENT/FUTURE RESIDENT

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Inhalation of Volatile Chemicals

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	hr/day	µg/m^3	µg/m^3	yr	-	(µg/m^3)$^{-1}$	-	-	(µg/m^3)$^{-1}$	(µg/m^3)$^{-1}$	-	-
Equation	-	Table D-3/D-4	*C3*	-	*(C5 / 70 yr x C2 / 24 hrs x EF / 365 days)*	-	-	*(C4 x C6 x C7 x C8)*	-	*(C10 − C7)*	*(C4 x C6 x C11)*	*(C9 + C12)*
Age group	Exposure Time	Chemical Concentration in Air	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Unit Risk	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Unit Risk	NHL+Liver Unit Risk	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	0.45	6.1E+00	6.1E+00	2	5.1E-04	1.0E-06	10	**3.1E-08**	4.1E-06	3.1E-06	**9.6E-09**	**4.1E-08**
2 to <6 years	0.45	6.1E+00	6.1E+00	4	1.0E-03	1.0E-06	3	**1.9E-08**	4.1E-06	3.1E-06	**1.9E-08**	**3.8E-08**
6 to <16 years	0.25	3.4E+00	3.4E+00	10	1.4E-03	1.0E-06	3	**1.5E-08**	4.1E-06	3.1E-06	**1.5E-08**	**3.0E-08**
16 to <30 years	0.25	3.4E+00	3.4E+00	14	2.0E-03	1.0E-06	1	**6.8E-09**	4.1E-06	3.1E-06	**2.1E-08**	**2.8E-08**
											Total Inhalation Risk	**1.4E-07**

ADAF = age-dependent adjustment factors

Source:

(1) EPA 2011. Toxicological Review of Trichloroethylene (CAS No. 79-01-6) in Support of Summary Information on the Integrated Risk Information System (IRIS). September

TABLE B-7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Scrapyard Area	Ingestion	**Volatile Organic Compounds**												
				Trichloroethene	2.40E-03	mg/kg	8.39E-10	mg/kg-day	4.60E-02	$(mg/kg\text{-}day)^{-1}$	3.86E-11	2.35E-09	mg/kg-day	5.00E-04	mg/kg-day	4.70E-06
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.25E-01	mg/kg	1.83E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.34E-07	5.14E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	4.96E-01	mg/kg	1.73E-07	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.27E-06	4.85E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	6.59E-01	mg/kg	2.30E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.68E-07	6.45E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.75E-01	mg/kg	6.13E-08	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	4.47E-07	1.72E-07	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.12E-01	mg/kg	1.44E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.05E-07	4.03E-07	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.92E-05	mg/kg	1.02E-11	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	1.33E-06	2.86E-11	mg/kg-day	7.00E-10	mg/kg-day	4.08E-02
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.41E+01	mg/kg	4.92E-06	mg/kg-day	3.40E-01	$(mg/kg\text{-}day)^{-1}$	1.67E-06	1.38E-05	mg/kg-day	5.00E-04	mg/kg-day	2.75E-02
				Aroclor 1248	4.80E-01	mg/kg	1.68E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.35E-07	4.70E-07	mg/kg-day	NA	NA	NA
				Aroclor 1260	2.00E+02	mg/kg	6.99E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.40E-04	1.96E-04	mg/kg-day	2.00E-05	mg/kg-day	9.78E+00
				Delta-BHC	6.90E-01	mg/kg	2.41E-07	mg/kg-day	1.80E+00	$(mg/kg\text{-}day)^{-1}$	4.34E-07	6.75E-07	mg/kg-day	NA	NA	NA
				Dieldrin	2.40E+00	mg/kg	8.39E-07	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	1.34E-05	2.35E-06	mg/kg-day	5.00E-05	mg/kg-day	4.70E-02
				Heptachlor Epoxide	1.60E+00	mg/kg	5.59E-07	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	5.09E-06	1.57E-06	mg/kg-day	1.30E-05	mg/kg-day	1.20E-01
				Inorganics												
				Aluminum	9.68E+03	mg/kg	3.38E-03	mg/kg-day	NA	NA	NA	9.47E-03	mg/kg-day	1.00E+00	mg/kg-day	9.47E-03
				Antimony	1.20E+01	mg/kg	4.19E-06	mg/kg-day	NA	NA	NA	1.17E-05	mg/kg-day	4.00E-04	mg/kg-day	2.93E-02
				Arsenic	4.69E+00	mg/kg	9.83E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.47E-06	2.75E-06	mg/kg-day	3.00E-04	mg/kg-day	9.17E-03
				Cadmium	5.96E+00	mg/kg	2.08E-06	mg/kg-day	NA	NA	NA	5.83E-06	mg/kg-day	1.00E-03	mg/kg-day	5.83E-03
				Chromium	1.53E+02	mg/kg	5.35E-05	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	2.67E-05	1.50E-04	mg/kg-day	3.00E-03	mg/kg-day	4.99E-02
				Cobalt	6.32E+00	mg/kg	2.21E-06	mg/kg-day	NA	NA	NA	6.19E-06	mg/kg-day	3.00E-04	mg/kg-day	2.06E-02
				Copper	4.07E+03	mg/kg	1.42E-03	mg/kg-day	NA	NA	NA	3.98E-03	mg/kg-day	4.00E-02	mg/kg-day	9.96E-02
				Cyanide	5.90E-01	mg/kg	2.06E-07	mg/kg-day	NA	NA	NA	5.77E-07	mg/kg-day	6.00E-04	mg/kg-day	9.62E-04
				Iron	4.53E+04	mg/kg	1.58E-02	mg/kg-day	NA	NA	NA	4.44E-02	mg/kg-day	7.00E-01	mg/kg-day	6.34E-02
				Manganese	4.04E+02	mg/kg	1.41E-04	mg/kg-day	NA	NA	NA	3.95E-04	mg/kg-day	1.40E-01	mg/kg-day	2.82E-03
				Mercury	1.41E+00	mg/kg	4.93E-07	mg/kg-day	NA	NA	NA	1.38E-06	mg/kg-day	3.00E-04	mg/kg-day	4.60E-03
				Nickel	2.18E+02	mg/kg	7.62E-05	mg/kg-day	NA	NA	NA	2.13E-04	mg/kg-day	2.00E-02	mg/kg-day	1.07E-02
				Zinc	8.76E+03	mg/kg	3.06E-03	mg/kg-day	NA	NA	NA	8.57E-03	mg/kg-day	3.00E-01	mg/kg-day	2.86E-02
			Exp. Route Total								1.92E-04					1.04E+01

TABLE B-7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Scrapyard Area	Dermal Contact	**Volatile Organic Compounds**												
				Trichloroethene	2.40E-03	mg/kg	NA	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.25E-01	mg/kg	1.57E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.15E-07	4.41E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	4.96E-01	mg/kg	1.49E-07	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.09E-06	4.16E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	6.59E-01	mg/kg	1.98E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.44E-07	5.54E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.75E-01	mg/kg	5.26E-08	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	3.84E-07	1.47E-07	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.12E-01	mg/kg	1.23E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	9.01E-08	3.45E-07	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.92E-05	mg/kg	2.02E-12	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	2.63E-07	5.66E-12	mg/kg-day	7.00E-10	mg/kg-day	8.08E-03
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.41E+01	mg/kg	9.74E-07	mg/kg-day	3.40E-01	$(mg/kg\text{-}day)^{-1}$	3.31E-07	2.73E-06	mg/kg-day	5.00E-04	mg/kg-day	5.45E-03
				Aroclor 1248	4.80E-01	mg/kg	1.55E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.10E-07	4.34E-07	mg/kg-day	NA	NA	NA
				Aroclor 1260	2.00E+02	mg/kg	6.46E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.29E-04	1.81E-04	mg/kg-day	2.00E-05	mg/kg-day	9.04E+00
				Delta-BHC	6.90E-01	mg/kg	1.59E-07	mg/kg-day	1.80E+00	$(mg/kg\text{-}day)^{-1}$	2.86E-07	4.46E-07	mg/kg-day	NA	NA	NA
				Dieldrin	2.40E+00	mg/kg	5.54E-07	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	8.86E-06	1.55E-06	mg/kg-day	5.00E-05	mg/kg-day	3.10E-02
				Heptachlor Epoxide	1.60E+00	mg/kg	3.69E-07	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	3.36E-06	1.03E-06	mg/kg-day	1.30E-05	mg/kg-day	7.95E-02
				Inorganics												
				Aluminum	9.68E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	1.20E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	4.69E+00	mg/kg	3.24E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.86E-07	9.08E-07	mg/kg-day	3.00E-04	mg/kg-day	3.03E-03
				Cadmium	5.96E+00	mg/kg	1.37E-08	mg/kg-day	NA	NA	NA	3.85E-08	mg/kg-day	2.50E-05	mg/kg-day	1.54E-03
				Chromium	1.53E+02	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	6.32E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Copper	4.07E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	4.00E-02	mg/kg-day	NA
				Cyanide	5.90E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	4.53E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Manganese	4.04E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Mercury	1.41E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	2.10E-05	mg/kg-day	NA
				Nickel	2.18E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	8.00E-04	mg/kg-day	NA
				Zinc	8.76E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-01	mg/kg-day	NA
			Exp. Route Total								1.45E-04					9.17E+00

TABLE B-7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Scrapyard Area	Inhalation	**Volatile Organic Compounds**												
				Trichloroethene	2.40E-03	mg/kg	1.81E-11	µg/m^3	4.10E-06	(µg/m^3)$^{-1}$	7.44E-17	5.08E-14	mg/m^3	2.00E-03	mg/m^3	2.54E-11
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.25E-01	mg/kg	3.97E-09	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	4.37E-13	1.11E-11	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	4.96E-01	mg/kg	3.75E-09	µg/m^3	1.10E-03	(µg/m^3)$^{-1}$	4.13E-12	1.05E-11	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	6.59E-01	mg/kg	4.99E-09	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	5.48E-13	1.40E-11	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	1.75E-01	mg/kg	1.33E-09	µg/m^3	1.20E-03	(µg/m^3)$^{-1}$	1.59E-12	3.71E-12	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.12E-01	mg/kg	3.11E-09	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	3.42E-13	8.71E-12	mg/m^3	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.92E-05	mg/kg	2.21E-13	µg/m^3	3.80E+01	(µg/m^3)$^{-1}$	8.39E-12	6.18E-16	mg/m^3	4.00E-08	mg/m^3	1.55E-08
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.41E+01	mg/kg	1.06E-07	µg/m^3	9.70E-05	(µg/m^3)$^{-1}$	1.03E-11	2.98E-10	mg/m^3	NA	NA	NA
				Aroclor 1248	4.80E-01	mg/kg	3.63E-09	µg/m^3	5.70E-04	(µg/m^3)$^{-1}$	2.07E-12	1.02E-11	mg/m^3	NA	NA	NA
				Aroclor 1260	2.00E+02	mg/kg	1.51E-06	µg/m^3	5.70E-04	(µg/m^3)$^{-1}$	8.62E-10	4.23E-09	mg/m^3	NA	NA	NA
				Delta-BHC	6.90E-01	mg/kg	5.22E-09	µg/m^3	5.10E-04	(µg/m^3)$^{-1}$	2.66E-12	1.46E-11	mg/m^3	NA	NA	NA
				Dieldrin	2.40E+00	mg/kg	1.81E-08	µg/m^3	4.60E-03	(µg/m^3)$^{-1}$	8.35E-11	5.08E-11	mg/m^3	NA	NA	NA
				Heptachlor Epoxide	1.60E+00	mg/kg	1.21E-08	µg/m^3	2.60E-03	(µg/m^3)$^{-1}$	3.15E-11	3.39E-11	mg/m^3	NA	NA	NA
				Inorganics												
				Aluminum	9.68E+03	mg/kg	7.32E-05	µg/m^3	NA	NA	NA	2.05E-07	mg/m^3	5.00E-03	mg/m^3	4.10E-05
				Antimony	1.20E+01	mg/kg	9.06E-08	µg/m^3	NA	NA	NA	2.54E-10	mg/m^3	NA	NA	NA
				Arsenic	4.69E+00	mg/kg	3.54E-08	µg/m^3	4.30E-03	(µg/m^3)$^{-1}$	1.52E-10	9.92E-11	mg/m^3	1.50E-05	mg/m^3	6.62E-06
				Cadmium	5.96E+00	mg/kg	4.50E-08	µg/m^3	1.80E-03	(µg/m^3)$^{-1}$	8.11E-11	1.26E-10	mg/m^3	1.00E-05	mg/m^3	1.26E-05
				Chromium	1.53E+02	mg/kg	1.16E-06	µg/m^3	1.20E-02	(µg/m^3)$^{-1}$	1.39E-08	3.24E-09	mg/m^3	1.00E-04	mg/m^3	3.24E-05
				Cobalt	6.32E+00	mg/kg	4.78E-08	µg/m^3	9.00E-03	(µg/m^3)$^{-1}$	4.30E-10	1.34E-10	mg/m^3	6.00E-06	mg/m^3	2.23E-05
				Copper	4.07E+03	mg/kg	3.08E-05	µg/m^3	NA	NA	NA	8.62E-08	mg/m^3	NA	NA	NA
				Cyanide	5.90E-01	mg/kg	4.46E-09	µg/m^3	NA	NA	NA	1.25E-11	mg/m^3	NA	NA	NA
				Iron	4.53E+04	mg/kg	3.43E-04	µg/m^3	NA	NA	NA	9.60E-07	mg/m^3	NA	NA	NA
				Manganese	4.04E+02	mg/kg	3.05E-06	µg/m^3	NA	NA	NA	8.55E-09	mg/m^3	5.00E-05	mg/m^3	1.71E-04
				Mercury	1.41E+00	mg/kg	1.07E-08	µg/m^3	NA	NA	NA	2.99E-11	mg/m^3	3.00E-04	mg/m^3	9.95E-08
				Nickel	2.18E+02	mg/kg	1.65E-06	µg/m^3	2.60E-04	(µg/m^3)$^{-1}$	4.29E-10	4.62E-09	mg/m^3	9.00E-05	mg/m^3	5.13E-05
				Zinc	8.76E+03	mg/kg	6.62E-05	µg/m^3	NA	NA	NA	1.85E-07	mg/m^3	NA	NA	NA
			Exp. Route Total								1.60E-08					3.37E-04
		Exposure Point Total									3.37E-04					1.95E+01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
µg/m^3 = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE B-7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Ingestion	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table B-7.0.1	mg/kg-day	4.60E-02	$(mg/kg-day)^{-1}$	4.60E-11	4.36E-09	mg/kg-day	5.00E-04	mg/kg-day	8.72E-06
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	6.48E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	4.73E-08	3.78E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	2.59E-08	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.89E-07	1.51E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	6.07E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	4.43E-08	3.54E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	1.49E-08	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.09E-07	8.72E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	3.63E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.65E-08	2.12E-07	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	1.96E-12	mg/kg-day	1.30E+05	$(mg/kg-day)^{-1}$	2.55E-07	1.15E-11	mg/kg-day	7.00E-10	mg/kg-day	1.64E-02
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	3.26E-08	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	6.51E-08	1.90E-07	mg/kg-day	2.00E-05	mg/kg-day	9.50E-03
				Aroclor 1260	8.51E-01	mg/kg	9.09E-08	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	1.82E-07	5.30E-07	mg/kg-day	2.00E-05	mg/kg-day	2.65E-02
				Heptachlor Epoxide	1.20E-01	mg/kg	1.28E-08	mg/kg-day	9.10E+00	$(mg/kg-day)^{-1}$	1.17E-07	7.47E-08	mg/kg-day	1.30E-05	mg/kg-day	5.75E-03
				Inorganics												
				Aluminum	3.44E+03	mg/kg	3.67E-04	mg/kg-day	NA	NA	NA	2.14E-03	mg/kg-day	1.00E+00	mg/kg-day	2.14E-03
				Antimony	7.77E+00	mg/kg	8.29E-07	mg/kg-day	NA	NA	NA	4.84E-06	mg/kg-day	4.00E-04	mg/kg-day	1.21E-02
				Arsenic	4.20E+00	mg/kg	2.69E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	4.03E-07	1.57E-06	mg/kg-day	3.00E-04	mg/kg-day	5.23E-03
				Cadmium	1.77E+00	mg/kg	1.89E-07	mg/kg-day	NA	NA	NA	1.10E-06	mg/kg-day	1.00E-03	mg/kg-day	1.10E-03
				Chromium	1.78E+01	mg/kg	1.90E-06	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	9.49E-07	1.11E-05	mg/kg-day	3.00E-03	mg/kg-day	3.69E-03
				Cobalt	2.61E+00	mg/kg	2.78E-07	mg/kg-day	NA	NA	NA	1.62E-06	mg/kg-day	3.00E-04	mg/kg-day	5.41E-03
				Cyanide	8.50E-01	mg/kg	9.07E-08	mg/kg-day	NA	NA	NA	5.29E-07	mg/kg-day	6.00E-04	mg/kg-day	8.82E-04
				Iron	3.70E+04	mg/kg	3.95E-03	mg/kg-day	NA	NA	NA	2.30E-02	mg/kg-day	7.00E-01	mg/kg-day	3.29E-02
				Lead	1.15E+03	mg/kg	1.23E-04	mg/kg-day	NA	NA	NA	7.18E-04	mg/kg-day	NA	NA	NA
				Manganese	2.16E+02	mg/kg	2.31E-05	mg/kg-day	NA	NA	NA	1.35E-04	mg/kg-day	1.40E-01	mg/kg-day	9.62E-04
				Vanadium	4.62E+01	mg/kg	4.93E-06	mg/kg-day	NA	NA	NA	2.88E-05	mg/kg-day	7.00E-05	mg/kg-day	4.11E-01
				Zinc	7.82E+03	mg/kg	8.35E-04	mg/kg-day	NA	NA	NA	4.87E-03	mg/kg-day	3.00E-01	mg/kg-day	1.62E-02
			Exp. Route Total								2.39E-06					5.50E-01

TABLE B-7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Dermal Contact	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	NA	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	2.48E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.81E-08	1.45E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	9.88E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	7.21E-08	5.76E-08	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	2.32E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.69E-08	1.35E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	5.71E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	4.17E-08	3.33E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	1.39E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.01E-08	8.09E-08	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	1.73E-13	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	2.25E-08	1.01E-12	mg/kg-day	7.00E-10	mg/kg-day	1.44E-03
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	1.34E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.68E-08	7.82E-08	mg/kg-day	2.00E-05	mg/kg-day	3.91E-03
				Aroclor 1260	8.51E-01	mg/kg	3.74E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	7.48E-08	2.18E-07	mg/kg-day	2.00E-05	mg/kg-day	1.09E-02
				Heptachlor Epoxide	1.20E-01	mg/kg	3.77E-09	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	3.43E-08	2.20E-08	mg/kg-day	1.30E-05	mg/kg-day	1.69E-03
				Inorganics												
				Aluminum	3.44E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	7.77E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	4.20E+00	mg/kg	3.95E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.93E-08	2.31E-07	mg/kg-day	3.00E-04	mg/kg-day	7.69E-04
				Cadmium	1.77E+00	mg/kg	5.56E-10	mg/kg-day	NA	NA	NA	3.24E-09	mg/kg-day	2.50E-05	mg/kg-day	1.30E-04
				Chromium	1.78E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	2.61E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Cyanide	8.50E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	3.70E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Lead	1.15E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.16E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Vanadium	4.62E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
				Zinc	7.82E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-01	mg/kg-day	NA
			Exp. Route Total								3.77E-07					1.88E-02

TABLE B-7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Inhalation	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table B-7.0.1	µg/m^3	4.10E-06	(µg/m^3)$^{-1}$	4.77E-11	3.23E-13	mg/m^3	2.15E-03	mg/m^3	1.50E-10
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	1.10E-10	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	1.20E-14	2.80E-11	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	4.37E-11	µg/m^3	1.10E-03	(µg/m^3)$^{-1}$	4.81E-14	1.12E-11	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	1.03E-10	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	1.13E-14	2.62E-11	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	2.53E-11	µg/m^3	1.20E-03	(µg/m^3)$^{-1}$	3.03E-14	6.45E-12	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	6.13E-11	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	6.75E-15	1.57E-11	mg/m^3	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	3.32E-15	µg/m^3	3.80E+01	(µg/m^3)$^{-1}$	1.26E-13	8.47E-16	mg/m^3	4.00E-08	mg/m^3	2.12E-08
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	5.50E-11	µg/m^3	5.70E-04	(µg/m^3)$^{-1}$	3.14E-14	1.41E-11	mg/m^3	NA	NA	NA
				Aroclor 1260	8.51E-01	mg/kg	1.54E-10	µg/m^3	5.70E-04	(µg/m^3)$^{-1}$	8.75E-14	3.92E-11	mg/m^3	NA	NA	NA
				Heptachlor Epoxide	1.20E-01	mg/kg	2.16E-11	µg/m^3	2.60E-03	(µg/m^3)$^{-1}$	5.63E-14	5.53E-12	mg/m^3	NA	NA	NA
				Inorganics												
				Aluminum	3.44E+03	mg/kg	6.21E-07	µg/m^3	NA	NA	NA	1.59E-07	mg/m^3	5.00E-03	mg/m^3	3.17E-05
				Antimony	7.77E+00	mg/kg	1.40E-09	µg/m^3	NA	NA	NA	3.58E-10	mg/m^3	NA	NA	NA
				Arsenic	4.20E+00	mg/kg	7.58E-10	µg/m^3	4.30E-03	(µg/m^3)$^{-1}$	3.26E-12	1.94E-10	mg/m^3	2.00E-04	mg/m^3	9.68E-07
				Cadmium	1.77E+00	mg/kg	3.19E-10	µg/m^3	1.80E-03	(µg/m^3)$^{-1}$	5.75E-13	8.16E-11	mg/m^3	3.00E-05	mg/m^3	2.72E-06
				Chromium	1.78E+01	mg/kg	3.21E-09	µg/m^3	1.20E-02	(µg/m^3)$^{-1}$	3.85E-11	8.20E-10	mg/m^3	3.00E-04	mg/m^3	2.73E-06
				Cobalt	2.61E+00	mg/kg	4.70E-10	µg/m^3	9.00E-03	(µg/m^3)$^{-1}$	4.23E-12	1.20E-10	mg/m^3	2.00E-05	mg/m^3	6.00E-06
				Cyanide	8.50E-01	mg/kg	1.53E-10	µg/m^3	NA	NA	NA	3.92E-11	mg/m^3	NA	NA	NA
				Iron	3.70E+04	mg/kg	6.67E-06	µg/m^3	NA	NA	NA	1.70E-06	mg/m^3	NA	NA	NA
				Lead	1.15E+03	mg/kg	2.08E-07	µg/m^3	NA	NA	NA	5.31E-08	mg/m^3	NA	NA	NA
				Manganese	2.16E+02	mg/kg	3.90E-08	µg/m^3	NA	NA	NA	9.97E-09	mg/m^3	1.70E-04	mg/m^3	5.86E-05
				Vanadium	4.62E+01	mg/kg	8.34E-09	µg/m^3	8.30E-03	(µg/m^3)$^{-1}$	6.92E-11	2.13E-09	mg/m^3	3.00E-02	mg/m^3	7.10E-08
				Zinc	7.82E+03	mg/kg	1.41E-06	µg/m^3	NA	NA	NA	3.60E-07	mg/m^3	NA	NA	NA
			Exp. Route Total								1.64E-10					1.03E-04
		Exposure Point Total									2.76E-06					5.69E-01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
µg/m^3 = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE B-7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Water	Surface Water	Woodbury Creek / Hessian Run	Ingestion	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.80E-01	µg/L	1.88E-09	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.37E-09	1.10E-08	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.20E-01	µg/L	3.35E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	2.44E-08	1.95E-08	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	3.80E-01	µg/L	3.98E-09	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.90E-09	2.32E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.50E-01	µg/L	1.57E-09	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.15E-09	9.15E-09	mg/kg-day	NA	NA	NA
				Pentachlorophenol	7.72E-01	µg/L	8.08E-09	mg/kg-day	4.00E-01	$(mg/kg\text{-}day)^{-1}$	3.23E-09	4.71E-08	mg/kg-day	5.00E-03	mg/kg-day	9.42E-06
				Inorganics												
				Aluminum	7.93E+03	µg/L	8.29E-05	mg/kg-day	NA	NA	NA	4.84E-04	mg/kg-day	1.00E+00	mg/kg-day	4.84E-04
				Antimony	7.10E+00	µg/L	7.43E-08	mg/kg-day	NA	NA	NA	4.33E-07	mg/kg-day	4.00E-04	mg/kg-day	1.08E-03
				Arsenic	1.30E+01	µg/L	1.36E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.05E-07	7.96E-07	mg/kg-day	3.00E-04	mg/kg-day	2.65E-03
				Barium	2.97E+02	µg/L	3.11E-06	mg/kg-day	NA	NA	NA	1.81E-05	mg/kg-day	2.00E-01	mg/kg-day	9.06E-05
				Beryllium	1.14E+01	µg/L	1.19E-07	mg/kg-day	NA	NA	NA	6.96E-07	mg/kg-day	2.00E-03	mg/kg-day	3.48E-04
				Cadmium	3.51E+00	µg/L	3.67E-08	mg/kg-day	NA	NA	NA	2.14E-07	mg/kg-day	1.00E-03	mg/kg-day	2.14E-04
				Chromium	3.86E+01	µg/L	4.04E-07	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	2.02E-07	2.36E-06	mg/kg-day	3.00E-03	mg/kg-day	7.85E-04
				Cobalt	1.85E+01	µg/L	1.93E-07	mg/kg-day	NA	NA	NA	1.13E-06	mg/kg-day	3.00E-04	mg/kg-day	3.76E-03
				Copper	3.17E+01	µg/L	3.31E-07	mg/kg-day	NA	NA	NA	1.93E-06	mg/kg-day	4.00E-02	mg/kg-day	4.83E-05
				Cyanide	3.50E+00	µg/L	3.66E-08	mg/kg-day	NA	NA	NA	2.14E-07	mg/kg-day	6.00E-04	mg/kg-day	3.56E-04
				Iron	1.27E+05	µg/L	1.33E-03	mg/kg-day	NA	NA	NA	7.77E-03	mg/kg-day	7.00E-01	mg/kg-day	1.11E-02
				Lead	2.74E+01	µg/L	2.87E-07	mg/kg-day	NA	NA	NA	1.67E-06	mg/kg-day	NA	NA	NA
				Manganese	3.06E+02	µg/L	3.20E-06	mg/kg-day	NA	NA	NA	1.87E-05	mg/kg-day	1.40E-01	mg/kg-day	1.33E-04
				Mercury	2.87E-01	µg/L	3.00E-09	mg/kg-day	NA	NA	NA	1.75E-08	mg/kg-day	3.00E-04	mg/kg-day	5.84E-05
				Nickel	6.65E+01	µg/L	6.96E-07	mg/kg-day	NA	NA	NA	4.06E-06	mg/kg-day	2.00E-02	mg/kg-day	2.03E-04
				Vanadium	1.55E+02	µg/L	1.62E-06	mg/kg-day	NA	NA	NA	9.46E-06	mg/kg-day	7.00E-05	mg/kg-day	1.35E-01
				Zinc	4.49E+02	µg/L	4.70E-06	mg/kg-day	NA	NA	NA	2.74E-05	mg/kg-day	3.00E-01	mg/kg-day	9.13E-05
			Exp. Route Total								4.40E-07					1.57E-01

TABLE B-7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Water	Surface Water	Woodbury Creek / Hessian Run	Dermal Contact	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.80E-01	µg/L	2.62E-06	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.91E-06	1.53E-05	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.20E-01	µg/L	7.97E-06	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	5.82E-05	4.65E-05	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	3.80E-01	µg/L	9.61E-06	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	7.01E-06	5.60E-05	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.50E-01	µg/L	3.80E-06	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.77E-06	2.21E-05	mg/kg-day	NA	NA	NA
				Pentachlorophenol	7.72E-01	µg/L	1.07E-05	mg/kg-day	4.00E-01	mg/kg-day	4.29E-06	6.26E-05	mg/kg-day	5.00E-03	mg/kg-day	1.25E-02
				Inorganics												
				Aluminum	7.93E+03	µg/L	8.80E-05	mg/kg-day	NA	NA	NA	5.13E-04	mg/kg-day	1.00E+00	mg/kg-day	5.13E-04
				Antimony	7.10E+00	µg/L	7.88E-08	mg/kg-day	NA	NA	NA	4.60E-07	mg/kg-day	6.00E-05	mg/kg-day	7.66E-03
				Arsenic	1.30E+01	µg/L	1.45E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	2.17E-07	8.44E-07	mg/kg-day	3.00E-04	mg/kg-day	2.81E-03
				Barium	2.97E+02	µg/L	3.30E-06	mg/kg-day	NA	NA	NA	1.92E-05	mg/kg-day	1.40E-02	mg/kg-day	1.37E-03
				Beryllium	1.14E+01	µg/L	1.27E-07	mg/kg-day	NA	NA	NA	7.38E-07	mg/kg-day	1.40E-05	mg/kg-day	5.27E-02
				Cadmium	3.51E+00	µg/L	3.90E-08	mg/kg-day	NA	NA	NA	2.27E-07	mg/kg-day	2.50E-05	mg/kg-day	9.10E-03
				Chromium	3.86E+01	µg/L	4.29E-07	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	2.14E-07	2.50E-06	mg/kg-day	7.50E-05	mg/kg-day	3.33E-02
				Cobalt	1.85E+01	µg/L	8.21E-08	mg/kg-day	NA	NA	NA	4.79E-07	mg/kg-day	3.00E-04	mg/kg-day	1.60E-03
				Copper	3.17E+01	µg/L	3.52E-07	mg/kg-day	NA	NA	NA	2.05E-06	mg/kg-day	4.00E-02	mg/kg-day	5.13E-05
				Cyanide	3.50E+00	µg/L	3.89E-08	mg/kg-day	NA	NA	NA	2.27E-07	mg/kg-day	6.00E-04	mg/kg-day	3.78E-04
				Iron	1.27E+05	µg/L	1.41E-03	mg/kg-day	NA	NA	NA	8.25E-03	mg/kg-day	7.00E-01	mg/kg-day	1.18E-02
				Lead	2.74E+01	µg/L	3.04E-08	mg/kg-day	NA	NA	NA	1.77E-07	mg/kg-day	NA	NA	NA
				Manganese	3.06E+02	µg/L	3.40E-06	mg/kg-day	NA	NA	NA	1.98E-05	mg/kg-day	5.60E-03	mg/kg-day	3.54E-03
				Mercury	2.87E-01	µg/L	3.19E-09	mg/kg-day	NA	NA	NA	1.86E-08	mg/kg-day	2.10E-05	mg/kg-day	8.85E-04
				Nickel	6.65E+01	µg/L	1.48E-07	mg/kg-day	NA	NA	NA	8.61E-07	mg/kg-day	8.00E-04	mg/kg-day	1.08E-03
				Vanadium	1.55E+02	µg/L	1.72E-06	mg/kg-day	NA	NA	NA	1.00E-05	mg/kg-day	7.00E-05	mg/kg-day	1.43E-01
				Zinc	4.49E+02	µg/L	2.99E-06	mg/kg-day	NA	NA	NA	1.74E-05	mg/kg-day	3.00E-01	mg/kg-day	5.81E-05
			Exp. Route Total								7.46E-05					2.83E-01
		Exposure Point Total									7.50E-05					4.39E-01

NA = not applicable
RfC= reference concentration
RfD = reference dose
µg/L = microgram per liter
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day

TABLE B-7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Sediment	Sediment	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	4.15E-02	mg/kg	4.43E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	8.86E-09	2.58E-08	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.30E-01	mg/kg	2.46E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	4.91E-08	1.43E-07	mg/kg-day	2.00E-05	mg/kg-day	7.16E-03
				Aroclor 1268	3.37E-02	mg/kg	3.60E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	7.20E-09	2.10E-08	mg/kg-day	2.00E-05	mg/kg-day	1.05E-03
				Inorganics												
				Aluminum	1.30E+04	mg/kg	1.39E-03	mg/kg-day	NA	NA	NA	8.10E-03	mg/kg-day	1.00E+00	mg/kg-day	8.10E-03
				Antimony	3.32E+00	mg/kg	3.54E-07	mg/kg-day	NA	NA	NA	2.07E-06	mg/kg-day	4.00E-04	mg/kg-day	5.17E-03
				Arsenic	1.72E+01	mg/kg	1.10E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.66E-06	1.07E-05	mg/kg-day	3.00E-04	mg/kg-day	3.58E-02
				Cadmium	3.41E+00	mg/kg	3.64E-07	mg/kg-day	NA	NA	NA	2.13E-06	mg/kg-day	1.00E-03	mg/kg-day	2.13E-03
				Chromium	9.10E+01	mg/kg	9.72E-06	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	4.86E-06	5.67E-05	mg/kg-day	3.00E-03	mg/kg-day	1.89E-02
				Cobalt	1.34E+01	mg/kg	1.43E-06	mg/kg-day	NA	NA	NA	8.36E-06	mg/kg-day	3.00E-04	mg/kg-day	2.79E-02
				Cyanide	4.84E-01	mg/kg	5.17E-08	mg/kg-day	NA	NA	NA	3.01E-07	mg/kg-day	6.00E-04	mg/kg-day	5.02E-04
				Iron	2.59E+04	mg/kg	2.76E-03	mg/kg-day	NA	NA	NA	1.61E-02	mg/kg-day	7.00E-01	mg/kg-day	2.30E-02
				Manganese	3.63E+02	mg/kg	3.88E-05	mg/kg-day	NA	NA	NA	2.26E-04	mg/kg-day	1.40E-01	mg/kg-day	1.62E-03
				Thallium	1.85E-01	mg/kg	1.97E-08	mg/kg-day	NA	NA	NA	1.15E-07	mg/kg-day	1.00E-05	mg/kg-day	1.15E-02
				Vanadium	9.03E+01	mg/kg	9.64E-06	mg/kg-day	NA	NA	NA	5.62E-05	mg/kg-day	7.00E-05	mg/kg-day	8.03E-01
			Exp. Route Total								6.58E-06					9.46E-01
Sediment	Sediment	Woodbury Creek / Hessian Run	Dermal Contact	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	4.15E-02	mg/kg	1.42E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.84E-07	8.28E-07	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.30E-01	mg/kg	7.86E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.57E-06	4.59E-06	mg/kg-day	2.00E-05	mg/kg-day	2.29E-01
				Aroclor 1268	3.37E-02	mg/kg	1.15E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.31E-07	6.73E-07	mg/kg-day	2.00E-05	mg/kg-day	3.36E-02
				Inorganics												
				Aluminum	1.30E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	3.32E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	1.72E+01	mg/kg	1.26E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.89E-05	7.37E-05	mg/kg-day	3.00E-04	mg/kg-day	2.46E-01
				Cadmium	3.41E+00	mg/kg	8.34E-08	mg/kg-day	NA	NA	NA	4.86E-07	mg/kg-day	2.50E-05	mg/kg-day	1.94E-02
				Chromium	9.10E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	1.34E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Cyanide	4.84E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	2.59E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Manganese	3.63E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Thallium	1.85E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
				Vanadium	9.03E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
			Exp. Route Total								2.10E-05					5.28E-01
		Exposure Point Total									2.76E-05					1.47E+00

NA = not applicable
RfD = reference dose
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day

TABLE B-7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Recreational User
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Ingestion	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table B-7.0.2	mg/kg-day	4.60E-02	$(mg/kg-day)^{-1}$	4.60E-11	4.36E-09	mg/kg-day	5.00E-04	mg/kg-day	8.72E-06
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	6.48E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	4.73E-08	3.78E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	2.59E-08	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.89E-07	1.51E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	6.07E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	4.43E-08	3.54E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	1.49E-08	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.09E-07	8.72E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	3.63E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.65E-08	2.12E-07	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	1.96E-12	mg/kg-day	1.30E+05	$(mg/kg-day)^{-1}$	2.55E-07	1.15E-11	mg/kg-day	7.00E-10	mg/kg-day	1.64E-02
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	3.26E-08	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	6.51E-08	1.90E-07	mg/kg-day	2.00E-05	mg/kg-day	9.50E-03
				Aroclor 1260	8.51E-01	mg/kg	9.09E-08	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	1.82E-07	5.30E-07	mg/kg-day	2.00E-05	mg/kg-day	2.65E-02
				Heptachlor Epoxide	1.20E-01	mg/kg	1.28E-08	mg/kg-day	9.10E+00	$(mg/kg-day)^{-1}$	1.17E-07	7.47E-08	mg/kg-day	1.30E-05	mg/kg-day	5.75E-03
				Inorganics												
				Aluminum	3.44E+03	mg/kg	3.67E-04	mg/kg-day	NA	NA	NA	2.14E-03	mg/kg-day	1.00E+00	mg/kg-day	2.14E-03
				Antimony	7.77E+00	mg/kg	8.29E-07	mg/kg-day	NA	NA	NA	4.84E-06	mg/kg-day	4.00E-04	mg/kg-day	1.21E-02
				Arsenic	4.20E+00	mg/kg	2.69E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	4.03E-07	1.57E-06	mg/kg-day	3.00E-04	mg/kg-day	5.23E-03
				Cadmium	1.77E+00	mg/kg	1.89E-07	mg/kg-day	NA	NA	NA	1.10E-06	mg/kg-day	1.00E-03	mg/kg-day	1.10E-03
				Chromium	1.78E+01	mg/kg	1.90E-06	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	9.49E-07	1.11E-05	mg/kg-day	3.00E-03	mg/kg-day	3.69E-03
				Cobalt	2.61E+00	mg/kg	2.78E-07	mg/kg-day	NA	NA	NA	1.62E-06	mg/kg-day	3.00E-04	mg/kg-day	5.41E-03
				Cyanide	8.50E-01	mg/kg	9.07E-08	mg/kg-day	NA	NA	NA	5.29E-07	mg/kg-day	6.00E-04	mg/kg-day	8.82E-04
				Iron	3.70E+04	mg/kg	3.95E-03	mg/kg-day	NA	NA	NA	2.30E-02	mg/kg-day	7.00E-01	mg/kg-day	3.29E-02
				Lead	1.15E+03	mg/kg	1.23E-04	mg/kg-day	NA	NA	NA	7.18E-04	mg/kg-day	NA	NA	NA
				Manganese	2.16E+02	mg/kg	2.31E-05	mg/kg-day	NA	NA	NA	1.35E-04	mg/kg-day	1.40E-01	mg/kg-day	9.62E-04
				Vanadium	4.62E+01	mg/kg	4.93E-06	mg/kg-day	NA	NA	NA	2.88E-05	mg/kg-day	7.00E-05	mg/kg-day	4.11E-01
				Zinc	7.82E+03	mg/kg	8.35E-04	mg/kg-day	NA	NA	NA	4.87E-03	mg/kg-day	3.00E-01	mg/kg-day	1.62E-02
			Exp. Route Total								2.39E-06					5.50E-01

TABLE B-7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Recreational User
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Dermal Contact	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	NA	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	2.48E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.81E-08	1.45E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	9.88E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	7.21E-08	5.76E-08	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	2.32E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.69E-08	1.35E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	5.71E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	4.17E-08	3.33E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	1.39E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.01E-08	8.09E-08	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	1.73E-13	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	2.25E-08	1.01E-12	mg/kg-day	7.00E-10	mg/kg-day	1.44E-03
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	1.34E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.68E-08	7.82E-08	mg/kg-day	2.00E-05	mg/kg-day	3.91E-03
				Aroclor 1260	8.51E-01	mg/kg	3.74E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	7.48E-08	2.18E-07	mg/kg-day	2.00E-05	mg/kg-day	1.09E-02
				Heptachlor Epoxide	1.20E-01	mg/kg	3.77E-09	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	3.43E-08	2.20E-08	mg/kg-day	1.30E-05	mg/kg-day	1.69E-03
				Inorganics												
				Aluminum	3.44E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	7.77E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	4.20E+00	mg/kg	3.95E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.93E-08	2.31E-07	mg/kg-day	3.00E-04	mg/kg-day	7.69E-04
				Cadmium	1.77E+00	mg/kg	5.56E-10	mg/kg-day	NA	NA	NA	3.24E-09	mg/kg-day	2.50E-05	mg/kg-day	1.30E-04
				Chromium	1.78E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	2.61E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Cyanide	8.50E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	3.70E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Lead	1.15E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.16E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Vanadium	4.62E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
				Zinc	7.82E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-01	mg/kg-day	NA
			Exp. Route Total								3.77E-07					1.88E-02

TABLE B-7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Recreational User
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Inhalation	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table B-7.0.2	$\mu g/m^3$	4.10E-06	$(\mu g/m^3)^{-1}$	4.77E-11	3.23E-13	mg/m^3	2.15E-03	mg/m^3	1.50E-10
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	1.10E-10	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.20E-14	2.80E-11	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	4.37E-11	$\mu g/m^3$	1.10E-03	$(\mu g/m^3)^{-1}$	4.81E-14	1.12E-11	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	1.03E-10	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.13E-14	2.62E-11	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	2.53E-11	$\mu g/m^3$	1.20E-03	$(\mu g/m^3)^{-1}$	3.03E-14	6.45E-12	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	6.13E-11	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	6.75E-15	1.57E-11	mg/m^3	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	3.32E-15	$\mu g/m^3$	3.80E+01	$(\mu g/m^3)^{-1}$	1.26E-13	8.47E-16	mg/m^3	4.00E-08	mg/m^3	2.12E-08
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	5.50E-11	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	3.14E-14	1.41E-11	mg/m^3	NA	NA	NA
				Aroclor 1260	8.51E-01	mg/kg	1.54E-10	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	8.75E-14	3.92E-11	mg/m^3	NA	NA	NA
				Heptachlor Epoxide	1.20E-01	mg/kg	2.16E-11	$\mu g/m^3$	2.60E-03	$(\mu g/m^3)^{-1}$	5.63E-14	5.53E-12	mg/m^3	NA	NA	NA
				Inorganics												
				Aluminum	3.44E+03	mg/kg	6.21E-07	$\mu g/m^3$	NA	NA	NA	1.59E-07	mg/m^3	5.00E-03	mg/m^3	3.17E-05
				Antimony	7.77E+00	mg/kg	1.40E-09	$\mu g/m^3$	NA	NA	NA	3.58E-10	mg/m^3	NA	NA	NA
				Arsenic	4.20E+00	mg/kg	7.58E-10	$\mu g/m^3$	4.30E-03	$(\mu g/m^3)^{-1}$	3.26E-12	1.94E-10	mg/m^3	2.00E-04	mg/m^3	9.68E-07
				Cadmium	1.77E+00	mg/kg	3.19E-10	$\mu g/m^3$	1.80E-03	$(\mu g/m^3)^{-1}$	5.75E-13	8.16E-11	mg/m^3	3.00E-05	mg/m^3	2.72E-06
				Chromium	1.78E+01	mg/kg	3.21E-09	$\mu g/m^3$	1.20E-02	$(\mu g/m^3)^{-1}$	3.85E-11	8.20E-10	mg/m^3	3.00E-04	mg/m^3	2.73E-06
				Cobalt	2.61E+00	mg/kg	4.70E-10	$\mu g/m^3$	9.00E-03	$(\mu g/m^3)^{-1}$	4.23E-12	1.20E-10	mg/m^3	2.00E-05	mg/m^3	6.00E-06
				Cyanide	8.50E-01	mg/kg	1.53E-10	$\mu g/m^3$	NA	NA	NA	3.92E-11	mg/m^3	NA	NA	NA
				Iron	3.70E+04	mg/kg	6.67E-06	$\mu g/m^3$	NA	NA	NA	1.70E-06	mg/m^3	NA	NA	NA
				Lead	1.15E+03	mg/kg	2.08E-07	$\mu g/m^3$	NA	NA	NA	5.31E-08	mg/m^3	NA	NA	NA
				Manganese	2.16E+02	mg/kg	3.90E-08	$\mu g/m^3$	NA	NA	NA	9.97E-09	mg/m^3	1.70E-04	mg/m^3	5.86E-05
				Vanadium	4.62E+01	mg/kg	8.34E-09	$\mu g/m^3$	8.30E-03	$(\mu g/m^3)^{-1}$	6.92E-11	2.13E-09	mg/m^3	3.00E-02	mg/m^3	7.10E-08
				Zinc	7.82E+03	mg/kg	1.41E-06	$\mu g/m^3$	NA	NA	NA	3.60E-07	mg/m^3	NA	NA	NA
			Exp. Route Total								1.64E-10					1.03E-04
		Exposure Point Total									2.76E-06					5.69E-01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE B-7.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Willow Woods Property	Ingestion	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	4.08E-01	mg/kg	2.73E-06	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.99E-06	5.21E-06	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	4.84E-01	mg/kg	3.25E-06	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	2.37E-05	6.19E-06	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	7.99E-01	mg/kg	5.36E-06	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	3.91E-06	1.02E-05	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	9.41E-07	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	6.87E-06	1.79E-06	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.59E-01	mg/kg	2.41E-06	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.76E-06	4.59E-06	mg/kg-day	NA	NA	NA
				Inorganics												
				Arsenic	9.96E+00	mg/kg	9.36E-06	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	1.40E-05	7.64E-05	mg/kg-day	3.00E-04	mg/kg-day	2.55E-01
				Chromium	6.90E+00	mg/kg	1.08E-05	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	5.40E-06	8.82E-05	mg/kg-day	3.00E-03	mg/kg-day	2.94E-02
				Iron	9.21E+03	mg/kg	1.44E-02	mg/kg-day	NA	NA	NA	1.18E-01	mg/kg-day	7.00E-01	mg/kg-day	1.68E-01
			Exp. Route Total								5.77E-05					4.52E-01
Surface Soil	Surface Soil	Willow Woods Property	Dermal Contact	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	4.08E-01	mg/kg	1.05E-06	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	7.66E-07	1.90E-06	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	4.84E-01	mg/kg	1.25E-06	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	9.10E-06	2.25E-06	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	7.99E-01	mg/kg	2.06E-06	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.50E-06	3.72E-06	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	3.61E-07	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	2.64E-06	6.53E-07	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.59E-01	mg/kg	9.24E-07	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	6.74E-07	1.67E-06	mg/kg-day	NA	NA	NA
				Inorganics												
				Arsenic	9.96E+00	mg/kg	1.48E-06	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	2.22E-06	1.07E-05	mg/kg-day	3.00E-04	mg/kg-day	3.57E-02
				Chromium	6.90E+00	mg/kg	NA	NA	5.00E-01	$(mg/kg-day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Iron	9.21E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
			Exp. Route Total								1.69E-05					3.57E-02
Surface Soil	Surface Soil	Willow Woods Property	Inhalation	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	4.08E-01	mg/kg	5.29E-08	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	5.82E-12	4.87E-11	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	4.84E-01	mg/kg	6.29E-08	$\mu g/m^3$	1.10E-03	$(\mu g/m^3)^{-1}$	6.92E-11	5.79E-11	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	7.99E-01	mg/kg	1.04E-07	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.14E-11	9.55E-11	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	1.82E-08	$\mu g/m^3$	1.20E-03	$(\mu g/m^3)^{-1}$	2.19E-11	1.68E-11	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.59E-01	mg/kg	4.66E-08	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	5.13E-12	4.29E-11	mg/m^3	NA	NA	NA
				Inorganics												
				Arsenic	9.96E+00	mg/kg	5.11E-07	$\mu g/m^3$	4.30E-03	$(\mu g/m^3)^{-1}$	2.20E-09	1.19E-09	mg/m^3	1.50E-05	mg/m^3	7.94E-05
				Chromium	6.90E+00	mg/kg	3.54E-07	$\mu g/m^3$	1.20E-02	$(\mu g/m^3)^{-1}$	4.25E-09	8.26E-10	mg/m^3	1.00E-04	mg/m^3	8.26E-06
				Iron	9.21E+03	mg/kg	4.72E-04	$\mu g/m^3$	NA	NA	NA	1.10E-06	mg/m^3	NA	mg/m^3	NA
			Exp. Route Total								6.56E-09					8.77E-05
		Exposure Point Total									7.46E-05					4.88E-01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE B-7.5
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Subsurface Soil	Surface/ Subsurface Soil	Willow Woods Property	Ingestion	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	2.98E-01	mg/kg	5.50E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	4.02E-09	3.85E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.51E-01	mg/kg	6.48E-09	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	4.73E-08	4.54E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.41E-01	mg/kg	9.98E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	7.29E-09	6.99E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.39E-01	mg/kg	2.56E-09	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.87E-08	1.79E-07	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	2.69E-01	mg/kg	4.96E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	3.62E-09	3.47E-07	mg/kg-day	NA	NA	NA
				Inorganics												
				Arsenic	7.00E+00	mg/kg	7.75E-08	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	1.16E-07	5.43E-06	mg/kg-day	3.00E-04	mg/kg-day	1.81E-02
				Chromium	9.60E+00	mg/kg	1.77E-07	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	8.86E-08	1.24E-05	mg/kg-day	3.00E-03	mg/kg-day	4.13E-03
				Iron	9.51E+03	mg/kg	1.75E-04	mg/kg-day	NA	NA	NA	1.23E-02	mg/kg-day	7.00E-01	mg/kg-day	1.75E-02
			Exp. Route Total								2.86E-07					3.98E-02
Surface Subsurface Soil	Surface/ Subsurface Soil	Willow Woods Property	Dermal Contact	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	2.98E-01	mg/kg	2.15E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.57E-09	1.50E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.51E-01	mg/kg	2.53E-09	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.84E-08	1.77E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.41E-01	mg/kg	3.89E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.84E-09	2.73E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.39E-01	mg/kg	9.98E-10	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	7.29E-09	6.99E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	2.69E-01	mg/kg	1.93E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.41E-09	1.35E-07	mg/kg-day	NA	NA	NA
				Inorganics												
				Arsenic	7.00E+00	mg/kg	1.16E-08	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	1.74E-08	8.14E-07	mg/kg-day	3.00E-04	mg/kg-day	2.71E-03
				Chromium	9.60E+00	mg/kg	NA	NA	5.00E-01	$(mg/kg-day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Iron	9.51E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
			Exp. Route Total								4.90E-08					2.71E-03
Surface Subsurface Soil	Surface/ Subsurface Soil	Willow Woods Property	Inhalation	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	2.98E-01	mg/kg	4.85E-11	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	5.34E-15	3.40E-12	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	3.51E-01	mg/kg	5.72E-11	$\mu g/m^3$	1.10E-03	$(\mu g/m^3)^{-1}$	6.29E-14	4.00E-12	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	5.41E-01	mg/kg	8.81E-11	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	9.69E-15	6.16E-12	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	1.39E-01	mg/kg	2.26E-11	$\mu g/m^3$	1.20E-03	$(\mu g/m^3)^{-1}$	2.71E-14	1.58E-12	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	2.69E-01	mg/kg	4.37E-11	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	4.81E-15	3.06E-12	mg/m^3	NA	NA	NA
				Inorganics												
				Arsenic	7.00E+00	mg/kg	1.14E-09	$\mu g/m^3$	4.30E-03	$(\mu g/m^3)^{-1}$	4.90E-12	7.98E-11	mg/m^3	1.50E-05	mg/kg-day	5.32E-06
				Chromium	9.60E+00	mg/kg	1.56E-09	$\mu g/m^3$	1.20E-02	$(\mu g/m^3)^{-1}$	1.88E-11	1.09E-10	mg/m^3	3.00E-04	mg/kg-day	3.65E-07
				Iron	9.51E+03	mg/kg	1.55E-06	$\mu g/m^3$	NA	NA	NA	1.08E-07	mg/m^3	NA	NA	NA
			Exp. Route Total								2.38E-11					5.68E-06
		Exposure Point Total									3.35E-07					4.25E-02

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE B-7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Rental Home Area	Ingestion	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.30E+02	mg/kg	8.72E-04	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	6.36E-04	1.66E-03	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	7.90E+01	mg/kg	5.30E-04	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	3.87E-03	1.01E-03	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	1.10E+02	mg/kg	7.38E-04	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	5.38E-04	1.41E-03	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	6.30E+01	mg/kg	4.22E-04	mg/kg-day	7.30E-02	$(mg/kg-day)^{-1}$	3.08E-05	8.05E-04	mg/kg-day	NA	NA	NA
				Chrysene	1.10E+02	mg/kg	7.38E-04	mg/kg-day	7.30E-03	$(mg/kg-day)^{-1}$	5.38E-06	1.41E-03	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	2.30E+01	mg/kg	1.54E-04	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.13E-03	2.94E-04	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.50E+01	mg/kg	2.35E-04	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.71E-04	4.47E-04	mg/kg-day	NA	NA	NA
				Pyrene	1.80E+02	mg/kg	2.82E-04	mg/kg-day	NA	NA	NA	2.30E-03	mg/kg-day	3.00E-02	mg/kg-day	7.67E-02
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	2.10E-01	mg/kg	3.29E-07	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	6.58E-07	2.68E-06	mg/kg-day	2.00E-05	mg/kg-day	1.34E-01
				Inorganics												
				Antimony	1.69E+00	mg/kg	2.64E-06	mg/kg-day	NA	NA	NA	2.15E-05	mg/kg-day	4.00E-04	mg/kg-day	5.39E-02
				Arsenic	2.62E+00	mg/kg	2.46E-06	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	3.69E-06	2.01E-05	mg/kg-day	3.00E-04	mg/kg-day	6.70E-02
				Chromium	2.58E+01	mg/kg	4.05E-05	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	2.02E-05	3.30E-04	mg/kg-day	3.00E-03	mg/kg-day	1.10E-01
				Cobalt	1.98E+00	mg/kg	3.11E-06	mg/kg-day	NA	NA	NA	2.54E-05	mg/kg-day	3.00E-04	mg/kg-day	8.46E-02
				Iron	1.08E+04	mg/kg	1.69E-02	mg/kg-day	NA	NA	NA	1.38E-01	mg/kg-day	7.00E-01	mg/kg-day	1.97E-01
				Manganese	4.32E+02	mg/kg	6.76E-04	mg/kg-day	NA	NA	NA	5.52E-03	mg/kg-day	1.40E-01	mg/kg-day	3.95E-02
				Thallium	5.76E-02	mg/kg	9.02E-08	mg/kg-day	NA	NA	NA	7.36E-07	mg/kg-day	1.00E-05	mg/kg-day	7.36E-02
			Exp. Route Total								6.40E-03					8.37E-01
Surface Soil	Surface Soil	Rental Home Area	Dermal Contact	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.30E+02	mg/kg	3.35E-04	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.44E-04	6.05E-04	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	7.90E+01	mg/kg	2.03E-04	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.48E-03	3.68E-04	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	1.10E+02	mg/kg	2.83E-04	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.07E-04	5.12E-04	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	6.30E+01	mg/kg	1.62E-04	mg/kg-day	7.30E-02	$(mg/kg-day)^{-1}$	1.18E-05	2.93E-04	mg/kg-day	NA	NA	NA
				Chrysene	1.10E+02	mg/kg	2.83E-04	mg/kg-day	7.30E-03	$(mg/kg-day)^{-1}$	2.07E-06	5.12E-04	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	2.30E+01	mg/kg	5.92E-05	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	4.32E-04	1.07E-04	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.50E+01	mg/kg	9.01E-05	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	6.58E-05	1.63E-04	mg/kg-day	NA	NA	NA
				Pyrene	1.80E+02	mg/kg	1.16E-04	mg/kg-day	NA	NA	NA	8.38E-04	mg/kg-day	3.00E-02	mg/kg-day	2.79E-02
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	2.10E-01	mg/kg	1.45E-07	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	2.91E-07	1.05E-06	mg/kg-day	2.00E-05	mg/kg-day	5.26E-02
				Inorganics												
				Antimony	1.69E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	2.62E+00	mg/kg	3.88E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	5.83E-07	2.81E-06	mg/kg-day	3.00E-04	mg/kg-day	9.38E-03
				Chromium	2.58E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg-day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	1.98E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Iron	1.08E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Manganese	4.32E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Thallium	5.76E-02	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
			Exp. Route Total								2.45E-03					8.99E-02

TABLE B-7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Rental Home Area	Inhalation	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.30E+02	mg/kg	4.11E-06	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	4.52E-10	3.78E-09	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	7.90E+01	mg/kg	2.50E-06	µg/m^3	1.10E-03	(µg/m^3)$^{-1}$	2.75E-09	2.30E-09	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	1.10E+02	mg/kg	3.48E-06	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	3.82E-10	3.20E-09	mg/m^3	NA	NA	NA
				Benzo(k)fluoranthene	6.30E+01	mg/kg	1.99E-06	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	2.19E-10	1.83E-09	mg/m^3	NA	NA	NA
				Chrysene	1.10E+02	mg/kg	3.48E-06	µg/m^3	1.10E-05	(µg/m^3)$^{-1}$	3.82E-11	3.20E-09	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	2.30E+01	mg/kg	7.27E-07	µg/m^3	1.20E-03	(µg/m^3)$^{-1}$	8.72E-10	6.69E-10	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.50E+01	mg/kg	1.11E-06	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	1.22E-10	1.02E-09	mg/m^3	NA	NA	NA
				Pyrene	1.80E+02	mg/kg	2.24E-06	µg/m^3	NA	NA	NA	5.24E-09	mg/m^3	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	2.10E-01	mg/kg	2.62E-09	µg/m^3	5.70E-04	(µg/m^3)$^{-1}$	1.49E-12	6.11E-12	mg/m^3	NA	NA	NA
				Inorganics												
				Antimony	1.69E+00	mg/kg	2.10E-08	µg/m^3	NA	NA	NA	4.90E-11	mg/m^3	NA	NA	NA
				Arsenic	2.62E+00	mg/kg	3.27E-08	µg/m^3	4.30E-03	(µg/m^3)$^{-1}$	1.41E-10	7.62E-11	mg/m^3	1.50E-05	mg/m^3	5.08E-06
				Chromium	2.58E+01	mg/kg	3.22E-07	µg/m^3	1.20E-02	(µg/m^3)$^{-1}$	3.87E-09	7.52E-10	mg/m^3	1.00E-04	mg/m^3	7.52E-06
				Cobalt	1.98E+00	mg/kg	2.47E-08	µg/m^3	9.00E-03	(µg/m^3)$^{-1}$	2.23E-10	5.77E-11	mg/m^3	6.00E-06	mg/m^3	9.62E-06
				Iron	1.08E+04	mg/kg	1.35E-04	µg/m^3	NA	NA	NA	3.14E-07	mg/m^3	NA	NA	NA
				Manganese	4.32E+02	mg/kg	5.39E-06	µg/m^3	NA	NA	NA	1.26E-08	mg/m^3	5.00E-05	mg/m^3	2.51E-04
				Thallium	5.76E-02	mg/kg	7.18E-10	µg/m^3	NA	NA	NA	1.68E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								9.06E-09					2.74E-04
		Exposure Point Total									8.85E-03					9.27E-01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
µg/m^3 = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE B-7.6

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk
					Value	Unit	Value	Unit	Value	Unit	
Groundwater	Groundwater	Rental Home Area	Ingestion	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	1.63E-05	mg/kg-day	1.00E-01	$(mg/kg\text{-}day)^{-1}$	1.63E-06
				cis-1,2-Dichloroethene	3.71E+00	µg/L	5.52E-05	mg/kg-day	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table B-7.0.4	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	1.79E-07
				Vinyl Chloride	7.04E+00	µg/L	5.74E-04	mg/kg-day	7.20E-01	$(mg/kg\text{-}day)^{-1}$	4.13E-04
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	1.09E-07	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	1.74E-06
				Inorganics							
				Antimony	9.02E+01	µg/L	1.34E-03	mg/kg-day	NA	NA	NA
				Arsenic	2.67E+01	µg/L	3.97E-04	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.95E-04
				Cadmium	4.18E-01	µg/L	6.22E-06	mg/kg-day	NA	NA	NA
				Chromium	2.40E+00	µg/L	3.57E-05	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	1.78E-05
				Cobalt	1.61E+00	µg/L	2.40E-05	mg/kg-day	NA	NA	NA
				Cyanide	3.19E+00	µg/L	4.74E-05	mg/kg-day	NA	NA	NA
				Iron	1.95E+04	µg/L	2.90E-01	mg/kg-day	NA	NA	NA
				Lead	1.85E+01	µg/L	2.75E-04	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	3.61E-03	mg/kg-day	NA	NA	NA
				Vanadium	3.86E+00	µg/L	5.74E-05	mg/kg-day	NA	NA	NA
				Zinc	6.21E+02	µg/L	9.23E-03	mg/kg-day	NA	NA	NA
			Exp. Route Total								1.03E-03

TABLE B-7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Groundwater	Groundwater	Rental Home Area	Dermal Contact	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	3.81E-08	mg/kg-day	1.00E-01	$(mg/kg\text{-}day)^{-1}$	3.81E-09
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table B-7.0.4	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	2.18E-08
				Vinyl Chloride	7.04E+00	µg/L	1.50E-05	mg/kg-day	7.20E-01	$(mg/kg\text{-}day)^{-1}$	1.08E-05
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	4.93E-08	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	7.88E-07
				Inorganics							
				Antimony	9.02E+01	µg/L	3.38E-06	mg/kg-day	NA	NA	NA
				Arsenic	2.67E+01	µg/L	9.98E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.50E-06
				Cadmium	4.18E-01	µg/L	1.56E-08	mg/kg-day	NA	NA	NA
				Chromium	2.40E+00	µg/L	8.98E-08	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	4.49E-08
				Cobalt	1.61E+00	µg/L	2.41E-08	mg/kg-day	NA	NA	NA
				Cyanide	3.19E+00	µg/L	1.19E-07	mg/kg-day	NA	NA	NA
				Iron	1.95E+04	µg/L	7.30E-04	mg/kg-day	NA	NA	NA
				Lead	1.85E+01	µg/L	6.92E-08	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	9.08E-06	mg/kg-day	NA	NA	NA
				Vanadium	3.86E+00	µg/L	1.44E-07	mg/kg-day	NA	NA	NA
				Zinc	6.21E+02	µg/L	1.39E-05	mg/kg-day	NA	NA	NA
			Exp. Route Total								1.31E-05

TABLE B-7.6

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk
					Value	Unit	Value	Unit	Value	Unit	
Groundwater	Groundwater	Rental Home Area	Inhalation at Showerhead	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	2.70E-04	µg/m^3	5.00E-06	(µg/m^3)$^{-1}$	1.35E-09
				cis-1,2-Dichloroethene	3.71E+00	µg/L	9.59E-04	µg/m^3	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table B-7.0.4	NA	4.10E-06	(µg/m^3)$^{-1}$	1.36E-07
				Vinyl Chloride	7.04E+00	µg/L	2.89E-03	µg/m^3	4.40E-06	(µg/m^3)$^{-1}$	1.27E-08
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	NA	NA	4.60E-03	(µg/m^3)$^{-1}$	NA
				Inorganics							
				Antimony	9.02E+01	µg/L	NA	NA	NA	NA	NA
				Arsenic	2.67E+01	µg/L	NA	NA	4.30E-03	(µg/m^3)$^{-1}$	NA
				Cadmium	4.18E-01	µg/L	NA	NA	1.80E-03	(µg/m^3)$^{-1}$	NA
				Chromium	2.40E+00	µg/L	NA	NA	1.20E-02	(µg/m^3)$^{-1}$	NA
				Cobalt	1.61E+00	µg/L	NA	NA	9.00E-03	(µg/m^3)$^{-1}$	NA
				Cyanide	3.19E+00	µg/L	NA	NA	NA	NA	NA
				Iron	1.95E+04	µg/L	NA	NA	NA	NA	NA
				Lead	1.85E+01	µg/L	NA	NA	NA	NA	NA
				Manganese	2.43E+02	µg/L	NA	NA	NA	NA	NA
				Vanadium	3.86E+00	µg/L	NA	NA	8.30E-03	(µg/m^3)$^{-1}$	NA
				Zinc	6.21E+02	µg/L	NA	NA	NA	NA	NA
			Exp. Route Total								1.50E-07
		Exposure Point Total									1.04E-03

NA = not applicable

µg/L = microgram per liter

µg/m^3 = microgram per cubic meter

mg/kg-day = milligram per kilogram per day

TABLE B-7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation - Adult					Noncancer Hazard Calculation - Child				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Rental Home Area	Ingestion	**Volatile Organic Compounds**												
				1,4-Dioxane	1.10E+00	µg/L	3.01E-05	mg/kg-day	3.00E-02	mg/kg-day	1.00E-03	7.02E-05	mg/kg-day	3.00E-02	mg/kg-day	2.34E-03
				cis-1,2-Dichloroethene	3.71E+00	µg/L	1.02E-04	mg/kg-day	2.00E-03	mg/kg-day	5.09E-02	2.37E-04	mg/kg-day	2.00E-03	mg/kg-day	1.19E-01
				Trichloroethene	1.98E-01	µg/L	5.42E-06	mg/kg-day	5.00E-04	mg/kg-day	1.08E-02	1.27E-05	mg/kg-day	5.00E-04	mg/kg-day	2.53E-02
				Vinyl Chloride	7.04E+00	µg/L	1.93E-04	mg/kg-day	3.00E-03	mg/kg-day	6.43E-02	4.50E-04	mg/kg-day	3.00E-03	mg/kg-day	1.50E-01
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	2.00E-07	mg/kg-day	5.00E-05	mg/kg-day	4.00E-03	4.67E-07	mg/kg-day	5.00E-05	mg/kg-day	9.33E-03
				Inorganics												
				Antimony	9.02E+01	µg/L	2.47E-03	mg/kg-day	4.00E-04	mg/kg-day	6.18E+00	5.77E-03	mg/kg-day	4.00E-04	mg/kg-day	1.44E+01
				Arsenic	2.67E+01	µg/L	7.31E-04	mg/kg-day	3.00E-04	mg/kg-day	2.44E+00	1.71E-03	mg/kg-day	3.00E-04	mg/kg-day	5.69E+00
				Cadmium	4.18E-01	µg/L	1.15E-05	mg/kg-day	1.00E-03	mg/kg-day	1.15E-02	2.67E-05	mg/kg-day	1.00E-03	mg/kg-day	2.67E-02
				Chromium	2.40E+00	µg/L	6.58E-05	mg/kg-day	3.00E-03	mg/kg-day	2.19E-02	1.53E-04	mg/kg-day	3.00E-03	mg/kg-day	5.11E-02
				Cobalt	1.61E+00	µg/L	4.42E-05	mg/kg-day	3.00E-04	mg/kg-day	1.47E-01	1.03E-04	mg/kg-day	3.00E-04	mg/kg-day	3.44E-01
				Cyanide	3.19E+00	µg/L	8.73E-05	mg/kg-day	6.00E-04	mg/kg-day	1.46E-01	2.04E-04	mg/kg-day	6.00E-04	mg/kg-day	3.40E-01
				Iron	1.95E+04	µg/L	5.34E-01	mg/kg-day	7.00E-01	mg/kg-day	7.63E-01	1.25E+00	mg/kg-day	7.00E-01	mg/kg-day	1.78E+00
				Lead	1.85E+01	µg/L	5.07E-04	mg/kg-day	NA	NA	NA	1.18E-03	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	6.65E-03	mg/kg-day	1.40E-01	mg/kg-day	4.75E-02	1.55E-02	mg/kg-day	1.40E-01	mg/kg-day	1.11E-01
				Vanadium	3.86E+00	µg/L	1.06E-04	mg/kg-day	7.00E-05	mg/kg-day	1.51E+00	2.47E-04	mg/kg-day	7.00E-05	mg/kg-day	3.53E+00
				Zinc	6.21E+02	µg/L	1.70E-02	mg/kg-day	3.00E-01	mg/kg-day	5.67E-02	3.97E-02	mg/kg-day	3.00E-01	mg/kg-day	1.32E-01
			Exp. Route Total								1.15E+01					2.67E+01
Groundwater	Groundwater	Rental Home Area	Dermal Contact	**Volatile Organic Compounds**												
				1,4-Dioxane	1.10E+00	µg/L	7.07E-08	mg/kg-day	3.00E-02	mg/kg-day	2.36E-06	1.62E-07	mg/kg-day	3.00E-02	mg/kg-day	5.41E-06
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	2.00E-03	mg/kg-day	NA	NA	NA	2.00E-03	mg/kg-day	NA
				Trichloroethene	1.98E-01	µg/L	6.17E-07	mg/kg-day	5.00E-04	mg/kg-day	1.23E-03	1.42E-06	mg/kg-day	5.00E-04	mg/kg-day	2.83E-03
				Vinyl Chloride	7.04E+00	µg/L	6.58E-06	mg/kg-day	3.00E-03	mg/kg-day	2.19E-03	1.51E-05	mg/kg-day	3.00E-03	mg/kg-day	5.04E-03
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	9.13E-08	mg/kg-day	5.00E-05	mg/kg-day	1.83E-03	2.10E-07	mg/kg-day	5.00E-05	mg/kg-day	4.19E-03
				Inorganics												
				Antimony	9.02E+01	µg/L	5.56E-06	mg/kg-day	6.00E-05	mg/kg-day	9.27E-02	1.71E-05	mg/kg-day	6.00E-05	mg/kg-day	2.86E-01
				Arsenic	2.67E+01	µg/L	1.65E-06	mg/kg-day	3.00E-04	mg/kg-day	5.48E-03	5.07E-06	mg/kg-day	3.00E-04	mg/kg-day	1.69E-02
				Cadmium	4.18E-01	µg/L	2.58E-08	mg/kg-day	2.50E-05	mg/kg-day	1.03E-03	7.94E-08	mg/kg-day	2.50E-05	mg/kg-day	3.17E-03
				Chromium	2.40E+00	µg/L	1.48E-07	mg/kg-day	7.50E-05	mg/kg-day	1.97E-03	4.56E-07	mg/kg-day	7.50E-05	mg/kg-day	6.08E-03
				Cobalt	1.61E+00	µg/L	3.97E-08	mg/kg-day	3.00E-04	mg/kg-day	1.32E-04	1.22E-07	mg/kg-day	3.00E-04	mg/kg-day	4.08E-04
				Cyanide	3.19E+00	µg/L	1.96E-07	mg/kg-day	6.00E-04	mg/kg-day	3.27E-04	6.05E-07	mg/kg-day	6.00E-04	mg/kg-day	1.01E-03
				Iron	1.95E+04	µg/L	1.20E-03	mg/kg-day	7.00E-01	mg/kg-day	1.72E-03	3.70E-03	mg/kg-day	7.00E-01	mg/kg-day	5.29E-03
				Lead	1.85E+01	µg/L	1.14E-07	mg/kg-day	NA	NA	NA	3.51E-07	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	1.50E-05	mg/kg-day	5.60E-03	mg/kg-day	2.67E-03	4.61E-05	mg/kg-day	5.60E-03	mg/kg-day	8.23E-03
				Vanadium	3.86E+00	µg/L	2.38E-07	mg/kg-day	7.00E-05	mg/kg-day	3.40E-03	7.33E-07	mg/kg-day	7.00E-05	mg/kg-day	1.05E-02
				Zinc	6.21E+02	µg/L	2.30E-05	mg/kg-day	3.00E-01	mg/kg-day	7.65E-05	7.07E-05	mg/kg-day	3.00E-01	mg/kg-day	2.36E-04
			Exp. Route Total								1.15E-01					3.49E-01

TABLE B-7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation - Adult					Noncancer Hazard Calculation - Child				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Rental Home	Inhalation	**Volatile Organic Compounds**												
		Area	at Showerhead	1,4-Dioxane	1.10E+00	µg/L	4.46E-04	mg/m^3	3.00E-02	mg/m^3	1.49E-02	1.37E-03	mg/m^3	3.00E-02	mg/m^3	4.56E-02
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	7.88E-05	mg/m^3	2.00E-03	mg/m^3	3.94E-02	2.42E-04	mg/m^3	2.00E-03	mg/m^3	1.21E-01
				Vinyl Chloride	7.04E+00	µg/L	3.13E-03	mg/m^3	1.00E-01	mg/m^3	3.13E-02	9.58E-03	mg/m^3	1.00E-01	mg/m^3	9.58E-02
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Inorganics												
				Antimony	9.02E+01	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Arsenic	2.67E+01	µg/L	NA	NA	1.50E-05	mg/m^3	NA	NA	NA	1.50E-05	mg/m^3	NA
				Cadmium	4.18E-01	µg/L	NA	NA	1.00E-05	mg/m^3	NA	NA	NA	1.00E-05	mg/m^3	NA
				Chromium	2.40E+00	µg/L	NA	NA	1.00E-04	mg/m^3	NA	NA	NA	1.00E-04	mg/m^3	NA
				Cobalt	1.61E+00	µg/L	NA	NA	6.00E-06	mg/m^3	NA	NA	NA	6.00E-06	mg/m^3	NA
				Cyanide	3.19E+00	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Iron	1.95E+04	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Lead	1.85E+01	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.43E+02	µg/L	NA	NA	5.00E-05	mg/m^3	NA	NA	NA	5.00E-05	mg/m^3	NA
				Vanadium	3.86E+00	µg/L	NA	NA	1.00E-04	mg/m^3	NA	NA	NA	1.00E-04	mg/m^3	NA
				Zinc	6.21E+02	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Exp. Route Total								8.55E-02					2.62E-01
		Exposure Point Total									1.17E+01					2.73E+01

NA = not applicable
RfC= reference concentration
RfD = reference dose
mg/kg-day = milligram per kilogram per day
µg/L = microgram per liter
mg/m^3 = milligram per cubic meter

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Matteo Property	Ingestion	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table B-7.0.3	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	8.39E-10	8.95E-08	mg/kg-day	5.00E-04	mg/kg-day	1.79E-04
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.97E+01	mg/kg	4.01E-04	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.92E-04	7.64E-04	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.65E+01	mg/kg	2.45E-04	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.79E-03	4.67E-04	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.06E+01	mg/kg	3.39E-04	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.48E-04	6.47E-04	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	2.93E+01	mg/kg	1.97E-04	mg/kg-day	7.30E-02	$(mg/kg\text{-}day)^{-1}$	1.44E-05	3.75E-04	mg/kg-day	NA	NA	NA
				Chrysene	5.06E+01	mg/kg	3.39E-04	mg/kg-day	7.30E-03	$(mg/kg\text{-}day)^{-1}$	2.48E-06	6.47E-04	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	7.23E+00	mg/kg	4.85E-05	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	3.54E-04	9.25E-05	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.63E+01	mg/kg	1.09E-04	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	7.99E-05	2.09E-04	mg/kg-day	NA	NA	NA
				Pyrene	8.26E+01	mg/kg	1.29E-04	mg/kg-day	NA	NA	NA	1.06E-03	mg/kg-day	3.00E-02	mg/kg-day	3.52E-02
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	4.23E-11	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	5.49E-06	3.45E-10	mg/kg-day	7.00E-10	mg/kg-day	4.93E-01
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.44E+01	mg/kg	2.26E-05	mg/kg-day	3.40E-01	$(mg/kg\text{-}day)^{-1}$	7.69E-06	1.85E-04	mg/kg-day	5.00E-04	mg/kg-day	3.69E-01
				Aroclor 1254	1.99E-01	mg/kg	3.12E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	6.24E-07	2.55E-06	mg/kg-day	2.00E-05	mg/kg-day	1.27E-01
				Aroclor 1260	3.67E+01	mg/kg	5.74E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.15E-04	4.69E-04	mg/kg-day	2.00E-05	mg/kg-day	2.35E+01
				Delta-BHC	6.90E-01	mg/kg	1.08E-06	mg/kg-day	1.80E+00	$(mg/kg\text{-}day)^{-1}$	1.94E-06	8.82E-06	mg/kg-day	NA	NA	NA
				Dieldrin	1.17E+00	mg/kg	1.83E-06	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	2.93E-05	1.50E-05	mg/kg-day	5.00E-05	mg/kg-day	2.99E-01
				Heptachlor Epoxide	7.44E-01	mg/kg	1.17E-06	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	1.06E-05	9.51E-06	mg/kg-day	1.30E-05	mg/kg-day	7.32E-01
				Inorganics												
				Aluminum	4.83E+03	mg/kg	7.57E-03	mg/kg-day	NA	NA	NA	6.18E-02	mg/kg-day	1.00E+00	mg/kg-day	6.18E-02
				Antimony	4.51E+00	mg/kg	7.06E-06	mg/kg-day	NA	NA	NA	5.77E-05	mg/kg-day	4.00E-04	mg/kg-day	1.44E-01
				Arsenic	3.51E+00	mg/kg	3.30E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.95E-06	2.69E-05	mg/kg-day	3.00E-04	mg/kg-day	8.98E-02
				Cadmium	3.69E+00	mg/kg	5.77E-06	mg/kg-day	NA	NA	NA	4.71E-05	mg/kg-day	1.00E-03	mg/kg-day	4.71E-02
				Chromium	3.38E+01	mg/kg	5.29E-05	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	2.64E-05	4.32E-04	mg/kg-day	3.00E-03	mg/kg-day	1.44E-01
				Cobalt	3.34E+00	mg/kg	5.23E-06	mg/kg-day	NA	NA	NA	4.27E-05	mg/kg-day	3.00E-04	mg/kg-day	1.42E-01
				Copper	6.70E+02	mg/kg	1.05E-03	mg/kg-day	NA	NA	NA	8.56E-03	mg/kg-day	4.00E-02	mg/kg-day	2.14E-01
				Cyanide	8.50E-01	mg/kg	1.33E-06	mg/kg-day	NA	NA	NA	1.09E-05	mg/kg-day	6.00E-04	mg/kg-day	1.81E-02
				Iron	2.99E+04	mg/kg	4.68E-02	mg/kg-day	NA	NA	NA	3.82E-01	mg/kg-day	7.00E-01	mg/kg-day	5.46E-01
				Lead	7.67E+02	mg/kg	1.20E-03	mg/kg-day	NA	NA	NA	9.81E-03	mg/kg-day	NA	NA	NA
				Manganese	2.65E+02	mg/kg	4.14E-04	mg/kg-day	NA	NA	NA	3.38E-03	mg/kg-day	1.40E-01	mg/kg-day	2.42E-02
				Mercury	7.20E-01	mg/kg	1.13E-06	mg/kg-day	NA	NA	NA	9.21E-06	mg/kg-day	3.00E-04	mg/kg-day	3.07E-02
				Nickel	4.26E+01	mg/kg	6.67E-05	mg/kg-day	NA	NA	NA	5.45E-04	mg/kg-day	2.00E-02	mg/kg-day	2.72E-02
				Thallium	5.46E-02	mg/kg	8.55E-08	mg/kg-day	NA	NA	NA	6.98E-07	mg/kg-day	1.00E-05	mg/kg-day	6.98E-02
				Vanadium	2.93E+01	mg/kg	4.59E-05	mg/kg-day	NA	NA	NA	3.74E-04	mg/kg-day	7.00E-05	mg/kg-day	5.35E+00
				Zinc	2.64E+03	mg/kg	4.13E-03	mg/kg-day	NA	NA	NA	3.37E-02	mg/kg-day	3.00E-01	mg/kg-day	1.12E-01
			Exp. Route Total								2.98E-03					3.25E+01

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Matteo Property	Dermal Contact	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	NA	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.97E+01	mg/kg	1.54E-04	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.12E-04	2.78E-04	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.65E+01	mg/kg	9.39E-05	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	6.86E-04	1.70E-04	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.06E+01	mg/kg	1.30E-04	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	9.51E-05	2.35E-04	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	2.93E+01	mg/kg	7.55E-05	mg/kg-day	7.30E-02	$(mg/kg\text{-}day)^{-1}$	5.51E-06	1.37E-04	mg/kg-day	NA	NA	NA
				Chrysene	5.06E+01	mg/kg	1.30E-04	mg/kg-day	7.30E-03	$(mg/kg\text{-}day)^{-1}$	9.51E-07	2.35E-04	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	7.23E+00	mg/kg	1.86E-05	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.36E-04	3.37E-05	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.63E+01	mg/kg	4.20E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	3.07E-05	7.60E-05	mg/kg-day	NA	NA	NA
				Pyrene	8.26E+01	mg/kg	5.31E-05	mg/kg-day	NA	NA	NA	3.84E-04	mg/kg-day	3.00E-02	mg/kg-day	1.28E-02
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	4.00E-12	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	5.20E-07	2.90E-11	mg/kg-day	7.00E-10	mg/kg-day	4.14E-02
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.44E+01	mg/kg	2.14E-06	mg/kg-day	3.40E-01	$(mg/kg\text{-}day)^{-1}$	7.28E-07	1.55E-05	mg/kg-day	5.00E-04	mg/kg-day	3.10E-02
				Aroclor 1254	1.99E-01	mg/kg	1.38E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.76E-07	9.99E-07	mg/kg-day	2.00E-05	mg/kg-day	5.00E-02
				Aroclor 1260	3.67E+01	mg/kg	2.54E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	5.08E-05	1.84E-04	mg/kg-day	2.00E-05	mg/kg-day	9.20E+00
				Delta-BHC	6.90E-01	mg/kg	3.41E-07	mg/kg-day	1.80E+00	$(mg/kg\text{-}day)^{-1}$	6.14E-07	2.47E-06	mg/kg-day	NA	NA	NA
				Dieldrin	1.17E+00	mg/kg	5.78E-07	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	9.25E-06	4.19E-06	mg/kg-day	5.00E-05	mg/kg-day	8.38E-02
				Heptachlor Epoxide	7.44E-01	mg/kg	3.68E-07	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	3.35E-06	2.66E-06	mg/kg-day	1.30E-05	mg/kg-day	2.05E-01
				Inorganics												
				Aluminum	4.83E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	4.51E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	3.51E+00	mg/kg	5.21E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.81E-07	3.77E-06	mg/kg-day	3.00E-04	mg/kg-day	1.26E-02
				Cadmium	3.69E+00	mg/kg	1.82E-08	mg/kg-day	NA	NA	NA	1.32E-07	mg/kg-day	2.50E-05	mg/kg-day	5.28E-03
				Chromium	3.38E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	3.34E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Copper	6.70E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	4.00E-02	mg/kg-day	NA
				Cyanide	8.50E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	2.99E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Lead	7.67E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.65E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Mercury	7.20E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	2.10E-05	mg/kg-day	NA
				Nickel	4.26E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	8.00E-04	mg/kg-day	NA
				Thallium	5.46E-02	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
				Vanadium	2.93E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
				Zinc	2.64E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-01	mg/kg-day	NA
			Exp. Route Total								1.13E-03					9.64E+00

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Matteo Property	Inhalation	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table B-7.0.3	NA	4.10E-06	$(\mu g/m^3)^{-1}$	4.89E-09	3.96E-13	mg/m^3	2.00E-03	mg/m^3	1.98E-10
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.97E+01	mg/kg	3.66E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	4.03E-10	3.38E-09	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	3.65E+01	mg/kg	2.24E-06	$\mu g/m^3$	1.10E-03	$(\mu g/m^3)^{-1}$	2.46E-09	2.06E-09	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	5.06E+01	mg/kg	3.10E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	3.41E-10	2.86E-09	mg/m^3	NA	NA	NA
				Benzo(k)fluoranthene	2.93E+01	mg/kg	1.80E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.98E-10	1.66E-09	mg/m^3	NA	NA	NA
				Chrysene	5.06E+01	mg/kg	3.10E-06	$\mu g/m^3$	1.10E-05	$(\mu g/m^3)^{-1}$	3.41E-11	2.86E-09	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	7.23E+00	mg/kg	4.44E-07	$\mu g/m^3$	1.20E-03	$(\mu g/m^3)^{-1}$	5.32E-10	4.09E-10	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.63E+01	mg/kg	1.00E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.10E-10	9.22E-10	mg/m^3	NA	NA	NA
				Pyrene	8.26E+01	mg/kg	2.00E-06	$\mu g/m^3$	NA	NA	NA	4.67E-09	mg/m^3	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	6.54E-13	$\mu g/m^3$	3.80E+01	$(\mu g/m^3)^{-1}$	2.48E-11	1.53E-15	mg/m^3	4.00E-08	mg/m^3	3.81E-08
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.44E+01	mg/kg	3.50E-07	$\mu g/m^3$	9.70E-05	$(\mu g/m^3)^{-1}$	3.39E-11	8.16E-10	mg/m^3	NA	NA	NA
				Aroclor 1254	1.99E-01	mg/kg	4.83E-09	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	2.75E-12	1.13E-11	mg/m^3	NA	NA	NA
				Aroclor 1260	3.67E+01	mg/kg	8.89E-07	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	5.07E-10	2.07E-09	mg/m^3	NA	NA	NA
				Delta-BHC	6.90E-01	mg/kg	1.67E-08	$\mu g/m^3$	5.10E-04	$(\mu g/m^3)^{-1}$	8.52E-12	3.90E-11	mg/m^3	NA	NA	NA
				Dieldrin	1.17E+00	mg/kg	2.83E-08	$\mu g/m^3$	4.60E-03	$(\mu g/m^3)^{-1}$	1.30E-10	6.61E-11	mg/m^3	NA	NA	NA
				Heptachlor Epoxide	7.44E-01	mg/kg	1.80E-08	$\mu g/m^3$	2.60E-03	$(\mu g/m^3)^{-1}$	4.69E-11	4.21E-11	mg/m^3	NA	NA	NA
				Inorganics												
				Aluminum	4.83E+03	mg/kg	1.17E-04	$\mu g/m^3$	NA	NA	NA	2.73E-07	mg/m^3	5.00E-03	mg/m^3	5.46E-05
				Antimony	4.51E+00	mg/kg	1.09E-07	$\mu g/m^3$	NA	NA	NA	2.55E-10	mg/m^3	NA	mg/m^3	NA
				Arsenic	3.51E+00	mg/kg	8.50E-08	$\mu g/m^3$	4.30E-03	$(\mu g/m^3)^{-1}$	3.66E-10	1.98E-10	mg/m^3	1.50E-05	mg/m^3	1.32E-05
				Cadmium	3.69E+00	mg/kg	8.93E-08	$\mu g/m^3$	1.80E-03	$(\mu g/m^3)^{-1}$	1.61E-10	2.08E-10	mg/m^3	1.00E-05	mg/m^3	2.08E-05
				Chromium	3.38E+01	mg/kg	8.18E-07	$\mu g/m^3$	1.20E-02	$(\mu g/m^3)^{-1}$	9.81E-09	1.91E-09	mg/m^3	1.00E-04	mg/m^3	1.91E-05
				Cobalt	3.34E+00	mg/kg	8.09E-08	$\mu g/m^3$	9.00E-03	$(\mu g/m^3)^{-1}$	7.28E-10	1.89E-10	mg/m^3	6.00E-06	mg/m^3	3.15E-05
				Copper	6.70E+02	mg/kg	1.62E-05	$\mu g/m^3$	NA	NA	NA	3.79E-08	mg/m^3	NA	NA	NA
				Cyanide	8.50E-01	mg/kg	2.06E-08	$\mu g/m^3$	NA	NA	NA	4.80E-11	mg/m^3	NA	NA	NA
				Iron	2.99E+04	mg/kg	7.24E-04	$\mu g/m^3$	NA	NA	NA	1.69E-06	mg/m^3	NA	NA	NA
				Lead	7.67E+02	mg/kg	1.86E-05	$\mu g/m^3$	NA	NA	NA	4.34E-08	mg/m^3	NA	NA	NA
				Manganese	2.65E+02	mg/kg	6.41E-06	$\mu g/m^3$	NA	NA	NA	1.50E-08	mg/m^3	5.00E-05	mg/m^3	2.99E-04
				Mercury	7.20E-01	mg/kg	1.74E-08	$\mu g/m^3$	NA	NA	NA	4.07E-11	mg/m^3	3.00E-04	mg/m^3	1.36E-07
				Nickel	4.26E+01	mg/kg	1.03E-06	$\mu g/m^3$	2.60E-04	$(\mu g/m^3)^{-1}$	2.68E-10	2.41E-09	mg/m^3	9.00E-05	mg/m^3	2.68E-05
				Thallium	5.46E-02	mg/kg	1.32E-09	$\mu g/m^3$	NA	NA	NA	3.09E-12	mg/m^3	NA	NA	NA
				Vanadium	2.93E+01	mg/kg	7.09E-07	$\mu g/m^3$	8.30E-03	$(\mu g/m^3)^{-1}$	5.89E-09	1.66E-09	mg/m^3	1.00E-04	mg/m^3	1.66E-05
				Zinc	2.64E+03	mg/kg	6.39E-05	$\mu g/m^3$	NA	NA	NA	1.49E-07	mg/m^3	NA	NA	NA
			Exp. Route Total								2.70E-08					4.82E-04
		Exposure Point Total									4.11E-03					4.22E+01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Groundwater	Groundwater	Tap Water	Ingestion	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	1.63E-05	mg/kg-day	1.00E-01	$(mg/kg\text{-}day)^{-1}$	1.63E-06
				cis-1,2-Dichloroethene	3.71E+00	µg/L	5.52E-05	mg/kg-day	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table B-7.0.4	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	1.79E-07
				Vinyl Chloride	7.04E+00	µg/L	5.74E-04	mg/kg-day	7.20E-01	$(mg/kg\text{-}day)^{-1}$	4.13E-04
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	1.09E-07	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	1.74E-06
				Inorganics							
				Antimony	9.02E+01	µg/L	1.34E-03	mg/kg-day	NA	NA	NA
				Arsenic	2.67E+01	µg/L	3.97E-04	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.95E-04
				Cadmium	4.18E-01	µg/L	6.22E-06	mg/kg-day	NA	NA	NA
				Chromium	2.40E+00	µg/L	3.57E-05	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	1.78E-05
				Cobalt	1.61E+00	µg/L	2.40E-05	mg/kg-day	NA	NA	NA
				Cyanide	3.19E+00	µg/L	4.74E-05	mg/kg-day	NA	NA	NA
				Iron	1.95E+04	µg/L	2.90E-01	mg/kg-day	NA	NA	NA
				Lead	1.85E+01	µg/L	2.75E-04	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	3.61E-03	mg/kg-day	NA	NA	NA
				Vanadium	3.86E+00	µg/L	5.74E-05	mg/kg-day	NA	NA	NA
				Zinc	6.21E+02	µg/L	9.23E-03	mg/kg-day	NA	NA	NA
			Exp. Route Total								1.03E-03

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Groundwater	Groundwater	Tap Water	Dermal Contact	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	3.81E-08	mg/kg-day	1.00E-01	$(mg/kg\text{-}day)^{-1}$	3.81E-09
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table B-7.0.4	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	2.18E-08
				Vinyl Chloride	7.04E+00	µg/L	1.50E-05	mg/kg-day	7.20E-01	$(mg/kg\text{-}day)^{-1}$	1.08E-05
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	4.93E-08	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	7.88E-07
				Inorganics							
				Antimony	9.02E+01	µg/L	3.38E-06	mg/kg-day	NA	NA	NA
				Arsenic	2.67E+01	µg/L	9.98E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.50E-06
				Cadmium	4.18E-01	µg/L	1.56E-08	mg/kg-day	NA	NA	NA
				Chromium	2.40E+00	µg/L	8.98E-08	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	4.49E-08
				Cobalt	1.61E+00	µg/L	2.41E-08	mg/kg-day	NA	NA	NA
				Cyanide	3.19E+00	µg/L	1.19E-07	mg/kg-day	NA	NA	NA
				Iron	1.95E+04	µg/L	7.30E-04	mg/kg-day	NA	NA	NA
				Lead	1.85E+01	µg/L	6.92E-08	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	9.08E-06	mg/kg-day	NA	NA	NA
				Vanadium	3.86E+00	µg/L	1.44E-07	mg/kg-day	NA	NA	NA
				Zinc	6.21E+02	µg/L	1.39E-05	mg/kg-day	NA	NA	NA
			Exp. Route Total								1.31E-05

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk
					Value	Unit	Value	Unit	Value	Unit	
Groundwater	Groundwater	Tap Water	Inhalation at Showerhead	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	2.70E-04	µg/m^3	5.00E-06	(µg/m^3)$^{-1}$	1.35E-09
				cis-1,2-Dichloroethene	3.71E+00	µg/L	9.59E-04	µg/m^3	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table B-7.0.4	NA	4.10E-06	(µg/m^3)$^{-1}$	1.36E-07
				Vinyl Chloride	7.04E+00	µg/L	2.89E-03	µg/m^3	4.40E-06	(µg/m^3)$^{-1}$	1.27E-08
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	NA	NA	4.60E-03	(µg/m^3)$^{-1}$	NA
				Inorganics							
				Antimony	9.02E+01	µg/L	NA	NA	NA	NA	NA
				Arsenic	2.67E+01	µg/L	NA	NA	4.30E-03	(µg/m^3)$^{-1}$	NA
				Cadmium	4.18E-01	µg/L	NA	NA	1.80E-03	(µg/m^3)$^{-1}$	NA
				Chromium	2.40E+00	µg/L	NA	NA	1.20E-02	(µg/m^3)$^{-1}$	NA
				Cobalt	1.61E+00	µg/L	NA	NA	9.00E-03	(µg/m^3)$^{-1}$	NA
				Cyanide	3.19E+00	µg/L	NA	NA	NA	NA	NA
				Iron	1.95E+04	µg/L	NA	NA	NA	NA	NA
				Lead	1.85E+01	µg/L	NA	NA	NA	NA	NA
				Manganese	2.43E+02	µg/L	NA	NA	NA	NA	NA
				Vanadium	3.86E+00	µg/L	NA	NA	8.30E-03	(µg/m^3)$^{-1}$	NA
				Zinc	6.21E+02	µg/L	NA	NA	NA	NA	NA
			Exp. Route Total								1.50E-07
		Exposure Point Total									1.04E-03

NA = not applicable
µg/L = microgram per liter
µg/m^3 = microgram per cubic meter
mg/kg-day = milligram per kilogram per day

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation - Adult					Noncancer Hazard Calculation - Child				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Tap Water	Ingestion	**Volatile Organic Compounds**												
				1,4-Dioxane	1.10E+00	µg/L	3.01E-05	mg/kg-day	3.00E-02	mg/kg-day	1.00E-03	7.02E-05	mg/kg-day	3.00E-02	mg/kg-day	2.34E-03
				cis-1,2-Dichloroethene	3.71E+00	µg/L	1.02E-04	mg/kg-day	2.00E-03	mg/kg-day	5.09E-02	2.37E-04	mg/kg-day	2.00E-03	mg/kg-day	1.19E-01
				Trichloroethene	1.98E-01	µg/L	5.42E-06	mg/kg-day	5.00E-04	mg/kg-day	1.08E-02	1.27E-05	mg/kg-day	5.00E-04	mg/kg-day	2.53E-02
				Vinyl Chloride	7.04E+00	µg/L	1.93E-04	mg/kg-day	3.00E-03	mg/kg-day	6.43E-02	4.50E-04	mg/kg-day	3.00E-03	mg/kg-day	1.50E-01
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	2.00E-07	mg/kg-day	5.00E-05	mg/kg-day	4.00E-03	4.67E-07	mg/kg-day	5.00E-05	mg/kg-day	9.33E-03
				Inorganics												
				Antimony	9.02E+01	µg/L	2.47E-03	mg/kg-day	4.00E-04	mg/kg-day	6.18E+00	5.77E-03	mg/kg-day	4.00E-04	mg/kg-day	1.44E+01
				Arsenic	2.67E+01	µg/L	7.31E-04	mg/kg-day	3.00E-04	mg/kg-day	2.44E+00	1.71E-03	mg/kg-day	3.00E-04	mg/kg-day	5.69E+00
				Cadmium	4.18E-01	µg/L	1.15E-05	mg/kg-day	1.00E-03	mg/kg-day	1.15E-02	2.67E-05	mg/kg-day	1.00E-03	mg/kg-day	2.67E-02
				Chromium	2.40E+00	µg/L	6.58E-05	mg/kg-day	3.00E-03	mg/kg-day	2.19E-02	1.53E-04	mg/kg-day	3.00E-03	mg/kg-day	5.11E-02
				Cobalt	1.61E+00	µg/L	4.42E-05	mg/kg-day	3.00E-04	mg/kg-day	1.47E-01	1.03E-04	mg/kg-day	3.00E-04	mg/kg-day	3.44E-01
				Cyanide	3.19E+00	µg/L	8.73E-05	mg/kg-day	6.00E-04	mg/kg-day	1.46E-01	2.04E-04	mg/kg-day	6.00E-04	mg/kg-day	3.40E-01
				Iron	1.95E+04	µg/L	5.34E-01	mg/kg-day	7.00E-01	mg/kg-day	7.63E-01	1.25E+00	mg/kg-day	7.00E-01	mg/kg-day	1.78E+00
				Lead	1.85E+01	µg/L	5.07E-04	mg/kg-day	NA	NA	NA	1.18E-03	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	6.65E-03	mg/kg-day	1.40E-01	mg/kg-day	4.75E-02	1.55E-02	mg/kg-day	1.40E-01	mg/kg-day	1.11E-01
				Vanadium	3.86E+00	µg/L	1.06E-04	mg/kg-day	7.00E-05	mg/kg-day	1.51E+00	2.47E-04	mg/kg-day	7.00E-05	mg/kg-day	3.53E+00
				Zinc	6.21E+02	µg/L	1.70E-02	mg/kg-day	3.00E-01	mg/kg-day	5.67E-02	3.97E-02	mg/kg-day	3.00E-01	mg/kg-day	1.32E-01
			Exp. Route Total								1.15E+01					2.67E+01
Groundwater	Groundwater	Tap Water	Dermal Contact	**Volatile Organic Compounds**												
				1,4-Dioxane	1.10E+00	µg/L	7.07E-08	mg/kg-day	3.00E-02	mg/kg-day	2.36E-06	1.62E-07	mg/kg-day	3.00E-02	mg/kg-day	5.41E-06
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	2.00E-03	mg/kg-day	NA	NA	NA	2.00E-03	mg/kg-day	NA
				Trichloroethene	1.98E-01	µg/L	6.17E-07	mg/kg-day	5.00E-04	mg/kg-day	1.23E-03	1.42E-06	mg/kg-day	5.00E-04	mg/kg-day	2.83E-03
				Vinyl Chloride	7.04E+00	µg/L	6.58E-06	mg/kg-day	3.00E-03	mg/kg-day	2.19E-03	1.51E-05	mg/kg-day	3.00E-03	mg/kg-day	5.04E-03
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	9.13E-08	mg/kg-day	5.00E-05	mg/kg-day	1.83E-03	2.10E-07	mg/kg-day	5.00E-05	mg/kg-day	4.19E-03
				Inorganics												
				Antimony	9.02E+01	µg/L	5.56E-06	mg/kg-day	6.00E-05	mg/kg-day	9.27E-02	1.71E-05	mg/kg-day	6.00E-05	mg/kg-day	2.86E-01
				Arsenic	2.67E+01	µg/L	1.65E-06	mg/kg-day	3.00E-04	mg/kg-day	5.48E-03	5.07E-06	mg/kg-day	3.00E-04	mg/kg-day	1.69E-02
				Cadmium	4.18E-01	µg/L	2.58E-08	mg/kg-day	2.50E-05	mg/kg-day	1.03E-03	7.94E-08	mg/kg-day	2.50E-05	mg/kg-day	3.17E-03
				Chromium	2.40E+00	µg/L	1.48E-07	mg/kg-day	7.50E-05	mg/kg-day	1.97E-03	4.56E-07	mg/kg-day	7.50E-05	mg/kg-day	6.08E-03
				Cobalt	1.61E+00	µg/L	3.97E-08	mg/kg-day	3.00E-04	mg/kg-day	1.32E-04	1.22E-07	mg/kg-day	3.00E-04	mg/kg-day	4.08E-04
				Cyanide	3.19E+00	µg/L	1.96E-07	mg/kg-day	6.00E-04	mg/kg-day	3.27E-04	6.05E-07	mg/kg-day	6.00E-04	mg/kg-day	1.01E-03
				Iron	1.95E+04	µg/L	1.20E-03	mg/kg-day	7.00E-01	mg/kg-day	1.72E-03	3.70E-03	mg/kg-day	7.00E-01	mg/kg-day	5.29E-03
				Lead	1.85E+01	µg/L	1.14E-07	mg/kg-day	NA	NA	NA	3.51E-07	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	1.50E-05	mg/kg-day	5.60E-03	mg/kg-day	2.67E-03	4.61E-05	mg/kg-day	5.60E-03	mg/kg-day	8.23E-03
				Vanadium	3.86E+00	µg/L	2.38E-07	mg/kg-day	7.00E-05	mg/kg-day	3.40E-03	7.33E-07	mg/kg-day	7.00E-05	mg/kg-day	1.05E-02
				Zinc	6.21E+02	µg/L	2.30E-05	mg/kg-day	3.00E-01	mg/kg-day	7.65E-05	7.07E-05	mg/kg-day	3.00E-01	mg/kg-day	2.36E-04
			Exp. Route Total								1.15E-01					3.49E-01

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation - Adult					Noncancer Hazard Calculation - Child				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Tap	Inhalation	**Volatile Organic Compounds**												
		Water	at Showerhead	1,4-Dioxane	1.10E+00	µg/L	4.46E-04	mg/m^3	3.00E-02	mg/m^3	1.49E-02	1.37E-03	mg/m^3	3.00E-02	mg/m^3	4.56E-02
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	7.88E-05	mg/m^3	2.00E-03	mg/m^3	3.94E-02	2.42E-04	mg/m^3	2.00E-03	mg/m^3	1.21E-01
				Vinyl Chloride	7.04E+00	µg/L	3.13E-03	mg/m^3	1.00E-01	mg/m^3	3.13E-02	9.58E-03	mg/m^3	1.00E-01	mg/m^3	9.58E-02
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	NA	NA	NA	mg/m^3	NA	NA	NA	NA	NA	NA
				Inorganics												
				Antimony	9.02E+01	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Arsenic	2.67E+01	µg/L	NA	NA	1.50E-05	mg/m^3	NA	NA	NA	1.50E-05	mg/m^3	NA
				Cadmium	4.18E-01	µg/L	NA	NA	1.00E-05	mg/m^3	NA	NA	NA	1.00E-05	mg/m^3	NA
				Chromium	2.40E+00	µg/L	NA	NA	1.00E-04	mg/m^3	NA	NA	NA	1.00E-04	mg/m^3	NA
				Cobalt	1.61E+00	µg/L	NA	NA	6.00E-06	mg/m^3	NA	NA	NA	6.00E-06	mg/m^3	NA
				Cyanide	3.19E+00	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Iron	1.95E+04	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Lead	1.85E+01	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.43E+02	µg/L	NA	NA	5.00E-05	mg/m^3	NA	NA	NA	5.00E-05	mg/m^3	NA
				Vanadium	3.86E+00	µg/L	NA	NA	1.00E-04	mg/m^3	NA	NA	NA	1.00E-04	mg/m^3	NA
				Zinc	6.21E+02	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Exp. Route Total								8.55E-02					2.62E-01
		Exposure Point Total									1.17E+01					2.73E+01

NA = not applicable
RfC= reference concentration
RfD = reference dose
mg/kg-day = milligram per kilogram per day
µg/L = microgram per liter
mg/m^3 = milligram per cubic meter

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Water	Surface Water	Woodbury Creek / Hessian Run	Ingestion	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.80E-01	µg/L	1.66E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.21E-08	3.22E-08	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.20E-01	µg/L	2.95E-08	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	2.15E-07	5.73E-08	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	3.80E-01	µg/L	3.50E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.56E-08	6.80E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.50E-01	µg/L	1.38E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.01E-08	2.68E-08	mg/kg-day	NA	NA	NA
				Pentachlorophenol	7.72E-01	µg/L	1.62E-08	mg/kg-day	4.00E-01	$(mg/kg-day)^{-1}$	6.48E-09	1.38E-07	mg/kg-day	5.00E-03	mg/kg-day	2.76E-05
				Inorganics												
				Aluminum	7.93E+03	µg/L	1.66E-04	mg/kg-day	NA	NA	NA	1.42E-03	mg/kg-day	1.00E+00	mg/kg-day	1.42E-03
				Antimony	7.10E+00	µg/L	1.49E-07	mg/kg-day	NA	NA	NA	1.27E-06	mg/kg-day	4.00E-04	mg/kg-day	3.18E-03
				Arsenic	1.30E+01	µg/L	2.74E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	4.10E-07	2.33E-06	mg/kg-day	3.00E-04	mg/kg-day	7.78E-03
				Barium	2.97E+02	µg/L	6.23E-06	mg/kg-day	NA	NA	NA	5.31E-05	mg/kg-day	2.00E-01	mg/kg-day	2.66E-04
				Beryllium	1.14E+01	µg/L	2.39E-07	mg/kg-day	NA	NA	NA	2.04E-06	mg/kg-day	2.00E-03	mg/kg-day	1.02E-03
				Cadmium	3.51E+00	µg/L	7.37E-08	mg/kg-day	NA	NA	NA	6.29E-07	mg/kg-day	1.00E-03	mg/kg-day	6.29E-04
				Chromium	3.86E+01	µg/L	8.10E-07	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	4.05E-07	6.91E-06	mg/kg-day	3.00E-03	mg/kg-day	2.30E-03
				Cobalt	1.85E+01	µg/L	3.88E-07	mg/kg-day	NA	NA	NA	3.31E-06	mg/kg-day	3.00E-04	mg/kg-day	1.10E-02
				Copper	3.17E+01	µg/L	6.65E-07	mg/kg-day	NA	NA	NA	5.67E-06	mg/kg-day	4.00E-02	mg/kg-day	1.42E-04
				Cyanide	3.50E+00	µg/L	7.34E-08	mg/kg-day	NA	NA	NA	6.26E-07	mg/kg-day	6.00E-04	mg/kg-day	1.04E-03
				Iron	1.27E+05	µg/L	2.67E-03	mg/kg-day	NA	NA	NA	2.28E-02	mg/kg-day	7.00E-01	mg/kg-day	3.26E-02
				Lead	2.74E+01	µg/L	5.75E-07	mg/kg-day	NA	NA	NA	4.91E-06	mg/kg-day	NA	NA	NA
				Manganese	3.06E+02	µg/L	6.42E-06	mg/kg-day	NA	NA	NA	5.48E-05	mg/kg-day	1.40E-01	mg/kg-day	3.91E-04
				Mercury	2.87E-01	µg/L	6.02E-09	mg/kg-day	NA	NA	NA	5.14E-08	mg/kg-day	3.00E-04	mg/kg-day	1.71E-04
				Nickel	6.65E+01	µg/L	1.40E-06	mg/kg-day	NA	NA	NA	1.19E-05	mg/kg-day	2.00E-02	mg/kg-day	5.95E-04
				Vanadium	1.55E+02	µg/L	3.25E-06	mg/kg-day	NA	NA	NA	2.77E-05	mg/kg-day	7.00E-05	mg/kg-day	3.96E-01
				Zinc	4.49E+02	µg/L	9.42E-06	mg/kg-day	NA	NA	NA	8.04E-05	mg/kg-day	3.00E-01	mg/kg-day	2.68E-04
			Exp. Route Total								1.08E-06					4.59E-01

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Water	Surface Water	Woodbury Creek / Hessian Run	Dermal Contact	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.80E-01	µg/L	3.05E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.23E-05	2.41E-05	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.20E-01	µg/L	9.29E-05	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	6.78E-04	7.34E-05	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	3.80E-01	µg/L	1.12E-04	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	8.17E-05	8.85E-05	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.50E-01	µg/L	4.43E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	3.23E-05	3.50E-05	mg/kg-day	NA	NA	NA
				Pentachlorophenol	7.72E-01	µg/L	2.64E-05	mg/kg-day	4.00E-01	mg/kg-day	1.06E-05	9.88E-05	mg/kg-day	5.00E-03	mg/kg-day	1.98E-02
				Inorganics												
				Aluminum	7.93E+03	µg/L	2.17E-04	mg/kg-day	NA	NA	NA	8.11E-04	mg/kg-day	1.00E+00	mg/kg-day	8.11E-04
				Antimony	7.10E+00	µg/L	1.94E-07	mg/kg-day	NA	NA	NA	7.26E-07	mg/kg-day	6.00E-05	mg/kg-day	1.21E-02
				Arsenic	1.30E+01	µg/L	3.57E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.35E-07	1.33E-06	mg/kg-day	3.00E-04	mg/kg-day	4.45E-03
				Barium	2.97E+02	µg/L	8.12E-06	mg/kg-day	NA	NA	NA	3.04E-05	mg/kg-day	1.40E-02	mg/kg-day	2.17E-03
				Beryllium	1.14E+01	µg/L	3.12E-07	mg/kg-day	NA	NA	NA	1.17E-06	mg/kg-day	1.40E-05	mg/kg-day	8.33E-02
				Cadmium	3.51E+00	µg/L	9.61E-08	mg/kg-day	NA	NA	NA	3.59E-07	mg/kg-day	2.50E-05	mg/kg-day	1.44E-02
				Chromium	3.86E+01	µg/L	1.06E-06	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	5.28E-07	3.95E-06	mg/kg-day	7.50E-05	mg/kg-day	5.27E-02
				Cobalt	1.85E+01	µg/L	2.02E-07	mg/kg-day	NA	NA	NA	7.56E-07	mg/kg-day	3.00E-04	mg/kg-day	2.52E-03
				Copper	3.17E+01	µg/L	8.67E-07	mg/kg-day	NA	NA	NA	3.24E-06	mg/kg-day	4.00E-02	mg/kg-day	8.10E-05
				Cyanide	3.50E+00	µg/L	9.57E-08	mg/kg-day	NA	NA	NA	3.58E-07	mg/kg-day	6.00E-04	mg/kg-day	5.97E-04
				Iron	1.27E+05	µg/L	3.48E-03	mg/kg-day	NA	NA	NA	1.30E-02	mg/kg-day	7.00E-01	mg/kg-day	1.86E-02
				Lead	2.74E+01	µg/L	7.50E-08	mg/kg-day	NA	NA	NA	2.80E-07	mg/kg-day	NA	NA	NA
				Manganese	3.06E+02	µg/L	8.37E-06	mg/kg-day	NA	NA	NA	3.13E-05	mg/kg-day	5.60E-03	mg/kg-day	5.59E-03
				Mercury	2.87E-01	µg/L	7.85E-09	mg/kg-day	NA	NA	NA	2.94E-08	mg/kg-day	2.10E-05	mg/kg-day	1.40E-03
				Nickel	6.65E+01	µg/L	3.64E-07	mg/kg-day	NA	NA	NA	1.36E-06	mg/kg-day	8.00E-04	mg/kg-day	1.70E-03
				Vanadium	1.55E+02	µg/L	4.24E-06	mg/kg-day	NA	NA	NA	1.59E-05	mg/kg-day	7.00E-05	mg/kg-day	2.26E-01
				Zinc	4.49E+02	µg/L	7.37E-06	mg/kg-day	NA	NA	NA	2.75E-05	mg/kg-day	3.00E-01	mg/kg-day	9.18E-05
			Exp. Route Total								8.26E-04					4.47E-01
		Exposure Point Total									8.27E-04					9.06E-01

NA = not applicable
RfC= reference concentration
RfD = reference dose
µg/L = microgram per liter
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Sediment	Sediment	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	4.15E-02	mg/kg	1.86E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.71E-08	1.52E-07	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.30E-01	mg/kg	1.03E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.06E-07	8.40E-07	mg/kg-day	2.00E-05	mg/kg-day	4.20E-02
				Aroclor 1268	3.37E-02	mg/kg	1.51E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.02E-08	1.23E-07	mg/kg-day	2.00E-05	mg/kg-day	6.16E-03
				Inorganics												
				Aluminum	1.30E+04	mg/kg	5.82E-03	mg/kg-day	NA	NA	NA	4.75E-02	mg/kg-day	1.00E+00	mg/kg-day	4.75E-02
				Antimony	3.32E+00	mg/kg	1.49E-06	mg/kg-day	NA	NA	NA	1.21E-05	mg/kg-day	4.00E-04	mg/kg-day	3.03E-02
				Arsenic	1.72E+01	mg/kg	4.63E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.94E-06	6.30E-05	mg/kg-day	3.00E-04	mg/kg-day	2.10E-01
				Cadmium	3.41E+00	mg/kg	1.53E-06	mg/kg-day	NA	NA	NA	1.25E-05	mg/kg-day	1.00E-03	mg/kg-day	1.25E-02
				Chromium	9.10E+01	mg/kg	4.07E-05	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	2.04E-05	3.32E-04	mg/kg-day	3.00E-03	mg/kg-day	1.11E-01
				Cobalt	1.34E+01	mg/kg	6.01E-06	mg/kg-day	NA	NA	NA	4.91E-05	mg/kg-day	3.00E-04	mg/kg-day	1.64E-01
				Cyanide	4.84E-01	mg/kg	2.16E-07	mg/kg-day	NA	NA	NA	1.77E-06	mg/kg-day	6.00E-04	mg/kg-day	2.95E-03
				Iron	2.59E+04	mg/kg	1.16E-02	mg/kg-day	NA	NA	NA	9.45E-02	mg/kg-day	7.00E-01	mg/kg-day	1.35E-01
				Manganese	3.63E+02	mg/kg	1.62E-04	mg/kg-day	NA	NA	NA	1.33E-03	mg/kg-day	1.40E-01	mg/kg-day	9.48E-03
				Thallium	1.85E-01	mg/kg	8.28E-08	mg/kg-day	NA	NA	NA	6.76E-07	mg/kg-day	1.00E-05	mg/kg-day	6.76E-02
				Vanadium	9.03E+01	mg/kg	4.04E-05	mg/kg-day	NA	NA	NA	3.30E-04	mg/kg-day	7.00E-05	mg/kg-day	4.71E+00
			Exp. Route Total								2.76E-05					5.55E+00
Sediment	Sediment	Woodbury Creek / Hessian Run	Dermal Contact	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	4.15E-02	mg/kg	6.20E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.24E-07	5.35E-07	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.30E-01	mg/kg	3.44E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	6.88E-07	2.96E-06	mg/kg-day	2.00E-05	mg/kg-day	1.48E-01
				Aroclor 1268	3.37E-02	mg/kg	5.04E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.01E-07	4.35E-07	mg/kg-day	2.00E-05	mg/kg-day	2.17E-02
				Inorganics												
				Aluminum	1.30E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	3.32E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	1.72E+01	mg/kg	5.52E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	8.28E-06	4.76E-05	mg/kg-day	3.00E-04	mg/kg-day	1.59E-01
				Cadmium	3.41E+00	mg/kg	3.64E-08	mg/kg-day	NA	NA	NA	3.14E-07	mg/kg-day	2.50E-05	mg/kg-day	1.26E-02
				Chromium	9.10E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	1.34E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Cyanide	4.84E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	2.59E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Manganese	3.63E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Thallium	1.85E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
				Vanadium	9.03E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
			Exp. Route Total								9.20E-06					3.41E-01
		Exposure Point Total									3.68E-05					5.89E+00

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult and child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**							
				Aroclor 1248	1.01E-01	mg/kg-ww	2.38E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	4.75E-05
				Aroclor 1254	2.63E-01	mg/kg-ww	6.19E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.24E-04
				Aroclor 1260	1.90E-01	mg/kg-ww	4.47E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	8.94E-05
				Inorganics							
				Lead	4.42E-01	mg/kg-ww	1.04E-04	mg/kg-day	NA	NA	NA
			Exp. Route Total								2.61E-04
		Exposure Point Total									2.61E-04

NA = not applicable
mg/kg-ww = milligram per kilogram wet weight
mg/kg-day = milligram per kilogram per day
RfD = reference dose
RfC= reference concentration

TABLE B-7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult and child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation (Adult)					Noncancer Hazard Calculation (Child)				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	1.01E-01	mg/kg-ww	4.99E-05	mg/kg-day	NA	NA	NA	7.77E-05	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.63E-01	mg/kg-ww	1.30E-04	mg/kg-day	2.00E-05	mg/kg-day	6.50E+00	2.02E-04	mg/kg-day	2.00E-05	mg/kg-day	1.01E+01
				Aroclor 1260	1.90E-01	mg/kg-ww	9.39E-05	mg/kg-day	2.00E-05	mg/kg-day	4.70E+00	1.46E-04	mg/kg-day	2.00E-05	mg/kg-day	7.30E+00
				Inorganics												
				Lead	4.42E-01	mg/kg-ww	2.18E-04	mg/kg-day	NA	NA	NA	3.40E-04	mg/kg-day	NA	NA	NA
			Exp. Route Total								1.12E+01					1.74E+01
		Exposure Point Total									1.12E+01					1.74E+01

NA = not applicable
RfD = reference dose
mg/kg-ww = milligram per kilogram wet weight
RfC= reference concentration
mg/kg-day = milligram per kilogram per day

TABLE B-7.8a
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	1.01E-01	mg/kg-ww	1.71E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.42E-05	4.99E-05	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.63E-01	mg/kg-ww	4.46E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	8.91E-05	1.30E-04	mg/kg-day	2.00E-05	mg/kg-day	6.50E+00
				Aroclor 1260	1.90E-01	mg/kg-ww	3.22E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	6.44E-05	9.39E-05	mg/kg-day	2.00E-05	mg/kg-day	4.70E+00
				Inorganics												
				Lead	4.42E-01	mg/kg-ww	7.49E-05	mg/kg-day	NA	NA	NA	2.18E-04	mg/kg-day	NA	NA	NA
			Exp. Route Total								1.88E-04					1.12E+01
		Exposure Point Total									1.88E-04					1.12E+01

NA = not applicable
RfD = reference dose
mg/kg-ww = milligram per kilogram wet weight
RfC= reference concentration
mg/kg-day = milligram per kilogram per day

TABLE B-7.8b
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	1.01E-01	mg/kg-ww	6.66E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.33E-05	7.77E-05	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.63E-01	mg/kg-ww	1.73E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.47E-05	2.02E-04	mg/kg-day	2.00E-05	mg/kg-day	1.01E+01
				Aroclor 1260	1.90E-01	mg/kg-ww	1.25E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.50E-05	1.46E-04	mg/kg-day	2.00E-05	mg/kg-day	7.30E+00
				Inorganics												
				Lead	4.42E-01	mg/kg-ww	2.91E-05	mg/kg-day	NA	NA	NA	3.40E-04	mg/kg-day	NA	NA	NA
			Exp. Route Total								7.30E-05					1.74E+01
		Exposure Point Total									7.30E-05					1.74E+01

NA = not applicable
RfD = reference dose
mg/kg-ww = milligram per kilogram wet weight
RfC= reference concentration
mg/kg-day = milligram per kilogram per day

TABLE B-7.9
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface / Subsurface Soil	Surface / Subsurface Soil	Matteo Property	Ingestion	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	1.29E-10	mg/kg-day	4.60E-02	$(mg/kg\text{-}day)^{-1}$	5.94E-12	9.04E-09	mg/kg-day	5.00E-04	mg/kg-day	1.81E-05
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	1.08E+01	mg/kg	1.99E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.45E-07	1.39E-05	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	6.62E+00	mg/kg	1.22E-07	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	8.92E-07	8.55E-06	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	9.19E+00	mg/kg	1.70E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.24E-07	1.19E-05	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	5.31E+00	mg/kg	9.80E-08	mg/kg-day	7.30E-02	$(mg/kg\text{-}day)^{-1}$	7.15E-09	6.86E-06	mg/kg-day	NA	NA	NA
				Chrysene	9.18E+00	mg/kg	1.69E-07	mg/kg-day	7.30E-03	$(mg/kg\text{-}day)^{-1}$	1.24E-09	1.19E-05	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.99E+00	mg/kg	3.66E-08	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	2.67E-07	2.56E-06	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.71E+00	mg/kg	3.16E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.30E-08	2.21E-06	mg/kg-day	NA	NA	NA
				Pyrene	1.49E+01	mg/kg	2.76E-07	mg/kg-day	NA	NA	NA	1.93E-05	mg/kg-day	3.00E-02	mg/kg-day	6.43E-04
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	4.98E-13	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	6.47E-08	3.49E-11	mg/kg-day	7.00E-10	mg/kg-day	4.98E-02
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	6.28E+00	mg/kg	1.16E-07	mg/kg-day	3.40E-01	$(mg/kg\text{-}day)^{-1}$	3.94E-08	8.11E-06	mg/kg-day	5.00E-04	mg/kg-day	1.62E-02
				Aroclor 1254	2.79E+01	mg/kg	5.15E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.03E-06	3.61E-05	mg/kg-day	2.00E-05	mg/kg-day	1.80E+00
				Aroclor 1260	6.55E+01	mg/kg	1.21E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.42E-06	8.45E-05	mg/kg-day	2.00E-05	mg/kg-day	4.23E+00
				Delta-BHC	4.20E-02	mg/kg	7.75E-10	mg/kg-day	1.80E+00	$(mg/kg\text{-}day)^{-1}$	1.40E-09	5.43E-08	mg/kg-day	NA	NA	NA
				Dieldrin	5.47E-01	mg/kg	1.01E-08	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	1.61E-07	7.06E-07	mg/kg-day	5.00E-05	mg/kg-day	1.41E-02
				Heptachlor Epoxide	1.87E-01	mg/kg	3.44E-09	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	3.13E-08	2.41E-07	mg/kg-day	1.30E-05	mg/kg-day	1.85E-02
				Inorganics												
				Aluminum	3.16E+03	mg/kg	5.83E-05	mg/kg-day	NA	NA	NA	4.08E-03	mg/kg-day	1.00E+00	mg/kg-day	4.08E-03
				Antimony	3.41E+01	mg/kg	6.29E-07	mg/kg-day	NA	NA	NA	4.41E-05	mg/kg-day	4.00E-04	mg/kg-day	1.10E-01
				Arsenic	9.71E+00	mg/kg	1.07E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.61E-07	7.52E-06	mg/kg-day	3.00E-04	mg/kg-day	2.51E-02
				Cadmium	1.26E+00	mg/kg	2.32E-08	mg/kg-day	NA	NA	NA	1.63E-06	mg/kg-day	1.00E-03	mg/kg-day	1.63E-03
				Chromium	2.08E+01	mg/kg	3.83E-07	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	1.92E-07	2.68E-05	mg/kg-day	3.00E-03	mg/kg-day	8.94E-03
				Cobalt	2.41E+00	mg/kg	4.44E-08	mg/kg-day	NA	NA	NA	3.11E-06	mg/kg-day	3.00E-04	mg/kg-day	1.04E-02
				Copper	3.27E+02	mg/kg	6.03E-06	mg/kg-day	NA	NA	NA	4.22E-04	mg/kg-day	4.00E-02	mg/kg-day	1.06E-02
				Iron	1.78E+04	mg/kg	3.29E-04	mg/kg-day	NA	NA	NA	2.30E-02	mg/kg-day	7.00E-01	mg/kg-day	3.29E-02
				Lead	1.71E+03	mg/kg	3.15E-05	mg/kg-day	NA	NA	NA	2.20E-03	mg/kg-day	NA	NA	NA
				Manganese	1.47E+02	mg/kg	2.71E-06	mg/kg-day	NA	NA	NA	1.90E-04	mg/kg-day	1.40E-01	mg/kg-day	1.36E-03
				Mercury	2.52E-01	mg/kg	4.65E-09	mg/kg-day	NA	NA	NA	3.25E-07	mg/kg-day	3.00E-04	mg/kg-day	1.08E-03
				Nickel	2.25E+01	mg/kg	4.14E-07	mg/kg-day	NA	NA	NA	2.90E-05	mg/kg-day	2.00E-02	mg/kg-day	1.45E-03
				Thallium	1.23E-01	mg/kg	2.27E-09	mg/kg-day	NA	NA	NA	1.59E-07	mg/kg-day	1.00E-05	mg/kg-day	1.59E-02
				Vanadium	2.02E+01	mg/kg	3.72E-07	mg/kg-day	NA	NA	NA	2.61E-05	mg/kg-day	7.00E-05	mg/kg-day	3.72E-01
				Zinc	1.40E+03	mg/kg	2.58E-05	mg/kg-day	NA	NA	NA	1.81E-03	mg/kg-day	3.00E-01	mg/kg-day	6.02E-03
			Exp. Route Total								5.56E-06					6.73E+00

TABLE B-7.9
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface / Subsurface Soil	Surface / Subsurface Soil	Matteo Property	Dermal Contact	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	NA	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	1.08E+01	mg/kg	7.77E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	5.67E-08	5.44E-06	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	6.62E+00	mg/kg	4.76E-08	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	3.48E-07	3.33E-06	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	9.19E+00	mg/kg	6.61E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	4.83E-08	4.63E-06	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	5.31E+00	mg/kg	3.82E-08	mg/kg-day	7.30E-02	$(mg/kg\text{-}day)^{-1}$	2.79E-09	2.68E-06	mg/kg-day	NA	NA	NA
				Chrysene	9.18E+00	mg/kg	6.60E-08	mg/kg-day	7.30E-03	$(mg/kg\text{-}day)^{-1}$	4.82E-10	4.62E-06	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.99E+00	mg/kg	1.43E-08	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.04E-07	1.00E-06	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.71E+00	mg/kg	1.23E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	8.99E-09	8.62E-07	mg/kg-day	NA	NA	NA
				Pyrene	1.49E+01	mg/kg	1.08E-07	mg/kg-day	NA	NA	NA	7.53E-06	mg/kg-day	3.00E-02	mg/kg-day	2.51E-04
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	4.48E-14	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	5.83E-09	3.14E-12	mg/kg-day	7.00E-10	mg/kg-day	4.48E-03
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	6.28E+00	mg/kg	1.04E-08	mg/kg-day	3.40E-01	$(mg/kg\text{-}day)^{-1}$	3.55E-09	7.30E-07	mg/kg-day	5.00E-04	mg/kg-day	1.46E-03
				Aroclor 1254	2.79E+01	mg/kg	2.16E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	4.33E-07	1.52E-05	mg/kg-day	2.00E-05	mg/kg-day	7.58E-01
				Aroclor 1260	6.55E+01	mg/kg	5.07E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.01E-06	3.55E-05	mg/kg-day	2.00E-05	mg/kg-day	1.78E+00
				Delta-BHC	4.20E-02	mg/kg	2.33E-10	mg/kg-day	1.80E+00	$(mg/kg\text{-}day)^{-1}$	4.19E-10	1.63E-08	mg/kg-day	NA	NA	NA
				Dieldrin	5.47E-01	mg/kg	3.03E-09	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	4.84E-08	2.12E-07	mg/kg-day	5.00E-05	mg/kg-day	4.24E-03
				Heptachlor Epoxide	1.87E-01	mg/kg	1.03E-09	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	9.40E-09	7.23E-08	mg/kg-day	1.30E-05	mg/kg-day	5.56E-03
				Inorganics												
				Aluminum	3.16E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	3.41E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	9.71E+00	mg/kg	1.61E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.42E-08	1.13E-06	mg/kg-day	3.00E-04	mg/kg-day	3.76E-03
				Cadmium	1.26E+00	mg/kg	6.97E-11	mg/kg-day	NA	NA	NA	4.88E-09	mg/kg-day	2.50E-05	mg/kg-day	1.95E-04
				Chromium	2.08E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	2.41E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Copper	3.27E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	4.00E-02	mg/kg-day	NA
				Iron	1.78E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Lead	1.71E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	1.47E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Mercury	2.52E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	2.10E-05	mg/kg-day	NA
				Nickel	2.25E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	8.00E-04	mg/kg-day	NA
				Thallium	1.23E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
				Vanadium	2.02E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
				Zinc	1.40E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-01	mg/kg-day	NA
			Exp. Route Total								2.11E-06					2.55E+00

TABLE B-7.9
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface / Subsurface Soil	Surface / Subsurface Soil	Matteo Property	Inhalation	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	5.38E-13	$\mu g/m^3$	4.10E-06	$(\mu g/m^3)^{-1}$	2.21E-18	3.77E-14	mg/m^3	2.15E-03	mg/m^3	1.75E-11
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	1.08E+01	mg/kg	8.30E-10	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	9.13E-14	5.81E-11	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	6.62E+00	mg/kg	5.09E-10	$\mu g/m^3$	1.10E-03	$(\mu g/m^3)^{-1}$	5.60E-13	3.56E-11	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	9.19E+00	mg/kg	7.06E-10	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	7.77E-14	4.94E-11	mg/m^3	NA	NA	NA
				Benzo(k)fluoranthene	5.31E+00	mg/kg	4.08E-10	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	4.49E-14	2.86E-11	mg/m^3	NA	NA	NA
				Chrysene	9.18E+00	mg/kg	7.05E-10	$\mu g/m^3$	1.10E-05	$(\mu g/m^3)^{-1}$	7.76E-15	4.94E-11	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	1.99E+00	mg/kg	1.53E-10	$\mu g/m^3$	1.20E-03	$(\mu g/m^3)^{-1}$	1.83E-13	1.07E-11	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.71E+00	mg/kg	1.32E-10	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.45E-14	9.21E-12	mg/m^3	NA	NA	NA
				Pyrene	1.49E+01	mg/kg	1.15E-09	$\mu g/m^3$	NA	NA	NA	8.04E-11	mg/m^3	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	2.07E-15	$\mu g/m^3$	3.80E+01	$(\mu g/m^3)^{-1}$	7.88E-14	1.45E-16	mg/m^3	4.00E-08	mg/m^3	3.63E-09
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	6.28E+00	mg/kg	4.83E-10	$\mu g/m^3$	9.70E-05	$(\mu g/m^3)^{-1}$	4.68E-14	3.38E-11	mg/m^3	NA	NA	NA
				Aroclor 1254	2.79E+01	mg/kg	2.15E-09	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	1.22E-12	1.50E-10	mg/m^3	NA	NA	NA
				Aroclor 1260	6.55E+01	mg/kg	5.03E-09	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	2.87E-12	3.52E-10	mg/m^3	NA	NA	NA
				Delta-BHC	4.20E-02	mg/kg	3.23E-12	$\mu g/m^3$	5.10E-04	$(\mu g/m^3)^{-1}$	1.65E-15	2.26E-13	mg/m^3	NA	NA	NA
				Dieldrin	5.47E-01	mg/kg	4.20E-11	$\mu g/m^3$	4.60E-03	$(\mu g/m^3)^{-1}$	1.93E-13	2.94E-12	mg/m^3	NA	NA	NA
				Heptachlor Epoxide	1.87E-01	mg/kg	1.44E-11	$\mu g/m^3$	2.60E-03	$(\mu g/m^3)^{-1}$	3.73E-14	1.00E-12	mg/m^3	NA	NA	NA
				Inorganics												
				Aluminum	3.16E+03	mg/kg	2.43E-07	$\mu g/m^3$	NA	NA	NA	1.70E-08	mg/m^3	5.00E-03	mg/m^3	3.40E-06
				Antimony	3.41E+01	mg/kg	2.62E-09	$\mu g/m^3$	NA	NA	NA	1.84E-10	mg/m^3	NA	NA	NA
				Arsenic	9.71E+00	mg/kg	7.46E-10	$\mu g/m^3$	4.30E-03	$(\mu g/m^3)^{-1}$	3.21E-12	5.22E-11	mg/m^3	1.50E-05	mg/m^3	3.48E-06
				Cadmium	1.26E+00	mg/kg	9.68E-11	$\mu g/m^3$	1.80E-03	$(\mu g/m^3)^{-1}$	1.74E-13	6.78E-12	mg/m^3	1.00E-05	mg/m^3	6.78E-07
				Chromium	2.08E+01	mg/kg	1.60E-09	$\mu g/m^3$	1.20E-02	$(\mu g/m^3)^{-1}$	1.92E-11	1.12E-10	mg/m^3	3.00E-04	mg/m^3	3.73E-07
				Cobalt	2.41E+00	mg/kg	1.85E-10	$\mu g/m^3$	9.00E-03	$(\mu g/m^3)^{-1}$	1.67E-12	1.30E-11	mg/m^3	2.00E-05	mg/m^3	6.48E-07
				Copper	3.27E+02	mg/kg	2.51E-08	$\mu g/m^3$	NA	NA	NA	1.76E-09	mg/m^3	NA	mg/m^3	NA
				Iron	1.78E+04	mg/kg	1.37E-06	$\mu g/m^3$	NA	NA	NA	9.60E-08	mg/m^3	NA	mg/m^3	NA
				Lead	1.71E+03	mg/kg	1.31E-07	$\mu g/m^3$	NA	NA	NA	9.19E-09	mg/m^3	NA	NA	NA
				Manganese	1.47E+02	mg/kg	1.13E-08	$\mu g/m^3$	NA	NA	NA	7.91E-10	mg/m^3	5.00E-05	mg/m^3	1.58E-05
				Mercury	2.52E-01	mg/kg	1.94E-11	$\mu g/m^3$	NA	NA	NA	1.36E-12	mg/m^3	3.00E-04	mg/m^3	4.52E-09
				Nickel	2.25E+01	mg/kg	1.73E-09	$\mu g/m^3$	2.60E-04	$(\mu g/m^3)^{-1}$	4.49E-13	1.21E-10	mg/m^3	2.00E-04	mg/m^3	6.04E-07
				Thallium	1.23E-01	mg/kg	9.46E-12	$\mu g/m^3$	NA	NA	NA	6.62E-13	mg/m^3	NA	NA	NA
				Vanadium	2.02E+01	mg/kg	1.55E-09	$\mu g/m^3$	8.30E-03	$(\mu g/m^3)^{-1}$	1.29E-11	1.09E-10	mg/m^3	1.00E-04	mg/m^3	1.09E-06
				Zinc	1.40E+03	mg/kg	1.07E-07	$\mu g/m^3$	NA	NA	NA	7.52E-09	mg/m^3	NA	NA	NA
			Exp. Route Total								4.30E-11					2.61E-05
		Exposure Point Total									7.67E-06					9.29E+00

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE B-8
CALCULATION OF RADIATION CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	NA
Receptor Population:	NA
Receptor Age:	NA

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	Exposure Point Concentration		Risk Calculation Approach	Cancer Risk Calculation				
								Intake/Activity		Cancer Slope Factor		
					Value	Unit		Value	Unit	Value	Unit	Cancer Risk
			NOT APPLICABLE TO THIS SITE									
			Exp. Route Total									
		Exposure Point Total										
												Total of Receptor Risks Across All Media

There are no radionucleotides in this risk assessment. As a result, this table is blank.

TABLE B-9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Scrapyard Area	**Volatile Organic Compounds**									
			Trichloroethene	4E-11	NA	7E-17	4E-11	Heart / Immune System / Developmental / Kidney / Liver	5E-06	NA	3E-11	5E-06
			Semi-volatile Organic Compounds									
			Benzo(a)anthracene	1E-07	1E-07	4E-13	2E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1E-06	1E-06	4E-12	2E-06	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	2E-07	1E-07	5E-13	3E-07	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4E-07	4E-07	2E-12	8E-07	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1E-07	9E-08	3E-13	2E-07	NA	NA	NA	NA	NA
			Dioxins/Furans									
			Dioxin/Furan TEQ	1E-06	3E-07	8E-12	2E-06	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	4E-02	8E-03	2E-08	5E-02
			Pesticides/Polychlorinated Biphenyls									
			4,4'-DDT	2E-06	3E-07	1E-11	2E-06	Liver	3E-02	5E-03	NA	3E-02
			Aroclor 1248	3E-07	3E-07	2E-12	6E-07	NA	NA	NA	NA	NA
			Aroclor 1260	1E-04	1E-04	9E-10	3E-04	Eye / Finger Nail / Immune System	1E+01	9E+00	NA	2E+01
			Delta-BHC	4E-07	3E-07	3E-12	7E-07	NA	NA	NA	NA	NA
			Dieldrin	1E-05	9E-06	8E-11	2E-05	Liver	5E-02	3E-02	NA	8E-02
			Heptachlor Epoxide	5E-06	3E-06	3E-11	8E-06	Liver	1E-01	8E-02	NA	2E-01
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	9E-03	NA	4E-05	1E-02
			Antimony	NA	NA	NA	NA	Longevity / Blood	3E-02	NA	NA	3E-02
			Arsenic	1E-06	5E-07	2E-10	2E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	9E-03	3E-03	7E-06	1E-02
			Cadmium	NA	NA	8E-11	8E-11	Kidney	6E-03	2E-03	1E-05	7E-03
			Chromium	3E-05	NA	1E-08	3E-05	Lung	5E-02	NA	3E-05	5E-02
			Cobalt	NA	NA	4E-10	4E-10	Thyroid / Respiratory System / Lung	2E-02	NA	2E-05	2E-02
			Copper	NA	NA	NA	NA	GI Tract	1E-01	NA	NA	1E-01
			Cyanide	NA	NA	NA	NA	NA	1E-03	NA	NA	1E-03
			Iron	NA	NA	NA	NA	GI Tract	6E-02	NA	NA	6E-02
			Manganese	NA	NA	NA	NA	CNS	3E-03	NA	2E-04	3E-03
			Mercury	NA	NA	NA	NA	Immune System / Nervous System	5E-03	NA	1E-07	5E-03
			Nickel	NA	NA	4E-10	4E-10	Body and Organ Weight / Respiratory	1E-02	NA	5E-05	1E-02
			Zinc	NA	NA	NA	NA	Blood	3E-02	NA	NA	3E-02
			Chemical Total	2E-04	1E-04	2E-08	3E-04	Chemical Total	1E+01	9E+00	3E-04	2E+01
		Exposure Point Total					3E-04					2E+01
	Exposure Medium Total						3E-04					2E+01
Medium Total							3E-04					2E+01
Receptor Total							3E-04					2E+01

Total Excess Cancer Risk Across All Media: 3E-04

Total Hazard Index Across All Media: 20

TABLE B-9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Blood HI Across All Media =	0.1
Liver HI Across All Media =	0.4
Kidney HI Across All Media =	<0.01
CNS HI Across All Media =	0.02
Development HI Across All Media =	0.06
Body and Organ Weight HI Across All Media =	0.01
Respiratory HI Across All Media =	0.08
Lung HI Across All Media =	0.08
Eye HI Across All Media =	19
Longevity HI Across All Media =	0.03
Cardiovascular System HI Across All Media =	0.01
Skin HI Across All Media =	0.01
Immune system HI Across All Media =	19
Heart HI Across All Media =	<0.01
Thyroid HI Across All Media =	0.02
GI Tract HI Across All Media =	0.2
Finger Nail HI Across All Media =	19
Endocrine System HI Across All Media =	0.05
Reproductive HI Across All Media =	0.05
Neurological HI Across All Media =	<0.01
Nervous System HI Across All Media =	<0.01

NA = not applicable
CNS = central nervous system
GI = gastrointestinal

TABLE B-9.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	**Volatile Organic Compounds**									
			Trichloroethene	5E-11	NA	5E-11	9E-11	Heart / Immune System / Developmental / Kidney	9E-06	NA	2E-10	9E-06
			Semi-volatile Organic Compounds									
			Benzo(a)anthracene	5E-08	2E-08	1E-14	7E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-07	7E-08	5E-14	3E-07	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	4E-08	2E-08	1E-14	6E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1E-07	4E-08	3E-14	2E-07	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	3E-08	1E-08	7E-15	4E-08	NA	NA	NA	NA	NA
			Dioxins/Furans									
			Dioxin/Furan TEQ	3E-07	2E-08	1E-13	3E-07	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	2E-02	1E-03	2E-08	2E-02
			Pesticides/Polychlorinated Biphenyls									
			Aroclor 1254	7E-08	3E-08	3E-14	9E-08	Eye / Finger Nail / Immune System	9E-03	4E-03	NA	1E-02
			Aroclor 1260	2E-07	7E-08	9E-14	3E-07	Eye / Finger Nail / Immune System	3E-02	1E-02	NA	4E-02
			Heptachlor Epoxide	1E-07	3E-08	6E-14	2E-07	Liver	6E-03	2E-03	NA	7E-03
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	2E-03	NA	3E-05	2E-03
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E-02	NA	NA	1E-02
			Arsenic	4E-07	6E-08	3E-12	5E-07	Developmental / Cardiovascular System / CNS / Skin	5E-03	8E-04	1E-06	6E-03
			Cadmium	NA	NA	6E-13	6E-13	Kidney / Respiratory System	1E-03	1E-04	3E-06	1E-03
			Chromium	9E-07	NA	4E-11	9E-07	Respiratory	4E-03	NA	3E-06	4E-03
			Cobalt	NA	NA	4E-12	4E-12	Thyroid / Respiratory System / Lung	5E-03	NA	6E-06	5E-03
			Cyanide	NA	NA	NA	NA	NA	9E-04	NA	NA	9E-04
			Iron	NA	NA	NA	NA	GI Tract	3E-02	NA	NA	3E-02
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	1E-03	NA	6E-05	1E-03
			Vanadium	NA	NA	7E-11	7E-11	Kidney / Respiratory System / Eyes	4E-01	NA	7E-08	4E-01
			Zinc	NA	NA	NA	NA	Blood	2E-02	NA	NA	2E-02
			Chemical Total	2E-06	4E-07	2E-10	3E-06	Chemical Total	5E-01	2E-02	1E-04	6E-01
		Exposure Point Total					3E-06					6E-01
	Exposure Medium Total						3E-06					6E-01
Medium Total							3E-06					6E-01

Page 1 of 3

TABLE B-9.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Woodbury Creek / Hessian Run	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	1E-09	2E-06	NA	2E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-08	6E-05	NA	6E-05	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	3E-09	7E-06	NA	7E-06	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1E-09	3E-06	NA	3E-06	NA	NA	NA	NA	NA
			Pentachlorophenol	3E-09	4E-06	NA	4E-06	Liver	9E-06	1E-02	NA	1E-02
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	5E-04	5E-04	NA	1E-03
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E-03	8E-03	NA	9E-03
			Arsenic	2E-07	2E-07	NA	4E-07	Skin	3E-03	3E-03	NA	5E-03
			Barium	NA	NA	NA	NA	Kidney	9E-05	1E-03	NA	1E-03
			Beryllium	NA	NA	NA	NA	Intestine	3E-04	5E-02	NA	5E-02
			Cadmium	NA	NA	NA	NA	Kidney	2E-04	9E-03	NA	9E-03
			Chromium	2E-07	2E-07	NA	4E-07	None reported	8E-04	3E-02	NA	3E-02
			Cobalt	NA	NA	NA	NA	Thyroid	4E-03	2E-03	NA	5E-03
			Copper	NA	NA	NA	NA	GI Tract	5E-05	5E-05	NA	1E-04
			Cyanide	NA	NA	NA	NA	None reported	4E-04	4E-04	NA	7E-04
			Iron	NA	NA	NA	NA	GI Tract	1E-02	1E-02	NA	2E-02
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	1E-04	4E-03	NA	4E-03
			Mercury	NA	NA	NA	NA	Immune System	6E-05	9E-04	NA	9E-04
			Nickel	NA	NA	NA	NA	Body and Organ Weight	2E-04	1E-03	NA	1E-03
			Vanadium	NA	NA	NA	NA	Kidney	1E-01	1E-01	NA	3E-01
			Zinc	NA	NA	NA	NA	Blood	9E-05	6E-05	NA	1E-04
			Chemical Total	4E-07	7E-05	--	8E-05	Chemical Total	2E-01	3E-01	--	4E-01
		Exposure Point Total					8E-05					4E-01
	Exposure Medium Total						8E-05					4E-01
Medium Total							8E-05					4E-01

Page 2 of 3

TABLE B-9.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Sediment	Sediment	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	9E-09	3E-07	NA	3E-07	NA	NA	NA	NA	NA
			Aroclor 1254	5E-08	2E-06	NA	2E-06	Eye / Finger Nail / Immune System	7E-03	2E-01	NA	2E-01
			Aroclor 1268	7E-09	2E-07	NA	2E-07	Eye / Finger Nail / Immune System	1E-03	3E-02	NA	3E-02
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	8E-03	NA	NA	8E-03
			Antimony	NA	NA	NA	NA	Longevity / Blood	5E-03	NA	NA	5E-03
			Arsenic	2E-06	2E-05	NA	2E-05	Skin	4E-02	2E-01	NA	3E-01
			Cadmium	NA	NA	NA	NA	Kidney	2E-03	2E-02	NA	2E-02
			Chromium	5E-06	NA	NA	5E-06	None reported	2E-02	NA	NA	2E-02
			Cobalt	NA	NA	NA	NA	Thyroid	3E-02	NA	NA	3E-02
			Cyanide	NA	NA	NA	NA	None reported	5E-04	NA	NA	5E-04
			Iron	NA	NA	NA	NA	GI Tract	2E-02	NA	NA	2E-02
			Manganese	NA	NA	NA	NA	CNS	2E-03	NA	NA	2E-03
			Thallium	NA	NA	NA	NA	Skin/Hair	1E-02	NA	NA	1E-02
			Vanadium	NA	NA	NA	NA	Kidney	8E-01	NA	NA	8E-01
			Chemical Total	7E-06	2E-05	--	3E-05	Chemical Total	9E-01	5E-01	--	1E+00
		Exposure Point Total					3E-05					1E+00
	Exposure Medium Total						3E-05					1E+00
Medium Total							3E-05					1E+00
Receptor Total							1E-04					2E+00

Total Excess Cancer Risk Across All Media	1E-04
Total Hazard Index Across All Media	2
Blood HI Across All Media =	0.06
Liver HI Across All Media =	0.04
Kidney HI Across All Media =	2
CNS HI Across All Media =	0.01
Development HI Across All Media =	0.02
Body and Organ Weight HI Across All Media =	<0.01
Respiratory HI Across All Media =	0.4
Lung HI Across All Media =	<0.01
Eye HI Across All Media =	0.7
Longevity HI Across All Media =	0.03
Cardiovascular System HI Across All Media =	<0.01
Skin HI Across All Media =	0.3
Intestine HI Across All Media =	0.05
Immune system HI Across All Media =	0.3
Heart HI Across All Media =	<0.01
Thyroid HI Across All Media =	0.04
GI Tract HI Across All Media =	0.08
Hair HI Across All Media =	0.01
Finger Nail HI Across All Media =	0.3
Endocrine System HI Across All Media =	0.02
Reproductive HI Across All Media =	0.02
Neurological HI Across All Media =	0.01

NA = not applicable CNS = central nervous system GI = gastrointestinal

Page 3 of 3

TABLE B-9.3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Recreational User
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	**Volatile Organic Compounds**									
			Trichloroethene	5E-11	NA	5E-11	9E-11	Heart / Immune System / Developmental / Kidney	9E-06	NA	2E-10	9E-06
			Semi-volatile Organic Compounds									
			Benzo(a)anthracene	5E-08	2E-08	1E-14	7E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-07	7E-08	5E-14	3E-07	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	4E-08	2E-08	1E-14	6E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1E-07	4E-08	3E-14	2E-07	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	3E-08	1E-08	7E-15	4E-08	NA	NA	NA	NA	NA
			Dioxins/Furans									
			Dioxin/Furan TEQ	3E-07	2E-08	1E-13	3E-07	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	2E-02	1E-03	2E-08	2E-02
			Pesticides/Polychlorinated Biphenyls									
			Aroclor 1254	7E-08	3E-08	3E-14	9E-08	Eye / Finger Nail / Immune System	9E-03	4E-03	NA	1E-02
			Aroclor 1260	2E-07	7E-08	9E-14	3E-07	Eye / Finger Nail / Immune System	3E-02	1E-02	NA	4E-02
			Heptachlor Epoxide	1E-07	3E-08	6E-14	2E-07	Liver	6E-03	2E-03	NA	7E-03
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	2E-03	NA	3E-05	2E-03
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E-02	NA	NA	1E-02
			Arsenic	4E-07	6E-08	3E-12	5E-07	Developmental / Cardiovascular System / CNS / Skin	5E-03	8E-04	1E-06	6E-03
			Cadmium	NA	NA	6E-13	6E-13	Kidney / Respiratory System	1E-03	1E-04	3E-06	1E-03
			Chromium	9E-07	NA	4E-11	9E-07	Respiratory	4E-03	NA	3E-06	4E-03
			Cobalt	NA	NA	4E-12	4E-12	Thyroid / Respiratory System / Lung	5E-03	NA	6E-06	5E-03
			Cyanide	NA	NA	NA	NA	NA	9E-04	NA	NA	9E-04
			Iron	NA	NA	NA	NA	GI Tract	3E-02	NA	NA	3E-02
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	1E-03	NA	6E-05	1E-03
			Vanadium	NA	NA	7E-11	7E-11	Kidney / Respiratory System / Eyes	4E-01	NA	7E-08	4E-01
			Zinc	NA	NA	NA	NA	Blood	2E-02	NA	NA	2E-02
			Chemical Total	2E-06	4E-07	2E-10	3E-06	Chemical Total	5E-01	2E-02	1E-04	6E-01
		Exposure Point Total					3E-06					6E-01
	Exposure Medium Total						3E-06					6E-01
Medium Total							3E-06					6E-01
Receptor Total							3E-06					6E-01

Total Excess Cancer Risk Across All Media: 3E-06

Total Hazard Index Across All Media: 0.6

TABLE B-9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Recreational User
Receptor Age:	Adolescent (6-18 years)

Blood HI Across All Media =	0.05
Liver HI Across All Media =	0.03
Kidney HI Across All Media =	0.4
CNS HI Across All Media =	<0.01
Development HI Across All Media =	0.02
Respiratory HI Across All Media =	0.4
Lung HI Across All Media =	<0.01
Eye HI Across All Media =	0.5
Longevity HI Across All Media =	0.01
Cardiovascular System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Immune system HI Across All Media =	0.05
Heart HI Across All Media =	<0.01
Thyroid HI Across All Media =	<0.01
GI Tract HI Across All Media =	0.03
Finger Nail HI Across All Media =	0.05
Endocrine System HI Across All Media =	0.02
Reproductive HI Across All Media =	0.02
Neurological HI Across All Media =	<0.01

NA = not applicable

CNS = central nervous system

GI = gastrointestinal

TABLE B-9.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Willow Woods Property	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	2E-06	8E-07	6E-12	3E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-05	9E-06	7E-11	3E-05	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	4E-06	2E-06	1E-11	5E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	7E-06	3E-06	2E-11	1E-05	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2E-06	7E-07	5E-12	2E-06	NA	NA	NA	NA	NA
			Inorganics									
			Arsenic	1E-05	2E-06	2E-09	2E-05	Developmental / Cardiovascular System / CNS / Lung / Skin	3E-01	4E-02	8E-05	3E-01
			Chromium	5E-06	NA	4E-09	5E-06	Lung	3E-02	NA	8E-06	3E-02
			Iron	NA	NA	NA	NA	GI Tract	2E-01	NA	NA	2E-01
			Chemical Total	6E-05	2E-05	7E-09	7E-05	Chemical Total	5E-01	4E-02	9E-05	5E-01
		Exposure Point Total					7E-05					5E-01
	Exposure Medium Total						7E-05					5E-01
Medium Total							7E-05					5E-01
Receptor Total							7E-05					5E-01

Total Excess Cancer Risk Across All Media	7E-05
Total Hazard Index Across All Media	0.5
CNS HI Across All Media =	0.3
Development HI Across All Media =	0.3
Lung HI Across All Media =	0.3
Cardiovascular System HI Across All Media =	0.3
Skin HI Across All Media =	0.3
GI Tract HI Across All Media =	0.2

NA = not applicable
CNS = central nervous system
GI = gastrointestinal

TABLE B-9.5
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface/ Subsurface Soil	Surface/ Subsurface Soil	Willow Woods Property	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	4E-09	2E-09	5E-15	6E-09	NA	NA	NA	NA	NA
			Benzo(a)pyrene	5E-08	2E-08	6E-14	7E-08	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	7E-09	3E-09	1E-14	1E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	2E-08	7E-09	3E-14	3E-08	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	4E-09	1E-09	5E-15	5E-09	NA	NA	NA	NA	NA
			Inorganics									
			Arsenic	1E-07	2E-08	5E-12	1E-07	Developmental / Cardiovascular System / CNS / Lung / Skin	2E-02	3E-03	5E-06	2E-02
			Chromium	9E-08	NA	2E-11	9E-08	Respiratory	4E-03	NA	4E-07	4E-03
			Iron	NA	NA	NA	NA	GI Tract	2E-02	NA	NA	2E-02
			Chemical Total	3E-07	5E-08	2E-11	3E-07	Chemical Total	4E-02	3E-03	6E-06	4E-02
		Exposure Point Total					3E-07					4E-02
	Exposure Medium Total						3E-07					4E-02
Medium Total							3E-07					4E-02
Receptor Total							3E-07					4E-02

Total Excess Cancer Risk Across All Media	3E-07
Total Hazard Index Across All Media	0.04
CNS HI Across All Media =	0.02
Development HI Across All Media =	0.02
Respiratory HI Across All Media =	<0.01
Lung HI Across All Media =	0.02
Cardiovascular System HI Across All Media =	0.02
Skin HI Across All Media =	0.02
GI Tract HI Across All Media =	0.02

NA = not applicable
CNS = central nervous system
GI = gastrointestinal

TABLE B-9.6
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Rental Home Area	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	6E-04	2E-04	5E-10	9E-04	NA	NA	NA	NA	NA
			Benzo(a)pyrene	4E-03	1E-03	3E-09	5E-03	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	5E-04	2E-04	4E-10	7E-04	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	3E-05	1E-05	2E-10	4E-05	NA	NA	NA	NA	NA
			Chrysene	5E-06	2E-06	4E-11	7E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1E-03	4E-04	9E-10	2E-03	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2E-04	7E-05	1E-10	2E-04	NA	NA	NA	NA	NA
			Pyrene	NA	NA	NA	NA	Kidney	8E-02	3E-02	NA	1E-01
			Pesticides/Polychlorinated Biphenyls									
			Aroclor 1254	7E-07	3E-07	1E-12	9E-07	Eye / Finger Nail / Immune System	1E-01	5E-02	NA	2E-01
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	5E-02	NA	NA	5E-02
			Arsenic	4E-06	6E-07	1E-10	4E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	7E-02	9E-03	5E-06	8E-02
			Chromium	2E-05	NA	4E-09	2E-05	Lung	1E-01	NA	8E-06	1E-01
			Cobalt	NA	NA	2E-10	2E-10	Thyroid / Respiratory System / Lung	8E-02	NA	1E-05	8E-02
			Iron	NA	NA	NA	NA	GI Tract	2E-01	NA	NA	2E-01
			Manganese	NA	NA	NA	NA	CNS	4E-02	NA	3E-04	4E-02
			Thallium	NA	NA	NA	NA	Skin / Hair	7E-02	NA	NA	7E-02
			Chemical Total	6E-03	2E-03	9E-09	9E-03	Chemical Total	8E-01	9E-02	3E-04	9E-01
		Exposure Point Total					9E-03					9E-01
	Exposure Medium Total						9E-03					9E-01
Medium Total							9E-03					9E-01

TABLE B-9.6
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Rental Home Area	**Volatile Organic Compounds**									
			1,4-Dioxane	2E-06	4E-09	1E-09	2E-06	Liver / Kidney / Respiratory	2E-03	5E-06	5E-02	5E-02
			cis-1,2-Dichloroethene	NA	NA	NA	NA	Kidney	1E-01	NA	NA	1E-01
			Trichloroethene	2E-07	2E-08	1E-07	3E-07	Heart / Immune System / Developmental / Kidney / Liver	3E-02	3E-03	1E-01	1E-01
			Vinyl Chloride	4E-04	1E-05	1E-08	4E-04	Liver	2E-01	5E-03	1E-01	3E-01
			Pesticides/Polychlorinated Biphenyls									
			Dieldrin	2E-06	8E-07	NA	3E-06	Liver	9E-03	4E-03	NA	1E-02
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E+01	3E-01	NA	1E+01
			Arsenic	6E-04	1E-06	NA	6E-04	Skin	6E+00	2E-02	NA	6E+00
			Cadmium	NA	NA	NA	NA	Kidney	3E-02	3E-03	NA	3E-02
			Chromium	2E-05	4E-08	NA	2E-05	None reported	5E-02	6E-03	NA	6E-02
			Cobalt	NA	NA	NA	NA	Thyroid	3E-01	4E-04	NA	3E-01
			Cyanide	NA	NA	NA	NA	None reported	3E-01	1E-03	NA	3E-01
			Iron	NA	NA	NA	NA	GI Tract	2E+00	5E-03	NA	2E+00
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	1E-01	8E-03	NA	1E-01
			Vanadium	NA	NA	NA	NA	Kidney	4E+00	1E-02	NA	4E+00
			Zinc	NA	NA	NA	NA	Blood	1E-01	2E-04	NA	1E-01
			Chemical Total	1E-03	1E-05	2E-07	1E-03	Chemical Total	3E+01	3E-01	3E-01	3E+01
		Exposure Point Total					1E-03					3E+01
	Exposure Medium Total						1E-03					3E+01
Medium Total							1E-03					3E+01
Receptor Total							1E-02					3E+01

Total Excess Cancer Risk Across All Media	1E-02
Total Hazard Index Across All Media	28

Blood HI Across All Media =	15
Liver HI Across All Media =	0.5
Kidney HI Across All Media =	4
CNS HI Across All Media =	0.2
Development HI Across All Media =	0.2
Respiratory HI Across All Media =	0.1
Lung HI Across All Media =	0.3
Eye HI Across All Media =	0.2
Longevity HI Across All Media =	15
Cardiovascular System HI Across All Media =	0.08
Skin HI Across All Media =	6
Immune system HI Across All Media =	0.3
Heart HI Across All Media =	0.1
Thyroid HI Across All Media =	0.4
GI Tract HI Across All Media =	2
Hair HI Across All Media =	0.07
Finger Nail HI Across All Media =	0.2

NA = not applicable
CNS = central nervous system
GI = gastrointestinal

TABLE B-9.7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Matteo Property	**Volatile Organic Compounds**									
			Trichloroethene	8E-10	NA	5E-09	6E-09	Heart / Immune System / Developmental / Kidney / Liver	2E-04	NA	2E-10	2E-04
			Semi-volatile Organic Compounds									
			Benzo(a)anthracene	3E-04	1E-04	4E-10	4E-04	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-03	7E-04	2E-09	2E-03	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	2E-04	1E-04	3E-10	3E-04	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1E-05	6E-06	2E-10	2E-05	NA	NA	NA	NA	NA
			Chrysene	2E-06	1E-06	3E-11	3E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4E-04	1E-04	5E-10	5E-04	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	8E-05	3E-05	1E-10	1E-04	NA	NA	NA	NA	NA
			Pyrene	NA	NA	NA	NA	Kidney	4E-02	1E-02	NA	5E-02
			Dioxins/Furans									
			Dioxin/Furan TEQ	5E-06	5E-07	2E-11	6E-06	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	5E-01	4E-02	4E-08	5E-01
			Pesticides/Polychlorinated Biphenyls									
			4,4'-DDT	8E-06	7E-07	3E-11	8E-06	Liver	4E-01	3E-02	NA	4E-01
			Aroclor 1254	6E-07	3E-07	3E-12	9E-07	Eye / Finger Nail / Immune System	1E-01	5E-02	NA	2E-01
			Aroclor 1260	1E-04	5E-05	5E-10	2E-04	Eye / Finger Nail / Immune System	2E+01	9E+00	NA	3E+01
			Delta-BHC	2E-06	6E-07	9E-12	3E-06	NA	NA	NA	NA	NA
			Dieldrin	3E-05	9E-06	1E-10	4E-05	Liver	3E-01	8E-02	NA	4E-01
			Heptachlor Epoxide	1E-05	3E-06	5E-11	1E-05	Liver	7E-01	2E-01	NA	9E-01
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	6E-02	NA	5E-05	6E-02
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E-01	NA	NA	1E-01
			Arsenic	5E-06	8E-07	4E-10	6E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	9E-02	1E-02	1E-05	1E-01
			Cadmium	NA	NA	2E-10	2E-10	Kidney	5E-02	5E-03	2E-05	5E-02
			Chromium	3E-05	NA	1E-08	3E-05	Lung	1E-01	NA	2E-05	1E-01
			Cobalt	NA	NA	7E-10	7E-10	Thyroid / Respiratory System / Lung	1E-01	NA	3E-05	1E-01
			Copper	NA	NA	NA	NA	GI Tract	2E-01	NA	NA	2E-01
			Cyanide	NA	NA	NA	NA	NA	2E-02	NA	NA	2E-02
			Iron	NA	NA	NA	NA	GI Tract	5E-01	NA	NA	5E-01
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	2E-02	NA	3E-04	2E-02
			Mercury	NA	NA	NA	NA	Immune System / Nervous System	3E-02	NA	1E-07	3E-02
			Nickel	NA	NA	3E-10	3E-10	Body and Organ Weight / Respiratory	3E-02	NA	3E-05	3E-02
			Thallium	NA	NA	NA	NA	Skin / Hair	7E-02	NA	NA	7E-02
			Vanadium	NA	NA	6E-09	6E-09	Kidney / Respiratory System	5E+00	NA	2E-05	5E+00
			Zinc	NA	NA	NA	NA	Blood	1E-01	NA	NA	1E-01
			Chemical Total	3E-03	1E-03	3E-08	4E-03	Chemical Total	3E+01	1E+01	5E-04	4E+01
		Exposure Point Total					4E-03					4E+01
	Exposure Medium Total						4E-03					4E+01
Medium Total							4E-03					4E+01

TABLE B-9.7

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	**Volatile Organic Compounds**									
			1,4-Dioxane	2E-06	4E-09	1E-09	2E-06	Liver / Kidney / Respiratory	2E-03	5E-06	5E-02	5E-02
			cis-1,2-Dichloroethene	NA	NA	NA	NA	Kidney	1E-01	NA	NA	1E-01
			Trichloroethene	2E-07	2E-08	1E-07	3E-07	Heart / Immune System / Developmental / Kidney / Liver	3E-02	3E-03	1E-01	1E-01
			Vinyl Chloride	4E-04	1E-05	1E-08	4E-04	Liver	2E-01	5E-03	1E-01	3E-01
			Pesticides/Polychlorinated Biphenyls									
			Dieldrin	2E-06	8E-07	NA	3E-06	Liver	9E-03	4E-03	NA	1E-02
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E+01	3E-01	NA	1E+01
			Arsenic	6E-04	1E-06	NA	6E-04	Skin	6E+00	2E-02	NA	6E+00
			Cadmium	NA	NA	NA	NA	Kidney	3E-02	3E-03	NA	3E-02
			Chromium	2E-05	4E-08	NA	2E-05	None reported	5E-02	6E-03	NA	6E-02
			Cobalt	NA	NA	NA	NA	Thyroid	3E-01	4E-04	NA	3E-01
			Cyanide	NA	NA	NA	NA	None reported	3E-01	1E-03	NA	3E-01
			Iron	NA	NA	NA	NA	GI Tract	2E+00	5E-03	NA	2E+00
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	1E-01	8E-03	NA	1E-01
			Vanadium	NA	NA	NA	NA	Kidney	4E+00	1E-02	NA	4E+00
			Zinc	NA	NA	NA	NA	Blood	1E-01	2E-04	NA	1E-01
			Chemical Total	1E-03	1E-05	2E-07	1E-03	Chemical Total	3E+01	3E-01	3E-01	3E+01
		Exposure Point Total					1E-03					3E+01
	Exposure Medium Total						1E-03					3E+01
Medium Total							1E-03					3E+01

TABLE B-9.7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Woodbury Creek / Hessian Run	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	1E-08	2E-05	NA	2E-05	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-07	7E-04	NA	7E-04	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	3E-08	8E-05	NA	8E-05	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1E-08	3E-05	NA	3E-05	NA	NA	NA	NA	NA
			Pentachlorophenol	6E-09	1E-05	NA	1E-05	Liver	3E-05	2E-02	NA	2E-02
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	1E-03	8E-04	NA	2E-03
			Antimony	NA	NA	NA	NA	Longevity / Blood	3E-03	1E-02	NA	2E-02
			Arsenic	4E-07	5E-07	NA	9E-07	Skin	8E-03	4E-03	NA	1E-02
			Barium	NA	NA	NA	NA	Kidney	3E-04	2E-03	NA	2E-03
			Beryllium	NA	NA	NA	NA	Intestine	1E-03	8E-02	NA	8E-02
			Cadmium	NA	NA	NA	NA	Kidney	6E-04	1E-02	NA	1E-02
			Chromium	4E-07	5E-07	NA	9E-07	None reported	2E-03	5E-02	NA	5E-02
			Cobalt	NA	NA	NA	NA	Thyroid	1E-02	3E-03	NA	1E-02
			Copper	NA	NA	NA	NA	GI Tract	1E-04	8E-05	NA	2E-04
			Cyanide	NA	NA	NA	NA	None reported	1E-03	6E-04	NA	2E-03
			Iron	NA	NA	NA	NA	GI Tract	3E-02	2E-02	NA	5E-02
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	4E-04	6E-03	NA	6E-03
			Mercury	NA	NA	NA	NA	Immune System	2E-04	1E-03	NA	2E-03
			Nickel	NA	NA	NA	NA	Body and Organ Weight	6E-04	2E-03	NA	2E-03
			Vanadium	NA	NA	NA	NA	Kidney	4E-01	2E-01	NA	6E-01
			Zinc	NA	NA	NA	NA	Blood	3E-04	9E-05	NA	4E-04
			Chemical Total	1E-06	8E-04	--	8E-04	Chemical Total	5E-01	4E-01	--	9E-01
		Exposure Point Total					8E-04					9E-01
	Exposure Medium Total						8E-04					9E-01
Medium Total							8E-04					9E-01

TABLE B-9.7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Sediment	Sediment	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	4E-08	1E-07	NA	2E-07	NA	NA	NA	NA	NA
			Aroclor 1254	2E-07	7E-07	NA	9E-07	Eye / Finger Nail / Immune System	4E-02	1E-01	NA	2E-01
			Aroclor 1268	3E-08	1E-07	NA	1E-07	Eye / Finger Nail / Immune System	6E-03	2E-02	NA	3E-02
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	5E-02	NA	NA	5E-02
			Antimony	NA	NA	NA	NA	Longevity / Blood	3E-02	NA	NA	3E-02
			Arsenic	7E-06	8E-06	NA	2E-05	Skin	2E-01	2E-01	NA	4E-01
			Cadmium	NA	NA	NA	NA	Kidney	1E-02	1E-02	NA	3E-02
			Chromium	2E-05	NA	NA	2E-05	None reported	1E-01	NA	NA	1E-01
			Cobalt	NA	NA	NA	NA	Thyroid	2E-01	NA	NA	2E-01
			Cyanide	NA	NA		NA	None reported	3E-03	NA		3E-03
			Iron	NA	NA	NA	NA	GI Tract	1E-01	NA	NA	1E-01
			Manganese	NA	NA	NA	NA	CNS	9E-03	NA	NA	9E-03
			Thallium	NA	NA	NA	NA	Skin/Hair	7E-02	NA	NA	7E-02
			Vanadium	NA	NA	NA	NA	Kidney	5E+00	NA	NA	5E+00
			Chemical Total	3E-05	9E-06	--	4E-05	Chemical Total	6E+00	3E-01	--	6E+00
		Exposure Point Total					4E-05					6E+00
	Exposure Medium Total						4E-05					6E+00
Medium Total							4E-05					6E+00

TABLE B-9.7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	5E-05	NA	NA	5E-05	NA	NA	NA	NA	NA
			Aroclor 1254	1E-04	NA	NA	1E-04	Eye / Finger Nail / Immune System	1E+01	NA	NA	1E+01
			Aroclor 1260	9E-05	NA	NA	9E-05	Eye / Finger Nail / Immune System	7E+00	NA	NA	7E+00
			Inorganics									
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	3E-04	--	--	3E-04	Chemical Total	2E+01	--	--	2E+01
		Exposure Point Total					3E-04					2E+01
	Exposure Medium Total						3E-04					2E+01
Medium Total							3E-04					2E+01
Receptor Total							6E-03					9E+01

Total Excess Cancer Risk Across All Media	6E-03
Total Hazard Index Across All Media	94

Blood HI Across All Media =	16
Liver HI Across All Media =	3
Kidney HI Across All Media =	15
CNS HI Across All Media =	0.3
Development HI Across All Media =	0.8
Body and Organ Weight HI Across All Media =	0.03
Respiratory HI Across All Media =	6
Lung HI Across All Media =	0.4
Eye HI Across All Media =	50
Longevity HI Across All Media =	15
Cardiovascular System HI Across All Media =	0.1
Skin HI Across All Media =	6
Intestine HI Across All Media =	0.08
Immune system HI Across All Media =	51
Heart HI Across All Media =	0.1
Thyroid HI Across All Media =	0.7
GI Tract HI Across All Media =	3
Hair HI Across All Media =	0.1
Finger Nail HI Across All Media =	50
Endocrine System HI Across All Media =	0.5
Reproductive HI Across All Media =	0.5
Neurological HI Across All Media =	0.1
Nervous System HI Across All Media =	0.03

NA = not applicable
CNS = central nervous system
GI = gastrointestinal

TABLE B-9.8a
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	3E-05	NA	NA	3E-05	NA	NA	NA	NA	NA
			Aroclor 1254	9E-05	NA	NA	9E-05	Eye / Finger Nail / Immune System	6E+00	NA	NA	6E+00
			Aroclor 1260	6E-05	NA	NA	6E-05	Eye / Finger Nail / Immune System	5E+00	NA	NA	5E+00
			Inorganics									
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	2E-04	--	--	2E-04	Chemical Total	1E+01	--	--	1E+01
		Exposure Point Total					2E-04					1E+01
	Exposure Medium Total						2E-04					1E+01
Medium Total							2E-04					1E+01
Receptor Total							2E-04					1E+01

Total Excess Cancer Risk Across All Media: 2E-04

Total Hazard Index Across All Media: 11

Eye HI Across All Media = 11
Immune system HI Across All Media = 11
Finger Nail HI Across All Media = 11

NA = not applicable

TABLE B-9.8b
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	1E-05	NA	NA	1E-05	NA	NA	NA	NA	NA
			Aroclor 1254	3E-05	NA	NA	3E-05	Eye / Finger Nail / Immune System	1E+01	NA	NA	1E+01
			Aroclor 1260	3E-05	NA	NA	3E-05	Eye / Finger Nail / Immune System	7E+00	NA	NA	7E+00
			Inorganics									
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	7E-05	--	--	7E-05	Chemical Total	2E+01	--	--	2E+01
		Exposure Point Total					7E-05					2E+01
	Exposure Medium Total						7E-05					2E+01
Medium Total							7E-05					2E+01
Receptor Total							7E-05					2E+01

Total Excess Cancer Risk Across All Media	7E-05
Total Hazard Index Across All Media	17
Eye HI Across All Media =	17
Immune system HI Across All Media =	17
Finger Nail HI Across All Media =	17

NA = not applicable

TABLE B-9.9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface / Subsurface Soil	Surface / Subsurface Soil	Matteo Property	**Volatile Organic Compounds**									
			Trichloroethene	6E-12	NA	2E-18	6E-12	Heart / Immune System / Developmental / Kidney	2E-05	NA	2E-11	2E-05
			Semi-volatile Organic Compounds									
			Benzo(a)anthracene	1E-07	6E-08	9E-14	2E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	9E-07	3E-07	6E-13	1E-06	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	1E-07	5E-08	8E-14	2E-07	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	7E-09	3E-09	4E-14	1E-08	NA	NA	NA	NA	NA
			Chrysene	1E-09	5E-10	8E-15	2E-09	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	3E-07	1E-07	2E-13	4E-07	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2E-08	9E-09	1E-14	3E-08	NA	NA	NA	NA	NA
			Pyrene	NA	NA	NA	NA	Kidney	6E-04	3E-04	NA	9E-04
			Dioxins/Furans									
			Dioxin/Furan TEQ	6E-08	6E-09	8E-14	7E-08	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	5E-02	4E-03	4E-09	5E-02
			Pesticides/Polychlorinated Biphenyls									
			4,4'-DDT	4E-08	4E-09	5E-14	4E-08	Liver	2E-02	1E-03	NA	2E-02
			Aroclor 1254	1E-06	4E-07	1E-12	1E-06	Eye / Finger Nail / Immune System	2E+00	8E-01	NA	3E+00
			Aroclor 1260	2E-06	1E-06	3E-12	3E-06	Eye / Finger Nail / Immune System	4E+00	2E+00	NA	6E+00
			Delta-BHC	1E-09	4E-10	2E-15	2E-09	NA	NA	NA	NA	NA
			Dieldrin	2E-07	5E-08	2E-13	2E-07	Liver	1E-02	4E-03	NA	2E-02
			Heptachlor Epoxide	3E-08	9E-09	4E-14	4E-08	Liver	2E-02	6E-03	NA	2E-02
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	4E-03	NA	3E-06	4E-03
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E-01	NA	NA	1E-01
			Arsenic	2E-07	2E-08	3E-12	2E-07	Developmental / Cardiovascular System / CNS / Lung / Skin	3E-02	4E-03	3E-06	3E-02
			Cadmium	NA	NA	2E-13	2E-13	Kidney	2E-03	2E-04	7E-07	2E-03
			Chromium	2E-07	NA	2E-11	2E-07	Respiratory	9E-03	NA	4E-07	9E-03
			Cobalt	NA	NA	2E-12	2E-12	Thyroid / Respiratory System/Lung	1E-02	NA	6E-07	1E-02
			Copper	NA	NA	NA	NA	GI Tract	1E-02	NA	NA	1E-02
			Iron	NA	NA	NA	NA	GI Tract	3E-02	NA	NA	3E-02
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	1E-03	NA	2E-05	1E-03
			Mercury	NA	NA	NA	NA	Immune System / Nervous System	1E-03	NA	5E-09	1E-03
			Nickel	NA	NA	4E-13	4E-13	Body and Organ Weight / Respiratory	1E-03	NA	6E-07	1E-03
			Thallium	NA	NA	NA	NA	Skin/Hair	2E-02	NA	NA	2E-02
			Vanadium	NA	NA	1E-11	1E-11	Kidney / Lung	4E-01	NA	1E-06	4E-01
			Zinc	NA	NA	NA	NA	Blood	6E-03	NA	NA	6E-03
			Chemical Total	6E-06	2E-06	4E-11	8E-06	Chemical Total	7E+00	3E+00	3E-05	9E+00
		Exposure Point Total					8E-06					9E+00
	Exposure Medium Total						8E-06					9E+00
Medium Total							8E-06					9E+00

TABLE B-9.9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Receptor Total							8E-06					9E+00

Total Excess Cancer Risk Across All Media	8E-06
Total Hazard Index Across All Media	9

Blood HI Across All Media =	0.2
Liver HI Across All Media =	0.1
Kidney HI Across All Media =	0.4
CNS HI Across All Media =	0.03
Development HI Across All Media =	0.08
Body and Organ Weight HI Across All Media =	<0.01
Respiratory HI Across All Media =	0.08
Lung HI Across All Media =	0.4
Eye HI Across All Media =	9
Longevity HI Across All Media =	0.1
Cardiovascular System HI Across All Media =	0.03
Skin HI Across All Media =	0.04
Immune system HI Across All Media =	9
Heart HI Across All Media =	<0.01
Thyroid HI Across All Media =	0.01
GI Tract HI Across All Media =	0.04
Hair HI Across All Media =	0.02
Finger Nail HI Across All Media =	9
Endocrine System HI Across All Media =	0.05
Reproductive HI Across All Media =	0.05
Neurological HI Across All Media =	<0.01
Nervous System HI Across All Media =	<0.01

NA = not applicable CNS = central nervous system GI = gastrointestinal

TABLE B-10.1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Scrapyard Area	**Semi-volatile Organic Compounds**									
			Benzo(a)pyrene	1E-06	1E-06	4E-12	2E-06	NA	NA	NA	NA	NA
			Dioxins/Furans									
			Dioxin/Furan TEQ	1E-06	3E-07	8E-12	2E-06	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	4E-02	8E-03	2E-08	5E-02
			Pesticides/Polychlorinated Biphenyls									
			4,4'-DDT	2E-06	3E-07	1E-11	2E-06	Liver	3E-02	5E-03	NA	3E-02
			Aroclor 1260	1E-04	1E-04	9E-10	3E-04	Eye / Finger Nail / Immune System	1E+01	9E+00	NA	2E+01
			Dieldrin	1E-05	9E-06	8E-11	2E-05	Liver	5E-02	3E-02	NA	8E-02
			Heptachlor Epoxide	5E-06	3E-06	3E-11	8E-06	Liver	1E-01	8E-02	NA	2E-01
			Inorganics									
			Arsenic	1E-06	5E-07	2E-10	2E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	9E-03	3E-03	7E-06	1E-02
			Chromium	3E-05	NA	1E-08	3E-05	Lung	5E-02	NA	3E-05	5E-02
			Chemical Total	2E-04	1E-04	2E-08	3E-04	Chemical Total	1E+01	9E+00	3E-04	2E+01
		Exposure Point Total					3E-04					2E+01
	Exposure Medium Total						3E-04					2E+01
Medium Total							3E-04					2E+01
Receptor Total							3E-04					2E+01

Total Excess Cancer Risk Across All Media	3E-04
Total Hazard Index Across All Media	20
Eye HI Across All Media =	19
Immune system HI Across All Media =	19
Finger Nail HI Across All Media =	19

NA = not applicable CNS = central nervous system

Note:
Only chemicals above EPA's threshold values are listed in this table.

TABLE B-10.2
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Chemical Total	2E-06	4E-07	2E-10	3E-06	Chemical Total	5E-01	2E-02	1E-04	6E-01
		Exposure Point Total					3E-06					6E-01
	Exposure Medium Total						3E-06					6E-01
Medium Total							3E-06					6E-01
Surface Water	Surface Water	Woodbury Creek / Hessian Run	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	1E-09	2E-06	NA	2E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-08	6E-05	NA	6E-05	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	3E-09	7E-06	NA	7E-06	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1E-09	3E-06	NA	3E-06	NA	NA	NA	NA	NA
			Pentachlorophenol	3E-09	4E-06	NA	4E-06	Liver	9E-06	1E-02	NA	1E-02
			Chemical Total	4E-07	7E-05	--	8E-05	Chemical Total	2E-01	3E-01	--	4E-01
		Exposure Point Total					8E-05					4E-01
	Exposure Medium Total						8E-05					4E-01
Medium Total							8E-05					4E-01
Sediment	Sediment	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1254	5E-08	2E-06	NA	2E-06	Eye / Finger Nail / Immune System	7E-03	2E-01	NA	2E-01
			Inorganics									
			Arsenic	2E-06	2E-05	NA	2E-05	Skin	4E-02	2E-01	NA	3E-01
			Chromium	5E-06	NA	NA	5E-06	None reported	2E-02	NA	NA	2E-02
			Chemical Total	7E-06	2E-05	--	3E-05	Chemical Total	9E-01	5E-01	--	1E+00
		Exposure Point Total					3E-05					1E+00
	Exposure Medium Total						3E-05					1E+00
Medium Total							3E-05					1E+00
Receptor Total							1E-04					2E+00

Total Excess Cancer Risk Across All Media: 1E-04

Total Hazard Index Across All Media: 2

Kidney HI Across All Media = 2

NA = not applicable

Note:
Only chemicals above EPA's threshold values are listed in this table.

TABLE B-10.3
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Recreational User
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Open Field/Waste Disposal Area	Chemical Total	2E-06	4E-07	2E-10	3E-06	Chemical Total	5E-01	2E-02	1E-04	6E-01
		Exposure Point Total					3E-06					6E-01
	Exposure Medium Total						3E-06					6E-01
Medium Total							3E-06					6E-01
Receptor Total							3E-06					6E-01

Total Excess Cancer Risk Across All Media: 3E-06

Total Hazard Index Across All Media: 0.6

Note:
Only chemicals above EPA's threshold values are listed in this table.

TABLE B-10.4
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Willow Woods Property	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	2E-06	8E-07	6E-12	3E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-05	9E-06	7E-11	3E-05	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	4E-06	2E-06	1E-11	5E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	7E-06	3E-06	2E-11	1E-05	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2E-06	7E-07	5E-12	2E-06	NA	NA	NA	NA	NA
			Inorganics									
			Arsenic	1E-05	2E-06	2E-09	2E-05	Developmental / Cardiovascular System / CNS / Lung / Skin	3E-01	4E-02	8E-05	3E-01
			Chromium	5E-06	NA	4E-09	5E-06	Lung	3E-02	NA	8E-06	3E-02
			Chemical Total	6E-05	2E-05	7E-09	7E-05	Chemical Total	5E-01	4E-02	9E-05	5E-01
		Exposure Point Total					7E-05					5E-01
	Exposure Medium Total						7E-05					5E-01
Medium Total							7E-05					5E-01
Receptor Total							7E-05					5E-01

Total Excess Cancer Risk Across All Media: 7E-05

Total Hazard Index Across All Media: 0.5

TABLE B-10.5
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface/ Subsurface Soil	Surface/ Subsurface Soil	Willow Woods Property	Chemical Total	3E-07	5E-08	2E-11	3E-07	Chemical Total	4E-02	3E-03	6E-06	4E-02
		Exposure Point Total					3E-07					4E-02
	Exposure Medium Total						3E-07					4E-02
Medium Total							3E-07					4E-02
Receptor Total							3E-07					4E-02

Total Excess Cancer Risk Across All Media: 3E-07

Total Hazard Index Across All Media: 0.04

Note:
Only chemicals above EPA's threshold values are listed in this table.

TABLE B-10.6
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Rental Home Area	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	6E-04	2E-04	5E-10	9E-04	NA	NA	NA	NA	NA
			Benzo(a)pyrene	4E-03	1E-03	3E-09	5E-03	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	5E-04	2E-04	4E-10	7E-04	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	3E-05	1E-05	2E-10	4E-05	NA	NA	NA	NA	NA
			Chrysene	5E-06	2E-06	4E-11	7E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	1E-03	4E-04	9E-10	2E-03	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2E-04	7E-05	1E-10	2E-04	NA	NA	NA	NA	NA
			Inorganics									
			Arsenic	4E-06	6E-07	1E-10	4E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	7E-02	9E-03	5E-06	8E-02
			Chromium	2E-05	NA	4E-09	2E-05	Lung	1E-01	NA	8E-06	1E-01
			Chemical Total	6E-03	2E-03	9E-09	9E-03	Chemical Total	8E-01	9E-02	3E-04	9E-01
		Exposure Point Total					9E-03					9E-01
	Exposure Medium Total						9E-03					9E-01
Medium Total							9E-03					9E-01

TABLE B-10.6
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Rental Home Area	**Volatile Organic Compounds**									
			1,4-Dioxane	2E-06	4E-09	1E-09	2E-06	Liver / Kidney / Respiratory	2E-03	5E-06	5E-02	5E-02
			Trichloroethene	2E-07	2E-08	1E-07	3E-07	Heart / Immune System / Developmental / Kidney / Liver	3E-02	3E-03	1E-01	1E-01
			Vinyl Chloride	4E-04	1E-05	1E-08	4E-04	Liver	2E-01	5E-03	1E-01	3E-01
			Pesticides/Polychlorinated Biphenyls									
			Dieldrin	2E-06	8E-07	NA	3E-06	Liver	9E-03	4E-03	NA	1E-02
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E+01	3E-01	NA	1E+01
			Arsenic	6E-04	1E-06	NA	6E-04	Skin	6E+00	2E-02	NA	6E+00
			Chromium	2E-05	4E-08	NA	2E-05	None reported	5E-02	6E-03	NA	6E-02
			Iron	NA	NA	NA	NA	GI Tract	2E+00	5E-03	NA	2E+00
			Vanadium	NA	NA	NA	NA	Kidney	4E+00	1E-02	NA	4E+00
			Chemical Total	1E-03	1E-05	2E-07	1E-03	Chemical Total	3E+01	3E-01	3E-01	3E+01
		Exposure Point Total					1E-03					3E+01
	Exposure Medium Total						1E-03					3E+01
Medium Total							1E-03					3E+01
Receptor Total							1E-02					3E+01

Total Excess Cancer Risk Across All Media: 1E-02

Total Hazard Index Across All Media: 28

Blood HI Across All Media =	15
Kidney HI Across All Media =	4
Longevity HI Across All Media =	15
Skin HI Across All Media =	6
GI Tract HI Across All Media =	2

TABLE B-10.7
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Matteo Property	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	3E-04	1E-04	4E-10	4E-04	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-03	7E-04	2E-09	2E-03	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	2E-04	1E-04	3E-10	3E-04	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1E-05	6E-06	2E-10	2E-05	NA	NA	NA	NA	NA
			Chrysene	2E-06	1E-06	3E-11	3E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	4E-04	1E-04	5E-10	5E-04	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	8E-05	3E-05	1E-10	1E-04	NA	NA	NA	NA	NA
			Dioxins/Furans									
			Dioxin/Furan TEQ	5E-06	5E-07	2E-11	6E-06	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	5E-01	4E-02	4E-08	5E-01
			Pesticides/Polychlorinated Biphenyls									
			4,4'-DDT	8E-06	7E-07	3E-11	8E-06	Liver	4E-01	3E-02	NA	4E-01
			Aroclor 1260	1E-04	5E-05	5E-10	2E-04	Eye / Finger Nail / Immune System	2E+01	9E+00	NA	3E+01
			Delta-BHC	2E-06	6E-07	9E-12	3E-06	NA	NA	NA	NA	NA
			Dieldrin	3E-05	9E-06	1E-10	4E-05	Liver	3E-01	8E-02	NA	4E-01
			Heptachlor Epoxide	1E-05	3E-06	5E-11	1E-05	Liver	7E-01	2E-01	NA	9E-01
			Inorganics									
			Arsenic	5E-06	8E-07	4E-10	6E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	9E-02	1E-02	1E-05	1E-01
			Chromium	3E-05	NA	1E-08	3E-05	Lung	1E-01	NA	2E-05	1E-01
			Vanadium	NA	NA	6E-09	6E-09	Kidney / Respiratory System	5E+00	NA	2E-05	5E+00
			Chemical Total	3E-03	1E-03	3E-08	4E-03	Chemical Total	3E+01	1E+01	5E-04	4E+01
		Exposure Point Total					4E-03					4E+01
	Exposure Medium Total						4E-03					4E+01
Medium Total							4E-03					4E+01
Groundwater	Groundwater	Tap Water	**Volatile Organic Compounds**									
			1,4-Dioxane	2E-06	4E-09	1E-09	2E-06	Liver / Kidney / Respiratory	2E-03	5E-06	5E-02	5E-02
			Vinyl Chloride	4E-04	1E-05	1E-08	4E-04	Liver	2E-01	5E-03	1E-01	3E-01
			Dieldrin	2E-06	8E-07	NA	3E-06	Liver	9E-03	4E-03	NA	1E-02
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E+01	3E-01	NA	1E+01
			Arsenic	6E-04	1E-06	NA	6E-04	Skin	6E+00	2E-02	NA	6E+00
			Chromium	2E-05	4E-08	NA	2E-05	None reported	5E-02	6E-03	NA	6E-02
			Iron	NA	NA	NA	NA	GI Tract	2E+00	5E-03	NA	2E+00
			Vanadium	NA	NA	NA	NA	Kidney	4E+00	1E-02	NA	4E+00
			Chemical Total	1E-03	1E-05	2E-07	1E-03	Chemical Total	3E+01	3E-01	3E-01	3E+01
		Exposure Point Total					1E-03					3E+01
	Exposure Medium Total						1E-03					3E+01
Medium Total							1E-03					3E+01

TABLE B-10.7
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Woodbury Creek / Hessian Run	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	1E-08	2E-05	NA	2E-05	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-07	7E-04	NA	7E-04	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	3E-08	8E-05	NA	8E-05	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	1E-08	3E-05	NA	3E-05	NA	NA	NA	NA	NA
			Pentachlorophenol	6E-09	1E-05	NA	1E-05	Liver	3E-05	2E-02	NA	2E-02
			Chemical Total	1E-06	8E-04	--	8E-04	Chemical Total	5E-01	4E-01	--	9E-01
		Exposure Point Total					8E-04					9E-01
	Exposure Medium Total						8E-04					9E-01
Medium Total							8E-04					9E-01
Sediment	Sediment	Woodbury Creek/ Hessian Run	**Inorganics**									
			Arsenic	7E-06	8E-06	NA	2E-05	Skin	2E-01	2E-01	NA	4E-01
			Chromium	2E-05	NA	NA	2E-05	None reported	1E-01	NA	NA	1E-01
			Vanadium	NA	NA	NA	NA	Kidney	5E+00	NA	NA	5E+00
			Chemical Total	3E-05	9E-06	--	4E-05	Chemical Total	6E+00	3E-01	--	6E+00
		Exposure Point Total					4E-05					6E+00
	Exposure Medium Total						4E-05					6E+00
Medium Total							4E-05					6E+00
Whole-body Fish	Whole-body Fish	Woodbury Creek/ Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	5E-05	NA	NA	5E-05	NA	NA	NA	NA	NA
			Aroclor 1254	1E-04	NA	NA	1E-04	Eye / Finger Nail / Immune System	1E+01	NA	NA	1E+01
			Aroclor 1260	9E-05	NA	NA	9E-05	Eye / Finger Nail / Immune System	7E+00	NA	NA	7E+00
			Chemical Total	3E-04	--	--	3E-04	Chemical Total	2E+01	--	--	2E+01
		Exposure Point Total					3E-04					2E+01
	Exposure Medium Total						3E-04					2E+01
Medium Total							3E-04					2E+01
Receptor Total							6E-03					9E+01

Total Excess Cancer Risk Across All Media	6E-03	Total Hazard Index Across All Media	94

Blood HI Across All Media =	16
Liver HI Across All Media =	3
Kidney HI Across All Media =	15
Respiratory HI Across All Media =	6
Eye HI Across All Media =	50
Longevity HI Across All Media =	15
Skin HI Across All Media =	6
Immune system HI Across All Media =	51
GI Tract HI Across All Media =	3
Finger Nail HI Across All Media =	50

NA = not applicable CNS = central nervous system GI = gastrointestinal

Note:
Only chemicals above EPA's threshold values are listed in this table.

CDM Smith

TABLE B-10.8a
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	3E-05	NA	NA	3E-05	NA	NA	NA	NA	NA
			Aroclor 1254	9E-05	NA	NA	9E-05	Eye / Finger Nail / Immune System	6E+00	NA	NA	6E+00
			Aroclor 1260	6E-05	NA	NA	6E-05	Eye / Finger Nail / Immune System	5E+00	NA	NA	5E+00
			Chemical Total	2E-04	--	--	2E-04	Chemical Total	1E+01	--	--	1E+01
		Exposure Point Total					2E-04					1E+01
	Exposure Medium Total						2E-04					1E+01
Medium Total							2E-04					1E+01
Receptor Total							2E-04					1E+01

Total Excess Cancer Risk Across All Media: 2E-04

Total Hazard Index Across All Media: 11

Eye HI Across All Media = 11
Immune system HI Across All Media = 11
Finger Nail HI Across All Media = 11

NA = not applicable

Note:
Only chemicals above EPA's threshold values are listed in this table

TABLE B-10.8b
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	1E-05	NA	NA	1E-05	NA	NA	NA	NA	NA
			Aroclor 1254	3E-05	NA	NA	3E-05	Eye / Finger Nail / Immune System	1E+01	NA	NA	1E+01
			Aroclor 1260	3E-05	NA	NA	3E-05	Eye / Finger Nail / Immune System	7E+00	NA	NA	7E+00
			Chemical Total	7E-05	--	--	7E-05	Chemical Total	2E+01	--	--	2E+01
		Exposure Point Total					7E-05					2E+01
	Exposure Medium Total						7E-05					2E+01
Medium Total							7E-05					2E+01
Receptor Total							7E-05					2E+01

Total Excess Cancer Risk Across All Media	7E-05
Total Hazard Index Across All Media	17
Eye HI Across All Media =	17
Immune system HI Across All Media =	17
Finger Nail HI Across All Media =	17

NA = not applicable

Note:
Only chemicals above EPA's threshold values are listed in this table.

TABLE B-10.9
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface / Subsurface Soil	Surface / Subsurface Soil	Matteo Property	**Semi-volatile Organic Compounds**									
			Benzo(a)pyrene	9E-07	3E-07	6E-13	1E-06	NA	NA	NA	NA	NA
			Pesticides/Polychlorinated Biphenyls									
			Aroclor 1254	1E-06	4E-07	1E-12	1E-06	Eye / Finger Nail / Immune System	2E+00	8E-01	NA	3E+00
			Aroclor 1260	2E-06	1E-06	3E-12	3E-06	Eye / Finger Nail / Immune System	4E+00	2E+00	NA	6E+00
			Chemical Total	6E-06	2E-06	4E-11	8E-06	Chemical Total	7E+00	3E+00	3E-05	9E+00
		Exposure Point Total					8E-06					9E+00
	Exposure Medium Total						8E-06					9E+00
Medium Total							8E-06					9E+00
Receptor Total							8E-06					9E+00

Total Excess Cancer Risk Across All Media	8E-06	Total Hazard Index Across All Media	9
		Eye HI Across All Media =	9
		Immune system HI Across All Media =	9
		Finger Nail HI Across All Media =	9

NA = not applicable

Note:
Only chemicals above EPA's threshold values are listed in this table.

Appendix C

Appendix C

ProUCL Output for Chemicals of Potential Concern

Appendix C Contents
Matteo & Sons, Inc. Site
Thorofare, New Jersey

ProUCL Output

C-1	Current/Future Surface Soil - Scrapyard Area
C-2	Current/Future Surface Soil - Open Field/Waste Disposal Area
C-3	Current Surface Soil - Rental Home Area
C-4	Current/Future Surface Soil - Willow Woods Property
C-5	Future Surface Soil - Matteo Property
C-6	Future Surface / Subsurface Soil - Matteo Property
C-7	Future Surface / Subsurface Soil - Willow Woods Property
C-8	Current/Future Groundwater
C-9	Current/Future Surface Water
C-10	Current/Future Sediment
C-11	Current/Future Whole-body Fish
C-12	Dioxin/Furan Calculation
C-13	Current/Future Surface Soil - Scrapyard Area, exclude Outliers (RHA-SS-10 or SB-107)
C-14	Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)
C-15	Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Outlier Test

C-16a	Current/Future Surface Soil - Scrapyard Area (Excluding Nondetects)
C-16b	Current/Future Surface Soil - Scrapyard Area (Replacing Nondetects with 1/2 the Detection Limit)
C-17a	Current Surface Soil - Rental Home Area (Excluding Nondetects)
C-17b	Current Surface Soil - Rental Home Area (Replacing Nondetects with 1/2 the Detection Limit)
C-18a	Future Surface Soil - Matteo Property (Excluding Nondetects)
C-18b	Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 10:26:24 PM
From File	ProUCL_Input_SS-SY.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Trichloroethene

General Statistics

Total Number of Observations	6	Number of Distinct Observations	6
		Number of Missing Observations	1
Number of Detects	1	Number of Non-Detects	5
Number of Distinct Detects	1	Number of Distinct Non-Detects	5

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 Trichloroethene was not processed!

Benzo(a)anthracene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	3
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	210	Minimum Non-Detect	190
Maximum Detect	610	Maximum Non-Detect	190
Variance Detects	35467	Percent Non-Detects	42.86%
Mean Detects	490	SD Detects	188.3
Median Detects	570	CV Detects	0.384
Skewness Detects	-1.897	Kurtosis Detects	3.637
Mean of Logged Detects	6.113	SD of Logged Detects	0.512

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.745	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.375	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	361.4	Standard Error of Mean	84.22

SD	193	95% KM (BCA) UCL	N/A
95% KM (t) UCL	525.1	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	500	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	614.1	95% KM Chebyshev UCL	728.5
97.5% KM Chebyshev UCL	887.4	99% KM Chebyshev UCL	1199

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.753	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.415	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.396	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)	6.278	k star (bias corrected MLE)	1.736
Theta hat (MLE)	78.05	Theta star (bias corrected MLE)	282.2
nu hat (MLE)	50.22	nu star (bias corrected)	13.89
MLE Mean (bias corrected)	490	MLE Sd (bias corrected)	371.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.508	nu hat (KM)	49.11
Approximate Chi Square Value (49.11, α)	34.02	Adjusted Chi Square Value (49.11, β)	30.28
95% Gamma Approximate KM-UCL (use when n>=50)	521.7	95% Gamma Adjusted KM-UCL (use when n<50)	586.3

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	36.78	Mean	330.8
Maximum	610	Median	210
SD	243.4	CV	0.736
k hat (MLE)	1.567	k star (bias corrected MLE)	0.991
Theta hat (MLE)	211.2	Theta star (bias corrected MLE)	334
nu hat (MLE)	21.93	nu star (bias corrected)	13.87
MLE Mean (bias corrected)	330.8	MLE Sd (bias corrected)	332.4
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (13.87, α)	6.481	Adjusted Chi Square Value (13.87, β)	5.037
95% Gamma Approximate UCL (use when n>=50)	707.9	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.704	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.4	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	339.4	Mean in Log Scale	5.592
SD in Original Scale	231.6	SD in Log Scale	0.767
95% t UCL (assumes normality of ROS data)	509.5	95% Percentile Bootstrap UCL	472.9

95% BCA Bootstrap UCL	473	95% Bootstrap t UCL	522.5
95% H-UCL (Log ROS)	942.5		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.742	95% H-UCL (KM -Log)	637
KM SD (logged)	0.544	95% Critical H Value (KM-Log)	2.553
KM Standard Error of Mean (logged)	0.237		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	320.7	Mean in Log Scale	5.445
SD in Original Scale	249.6	SD in Log Scale	0.909
95% t UCL (Assumes normality)	504.1	95% H-Stat UCL	1254

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	525.1	95% KM (Percentile Bootstrap) UCL	N/A

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	3
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	180	Minimum Non-Detect	190
Maximum Detect	630	Maximum Non-Detect	190
Variance Detects	41025	Percent Non-Detects	42.86%
Mean Detects	452.5	SD Detects	202.5
Median Detects	500	CV Detects	0.448
Skewness Detects	-1.011	Kurtosis Detects	-0.0878
Mean of Logged Detects	6.01	SD of Logged Detects	0.572

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Normal at 5% Significance Level

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	335.7	Standard Error of Mean	82.54
SD	189.1	95% KM (BCA) UCL	N/A
95% KM (t) UCL	496.1	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	471.5	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	583.3	95% KM Chebyshev UCL	695.5
97.5% KM Chebyshev UCL	851.2	99% KM Chebyshev UCL	1157

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.408	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.265	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.396	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)	4.955	k star (bias corrected MLE)	1.405
Theta hat (MLE)	91.33	Theta star (bias corrected MLE)	322
nu hat (MLE)	39.64	nu star (bias corrected)	11.24
MLE Mean (bias corrected)	452.5	MLE Sd (bias corrected)	381.7

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.151	nu hat (KM)	44.11
Approximate Chi Square Value (44.11, α)	29.88	Adjusted Chi Square Value (44.11, β)	26.4
95% Gamma Approximate KM-UCL (use when n>=50)	495.6	95% Gamma Adjusted KM-UCL (use when n<50)	561.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	102	Mean	339.4
Maximum	630	Median	272.3
SD	206.9	CV	0.61
k hat (MLE)	2.932	k star (bias corrected MLE)	1.77
Theta hat (MLE)	115.8	Theta star (bias corrected MLE)	191.7
nu hat (MLE)	41.04	nu star (bias corrected)	24.79
MLE Mean (bias corrected)	339.4	MLE Sd (bias corrected)	255.1
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (24.79, α)	14.45	Adjusted Chi Square Value (24.79, β)	12.13
95% Gamma Approximate UCL (use when n>=50)	582.3	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.852	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.271	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	340.2	Mean in Log Scale	5.67
SD in Original Scale	203.3	SD in Log Scale	0.616
95% t UCL (assumes normality of ROS data)	489.5	95% Percentile Bootstrap UCL	467.3
95% BCA Bootstrap UCL	466	95% Bootstrap t UCL	504.6
95% H-UCL (Log ROS)	693.2		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.66	95% H-UCL (KM -Log)	596.2
KM SD (logged)	0.551	95% Critical H Value (KM-Log)	2.569
KM Standard Error of Mean (logged)	0.241		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	299.3	Mean in Log Scale	5.386
SD in Original Scale	238.8	SD in Log Scale	0.878
95% t UCL (Assumes normality)	474.7	95% H-Stat UCL	1069

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	496.1	95% KM (Percentile Bootstrap) UCL	N/A

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	3
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	270	Minimum Non-Detect	190
Maximum Detect	820	Maximum Non-Detect	190
Variance Detects	59825	Percent Non-Detects	42.86%
Mean Detects	617.5	SD Detects	244.6
Median Detects	690	CV Detects	0.396
Skewness Detects	-1.427	Kurtosis Detects	1.934
Mean of Logged Detects	6.343	SD of Logged Detects	0.509

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.27	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	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

Mean	434.3	Standard Error of Mean	115.8
SD	265.3	95% KM (BCA) UCL	N/A
95% KM (t) UCL	659.3	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	624.8	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	781.7	95% KM Chebyshev UCL	939
97.5% KM Chebyshev UCL	1157	99% KM Chebyshev UCL	1586

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.498	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.323	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.396	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)	6.237	k star (bias corrected MLE)	1.726
Theta hat (MLE)	99	Theta star (bias corrected MLE)	357.8
nu hat (MLE)	49.9	nu star (bias corrected)	13.81
MLE Mean (bias corrected)	617.5	MLE Sd (bias corrected)	470

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.679	nu hat (KM)	37.51
Approximate Chi Square Value (37.51, α)	24.49	Adjusted Chi Square Value (37.51, β)	21.36
95% Gamma Approximate KM-UCL (use when n>=50)	665.3	95% Gamma Adjusted KM-UCL (use when n<50)	762.4

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	390.7
Maximum	820	Median	270
SD	335.8	CV	0.859
k hat (MLE)	0.403	k star (bias corrected MLE)	0.326
Theta hat (MLE)	968.7	Theta star (bias corrected MLE)	1200
nu hat (MLE)	5.647	nu star (bias corrected)	4.56
MLE Mean (bias corrected)	390.7	MLE Sd (bias corrected)	684.6
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (4.56, α)	0.955	Adjusted Chi Square Value (4.56, β)	0.554
95% Gamma Approximate UCL (use when n>=50)	1866	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.81	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.33	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	420.6	Mean in Log Scale	5.777
SD in Original Scale	302	SD in Log Scale	0.819
95% t UCL (assumes normality of ROS data)	642.4	95% Percentile Bootstrap UCL	598.6
95% BCA Bootstrap UCL	589.2	95% Bootstrap t UCL	675.9
95% H-UCL (Log ROS)	1318		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.874	95% H-UCL (KM -Log)	890.7
KM SD (logged)	0.637	95% Critical H Value (KM-Log)	2.755
KM Standard Error of Mean (logged)	0.278		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	393.6	Mean in Log Scale	5.576
SD in Original Scale	328.5	SD in Log Scale	1.022
95% t UCL (Assumes normality)	634.8	95% H-Stat UCL	2137

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	659.3	95% KM (Percentile Bootstrap) UCL	N/A

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	3
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	69	Minimum Non-Detect	190
Maximum Detect	230	Maximum Non-Detect	190
Variance Detects	6681	Percent Non-Detects	42.86%
Mean Detects	150	SD Detects	81.74
Median Detects	150.5	CV Detects	0.545
Skewness Detects	-0.0108	Kurtosis Detects	-5.353
Mean of Logged Detects	4.883	SD of Logged Detects	0.601

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.

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	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

Mean	120	Standard Error of Mean	28.43
SD	64.15	95% KM (BCA) UCL	N/A
95% KM (t) UCL	175.3	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	166.8	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	205.3	95% KM Chebyshev UCL	243.9
97.5% KM Chebyshev UCL	297.6	99% KM Chebyshev UCL	402.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.459	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.311	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.396	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)	4.062	k star (bias corrected MLE)	1.182
Theta hat (MLE)	36.92	Theta star (bias corrected MLE)	126.9
nu hat (MLE)	32.5	nu star (bias corrected)	9.458
MLE Mean (bias corrected)	150	MLE Sd (bias corrected)	138

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.499	nu hat (KM)	48.99
Approximate Chi Square Value (48.99, α)	33.92	Adjusted Chi Square Value (48.99, β)	30.18
95% Gamma Approximate KM-UCL (use when n>=50)	173.3	95% Gamma Adjusted KM-UCL (use when n<50)	194.8

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	50	Mean	121.9
Maximum	230	Median	91
SD	70.45	CV	0.578
k hat (MLE)	3.782	k star (bias corrected MLE)	2.256
Theta hat (MLE)	32.23	Theta star (bias corrected MLE)	54.03
nu hat (MLE)	52.95	nu star (bias corrected)	31.59
MLE Mean (bias corrected)	121.9	MLE Sd (bias corrected)	81.15
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (31.59, α)	19.75	Adjusted Chi Square Value (31.59, β)	16.98
95% Gamma Approximate UCL (use when n>=50)	195	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.28	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	121.7	Mean in Log Scale	4.673
SD in Original Scale	69.48	SD in Log Scale	0.533
95% t UCL (assumes normality of ROS data)	172.7	95% Percentile Bootstrap UCL	164.2
95% BCA Bootstrap UCL	169.3	95% Bootstrap t UCL	263.6
95% H-UCL (Log ROS)	214.2		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.664	95% H-UCL (KM -Log)	189.8
KM SD (logged)	0.476	95% Critical H Value (KM-Log)	2.411
KM Standard Error of Mean (logged)	0.217		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	126.4	Mean in Log Scale	4.742
SD in Original Scale	64.84	SD in Log Scale	0.46
95% t UCL (Assumes normality)	174.1	95% H-Stat UCL	199.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	175.3	95% KM (Percentile Bootstrap) UCL	N/A

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	3
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	160	Minimum Non-Detect	190
Maximum Detect	540	Maximum Non-Detect	190
Variance Detects	36425	Percent Non-Detects	42.86%
Mean Detects	362.5	SD Detects	190.9
Median Detects	375	CV Detects	0.526
Skewness Detects	-0.129	Kurtosis Detects	-5.027

Mean of Logged Detects	5.77	SD of Logged Detects	0.593

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.28	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	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

Mean	275.7	Standard Error of Mean	69.9
SD	160.2	95% KM (BCA) UCL	N/A
95% KM (t) UCL	411.5	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	390.7	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	485.4	95% KM Chebyshev UCL	580.4
97.5% KM Chebyshev UCL	712.3	99% KM Chebyshev UCL	971.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.428	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.317	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.396	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)	4.239	k star (bias corrected MLE)	1.226
Theta hat (MLE)	85.52	Theta star (bias corrected MLE)	295.6
nu hat (MLE)	33.91	nu star (bias corrected)	9.811
MLE Mean (bias corrected)	362.5	MLE Sd (bias corrected)	327.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.963	nu hat (KM)	41.49
Approximate Chi Square Value (41.49, α)	27.72	Adjusted Chi Square Value (41.49, β)	24.38
95% Gamma Approximate KM-UCL (use when n>=50)	412.6	95% Gamma Adjusted KM-UCL (use when n<50)	469.2

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	59.21	Mean	264.1
Maximum	540	Median	204.2
SD	187.2	CV	0.709
k hat (MLE)	2.28	k star (bias corrected MLE)	1.398
Theta hat (MLE)	115.8	Theta star (bias corrected MLE)	188.9
nu hat (MLE)	31.91	nu star (bias corrected)	19.57

MLE Mean (bias corrected)	264.1	MLE Sd (bias corrected)	223.4
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (19.57, α)	10.54	Adjusted Chi Square Value (19.57, β)	8.607
95% Gamma Approximate UCL (use when n>=50)	490.6	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.283	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	272.2	Mean in Log Scale	5.435
SD in Original Scale	177.9	SD in Log Scale	0.62
95% t UCL (assumes normality of ROS data)	402.8	95% Percentile Bootstrap UCL	381.3
95% BCA Bootstrap UCL	392.7	95% Bootstrap t UCL	676.8
95% H-UCL (Log ROS)	553		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.472	95% H-UCL (KM -Log)	462.5
KM SD (logged)	0.519	95% Critical H Value (KM-Log)	2.502
KM Standard Error of Mean (logged)	0.226		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	247.9	Mean in Log Scale	5.249
SD in Original Scale	196.6	SD in Log Scale	0.774
95% t UCL (Assumes normality)	392.3	95% H-Stat UCL	680.9

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	411.5	95% KM (Percentile Bootstrap) UCL	N/A

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.

Dioxin

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	0.735	Mean	15.49
Maximum	48.37	Median	2.55

SD	18.69	Std. Error of Mean	7.063
Coefficient of Variation	1.207	Skewness	1.032

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.807	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.327	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	29.21	95% Adjusted-CLT UCL (Chen-1995)	30.05
		95% Modified-t UCL (Johnson-1978)	29.67

Gamma GOF Test

A-D Test Statistic	0.583	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.317	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.325	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.636	k star (bias corrected MLE)	0.459
Theta hat (MLE)	24.35	Theta star (bias corrected MLE)	33.76
nu hat (MLE)	8.904	nu star (bias corrected)	6.422
MLE Mean (bias corrected)	15.49	MLE Sd (bias corrected)	22.87
		Approximate Chi Square Value (0.05)	1.859
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	1.212

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	53.5	95% Adjusted Gamma UCL (use when n<50)	82.07

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.267	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.307	Mean of logged Data	1.777
Maximum of Logged Data	3.879	SD of logged Data	1.644

Assuming Lognormal Distribution

95% H-UCL	999.7	90% Chebyshev (MVUE) UCL	46.21

95% Chebyshev (MVUE) UCL	59.66	97.5% Chebyshev (MVUE) UCL	78.32
99% Chebyshev (MVUE) UCL	115		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	27.1	95% Jackknife UCL	29.21
95% Standard Bootstrap UCL	26.03	95% Bootstrap-t UCL	41.06
95% Hall's Bootstrap UCL	25.39	95% Percentile Bootstrap UCL	26.34
95% BCA Bootstrap UCL	28.63		
90% Chebyshev(Mean, Sd) UCL	36.68	95% Chebyshev(Mean, Sd) UCL	46.27
97.5% Chebyshev(Mean, Sd) UCL	59.59	99% Chebyshev(Mean, Sd) UCL	85.76

Suggested UCL to Use

95% Student's-t UCL 29.21

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

4,4'-DDT

General Statistics

Total Number of Observations	7	Number of Distinct Observations	6
Number of Detects	4	Number of Non-Detects	3
Number of Distinct Detects	4	Number of Distinct Non-Detects	2
Minimum Detect	6.2	Minimum Non-Detect	3.6
Maximum Detect	32000	Maximum Non-Detect	3.7
Variance Detects	2.556E+8	Percent Non-Detects	42.86%
Mean Detects	8017	SD Detects	15988
Median Detects	31.45	CV Detects	1.994
Skewness Detects	2	Kurtosis Detects	4
Mean of Logged Detects	4.568	SD of Logged Detects	3.992

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.631	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.441	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.443	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	4583	Standard Error of Mean	4885
SD	11193	95% KM (BCA) UCL	N/A

95% KM (t) UCL	14075	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	12618	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	19238	95% KM Chebyshev UCL	25876
97.5% KM Chebyshev UCL	35090	99% KM Chebyshev UCL	53188

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.68	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.755	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.409	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.428	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)	0.171	k star (bias corrected MLE)	0.209
Theta hat (MLE)	47005	Theta star (bias corrected MLE)	38304
nu hat (MLE)	1.365	nu star (bias corrected)	1.674
MLE Mean (bias corrected)	8017	MLE Sd (bias corrected)	17524

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.168	nu hat (KM)	2.347
Approximate Chi Square Value (2.35, α)	0.209	Adjusted Chi Square Value (2.35, β)	0.115
95% Gamma Approximate KM-UCL (use when n>=50)	51575	95% Gamma Adjusted KM-UCL (use when n<50)	93584

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4581
Maximum	32000	Median	6.2
SD	12091	CV	2.639
k hat (MLE)	0.104	k star (bias corrected MLE)	0.155
Theta hat (MLE)	44167	Theta star (bias corrected MLE)	29650
nu hat (MLE)	1.452	nu star (bias corrected)	2.163
MLE Mean (bias corrected)	4581	MLE Sd (bias corrected)	11655
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (2.16, α)	0.175	Adjusted Chi Square Value (2.16, β)	0.103
95% Gamma Approximate UCL (use when n>=50)	56649	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.804	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.306	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4581	Mean in Log Scale	-0.261
SD in Original Scale	12091	SD in Log Scale	6.75
95% t UCL (assumes normality of ROS data)	13461	95% Percentile Bootstrap UCL	13717
95% BCA Bootstrap UCL	18287	95% Bootstrap t UCL	15420428

95% H-UCL (Log ROS) 1.804E+36

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.159	95% H-UCL (KM -Log)	9.870E+8
KM SD (logged)	3.078	95% Critical H Value (KM-Log)	10.2
KM Standard Error of Mean (logged)	1.343		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4582	Mean in Log Scale	2.87
SD in Original Scale	12090	SD in Log Scale	3.529
95% t UCL (Assumes normality)	13462	95% H-Stat UCL	1.741E+11

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	14075	95% KM (Percentile Bootstrap) UCL	N/A

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.

Aroclor 1248

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
Number of Detects	1	Number of Non-Detects	6
Number of Distinct Detects	1	Number of Distinct Non-Detects	6

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 Aroclor 1248 was not processed!

Aroclor 1260

General Statistics

Total Number of Observations	7	Number of Distinct Observations	6
Number of Detects	5	Number of Non-Detects	2
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	20	Minimum Non-Detect	35
Maximum Detect	200000	Maximum Non-Detect	38
Variance Detects	7.991E+9	Percent Non-Detects	28.57%
Mean Detects	40089	SD Detects	89393
Median Detects	100	CV Detects	2.23
Skewness Detects	2.236	Kurtosis Detects	5

Mean of Logged Detects	5.806	SD of Logged Detects	3.721

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.553	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.472	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	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

Mean	28641	Standard Error of Mean	29562
SD	69957	95% KM (BCA) UCL	85771
95% KM (t) UCL	86086	95% KM (Percentile Bootstrap) UCL	85737
95% KM (z) UCL	77267	95% KM Bootstrap t UCL	60208447
90% KM Chebyshev UCL	117328	95% KM Chebyshev UCL	157500
97.5% KM Chebyshev UCL	213257	99% KM Chebyshev UCL	322781

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.91	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.813	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.434	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.395	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)	0.159	k star (bias corrected MLE)	0.197
Theta hat (MLE)	252117	Theta star (bias corrected MLE)	203562
nu hat (MLE)	1.59	nu star (bias corrected)	1.969
MLE Mean (bias corrected)	40089	MLE Sd (bias corrected)	90336

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.168	nu hat (KM)	2.347
Approximate Chi Square Value (2.35, α)	0.208	Adjusted Chi Square Value (2.35, β)	0.115
95% Gamma Approximate KM-UCL (use when n>=50)	322372	95% Gamma Adjusted KM-UCL (use when n<50)	584906

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	28635
Maximum	200000	Median	35
SD	75565	CV	2.639
k hat (MLE)	0.108	k star (bias corrected MLE)	0.157
Theta hat (MLE)	264657	Theta star (bias corrected MLE)	182313
nu hat (MLE)	1.515	nu star (bias corrected)	2.199

MLE Mean (bias corrected)	28635	MLE Sd (bias corrected)	72253
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (2.20, α)	0.181	Adjusted Chi Square Value (2.20, β)	0.105
95% Gamma Approximate UCL (use when n>=50)	347929	95% Gamma Adjusted UCL (use when n<50)	599528

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.794	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	28637	Mean in Log Scale	4.713
SD in Original Scale	75564	SD in Log Scale	3.582
95% t UCL (assumes normality of ROS data)	84136	95% Percentile Bootstrap UCL	85737
95% BCA Bootstrap UCL	85839	95% Bootstrap t UCL	63520231
95% H-UCL (Log ROS)	2.191E+12		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.03	95% H-UCL (KM -Log)	5.920E+9
KM SD (logged)	3.071	95% Critical H Value (KM-Log)	10.17
KM Standard Error of Mean (logged)	1.299		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	28640	Mean in Log Scale	4.977
SD in Original Scale	75563	SD in Log Scale	3.352
95% t UCL (Assumes normality)	84137	95% H-Stat UCL	1.544E+11

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 322781

Warning: Recommended UCL exceeds the maximum observation

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.

delta-BHC

General Statistics

Total Number of Observations	6	Number of Distinct Observations	4
		Number of Missing Observations	1
Number of Detects	1	Number of Non-Detects	5
Number of Distinct Detects	1	Number of Distinct Non-Detects	3

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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 delta-BHC was not processed!

Dieldrin

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	2	Number of Non-Detects	5
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	8.2	Minimum Non-Detect	3.6
Maximum Detect	2400	Maximum Non-Detect	4.5
Variance Detects	2860354	Percent Non-Detects	71.43%
Mean Detects	1204	SD Detects	1691
Median Detects	1204	CV Detects	1.405
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	4.944	SD of Logged Detects	4.016

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 5.0

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

Mean	346.6	Standard Error of Mean	448.1
SD	838.3	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1217	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1084	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1691	95% KM Chebyshev UCL	2300
97.5% KM Chebyshev UCL	3145	99% KM Chebyshev UCL	4805

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	0.318	k star (bias corrected MLE)	N/A
Theta hat (MLE)	3789	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	1.271	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.171	nu hat (KM)	2.393

		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (2.39, α)	0.218	Adjusted Chi Square Value (2.39, β)	0.119
95% Gamma Approximate KM-UCL (use when n>=50)	3805	95% Gamma Adjusted KM-UCL (use when n<50)	6993

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	344	Mean in Log Scale	-8.907
SD in Original Scale	906.6	SD in Log Scale	10.34
95% t UCL (assumes normality of ROS data)	1010	95% Percentile Bootstrap UCL	1029
95% BCA Bootstrap UCL	1031	95% Bootstrap t UCL	2.358E+9
95% H-UCL (Log ROS)	N/A		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	345.4	Mean in Log Scale	1.876
SD in Original Scale	906	SD in Log Scale	2.662
95% t UCL (Assumes normality)	1011	95% H-Stat UCL	3413083

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

99% KM (Chebyshev) UCL 4805

Warning: Recommended UCL exceeds the maximum observation

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.

Heptachlor Epoxide

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	4
Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	2.5	Minimum Non-Detect	1.8
Maximum Detect	1600	Maximum Non-Detect	1.9
Variance Detects	844065	Percent Non-Detects	57.14%
Mean Detects	539.2	SD Detects	918.7
Median Detects	15	CV Detects	1.704
Skewness Detects	1.732	Kurtosis Detects	N/A
Mean of Logged Detects	3.667	SD of Logged Detects	3.336

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.756	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.383	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	232.1	Standard Error of Mean	258.5
SD	558.5	95% KM (BCA) UCL	N/A
95% KM (t) UCL	734.4	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	657.3	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1008	95% KM Chebyshev UCL	1359
97.5% KM Chebyshev UCL	1847	99% KM Chebyshev UCL	2804

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	0.268	k star (bias corrected MLE)	N/A
Theta hat (MLE)	2013	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	1.607	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.173	nu hat (KM)	2.418
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (2.42, α)	0.223	Adjusted Chi Square Value (2.42, β)	0.121
95% Gamma Approximate KM-UCL (use when n>=50)	2514	95% Gamma Adjusted KM-UCL (use when n<50)	4649

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.28	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	231.1	Mean in Log Scale	-3.206
SD in Original Scale	603.7	SD in Log Scale	7.054
95% t UCL (assumes normality of ROS data)	674.4	95% Percentile Bootstrap UCL	686.1
95% BCA Bootstrap UCL	914.3	95% Bootstrap t UCL	114505
95% H-UCL (Log ROS)	2.082E+38		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.908	95% H-UCL (KM -Log)	193077

KM SD (logged)	2.346	95% Critical H Value (KM-Log)	7.845
KM Standard Error of Mean (logged)	1.086		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	231.6	Mean in Log Scale	1.535
SD in Original Scale	603.4	SD in Log Scale	2.773
95% t UCL (Assumes normality)	674.8	95% H-Stat UCL	7350729

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	734.4	95% KM (Percentile Bootstrap) UCL	N/A

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.

Aluminum

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	1940	Mean	3807
Maximum	11800	Median	2430
SD	3565	Std. Error of Mean	1348
Coefficient of Variation	0.936	Skewness	2.526

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.575	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.381	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.335	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	6426	95% Adjusted-CLT UCL (Chen-1995)	7399
		95% Modified-t UCL (Johnson-1978)	6640

Gamma GOF Test

A-D Test Statistic	1.205	**Anderson-Darling Gamma GOF Test**	

5% A-D Critical Value	0.714	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.372	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.315	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.372	k star (bias corrected MLE)	1.451
Theta hat (MLE)	1605	Theta star (bias corrected MLE)	2624
nu hat (MLE)	33.21	nu star (bias corrected)	20.31
MLE Mean (bias corrected)	3807	MLE Sd (bias corrected)	3161
		Approximate Chi Square Value (0.05)	11.08
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	9.093

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	6979	95% Adjusted Gamma UCL (use when n<50)	8503

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.71	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.348	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.57	Mean of logged Data	8.019
Maximum of Logged Data	9.376	SD of logged Data	0.63

Assuming Lognormal Distribution

95% H-UCL	7501	90% Chebyshev (MVUE) UCL	6172
95% Chebyshev (MVUE) UCL	7341	97.5% Chebyshev (MVUE) UCL	8964
99% Chebyshev (MVUE) UCL	12152		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	6024	95% Jackknife UCL	6426
95% Standard Bootstrap UCL	5879	95% Bootstrap-t UCL	28549
95% Hall's Bootstrap UCL	22208	95% Percentile Bootstrap UCL	6389
95% BCA Bootstrap UCL	7657		
90% Chebyshev(Mean, Sd) UCL	7850	95% Chebyshev(Mean, Sd) UCL	9681
97.5% Chebyshev(Mean, Sd) UCL	12223	99% Chebyshev(Mean, Sd) UCL	17215

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 9681

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Antimony

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
Number of Detects	5	Number of Non-Detects	2
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	0.54	Minimum Non-Detect	1
Maximum Detect	25.2	Maximum Non-Detect	1.1
Variance Detects	106.2	Percent Non-Detects	28.57%
Mean Detects	6.988	SD Detects	10.31
Median Detects	3.1	CV Detects	1.475
Skewness Detects	2.104	Kurtosis Detects	4.519
Mean of Logged Detects	1.125	SD of Logged Detects	1.436

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.695	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.388	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	5.146	Standard Error of Mean	3.515
SD	8.317	95% KM (BCA) UCL	11.83
95% KM (t) UCL	11.98	95% KM (Percentile Bootstrap) UCL	11.6
95% KM (z) UCL	10.93	95% KM Bootstrap t UCL	33.07
90% KM Chebyshev UCL	15.69	95% KM Chebyshev UCL	20.47
97.5% KM Chebyshev UCL	27.09	99% KM Chebyshev UCL	40.12

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.356	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.699	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.266	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.367	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)	0.733	k star (bias corrected MLE)	0.427
Theta hat (MLE)	9.531	Theta star (bias corrected MLE)	16.38
nu hat (MLE)	7.332	nu star (bias corrected)	4.266
MLE Mean (bias corrected)	6.988	MLE Sd (bias corrected)	10.7

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.383	nu hat (KM)	5.359
Approximate Chi Square Value (5.36, α)	1.321	Adjusted Chi Square Value (5.36, β)	0.812
95% Gamma Approximate KM-UCL (use when n>=50)	20.87	95% Gamma Adjusted KM-UCL (use when n<50)	33.96

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4.994
Maximum	25.2	Median	1.4
SD	9.077	CV	1.818
k hat (MLE)	0.322	k star (bias corrected MLE)	0.279
Theta hat (MLE)	15.53	Theta star (bias corrected MLE)	17.9
nu hat (MLE)	4.502	nu star (bias corrected)	3.906
MLE Mean (bias corrected)	4.994	MLE Sd (bias corrected)	9.456
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (3.91, α)	0.685	Adjusted Chi Square Value (3.91, β)	0.376
95% Gamma Approximate UCL (use when n>=50)	28.48	95% Gamma Adjusted UCL (use when n<50)	51.92

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5.102	Mean in Log Scale	0.533
SD in Original Scale	9.01	SD in Log Scale	1.548
95% t UCL (assumes normality of ROS data)	11.72	95% Percentile Bootstrap UCL	11.55
95% BCA Bootstrap UCL	14.95	95% Bootstrap t UCL	40.89
95% H-UCL (Log ROS)	164.6		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.628	95% H-UCL (KM -Log)	60.19
KM SD (logged)	1.341	95% Critical H Value (KM-Log)	4.697
KM Standard Error of Mean (logged)	0.567		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.141	Mean in Log Scale	0.619
SD in Original Scale	8.986	SD in Log Scale	1.457
95% t UCL (Assumes normality)	11.74	95% H-Stat UCL	108.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	11.98	95% KM (Percentile Bootstrap) UCL	11.6

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.

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Arsenic

General Statistics

Total Number of Observations	7	Number of Distinct Observations	6
		Number of Missing Observations	0
Minimum	1.5	Mean	3.529
Maximum	6.1	Median	3.1
SD	1.578	Std. Error of Mean	0.596
Coefficient of Variation	0.447	Skewness	0.493

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	4.687	95% Adjusted-CLT UCL (Chen-1995)	4.628
		95% Modified-t UCL (Johnson-1978)	4.706

Gamma GOF Test

A-D Test Statistic	0.24	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.181	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.623	k star (bias corrected MLE)	3.308
Theta hat (MLE)	0.628	Theta star (bias corrected MLE)	1.067
nu hat (MLE)	78.72	nu star (bias corrected)	46.32
MLE Mean (bias corrected)	3.529	MLE Sd (bias corrected)	1.94
		Approximate Chi Square Value (0.05)	31.7
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	28.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	5.155	95% Adjusted Gamma UCL (use when n<50)	5.816

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**

5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.174	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.405	Mean of logged Data	1.169
Maximum of Logged Data	1.808	SD of logged Data	0.474

Assuming Lognormal Distribution

95% H-UCL	5.735	90% Chebyshev (MVUE) UCL	5.451
95% Chebyshev (MVUE) UCL	6.316	97.5% Chebyshev (MVUE) UCL	7.517
99% Chebyshev (MVUE) UCL	9.876		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	4.509	95% Jackknife UCL	4.687
95% Standard Bootstrap UCL	4.463	95% Bootstrap-t UCL	4.886
95% Hall's Bootstrap UCL	4.62	95% Percentile Bootstrap UCL	4.429
95% BCA Bootstrap UCL	4.5		
90% Chebyshev(Mean, Sd) UCL	5.317	95% Chebyshev(Mean, Sd) UCL	6.128
97.5% Chebyshev(Mean, Sd) UCL	7.252	99% Chebyshev(Mean, Sd) UCL	9.462

Suggested UCL to Use

95% Student's-t UCL	4.687

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cadmium

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
Number of Detects	5	Number of Non-Detects	2
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	0.55	Minimum Non-Detect	0.52
Maximum Detect	11.3	Maximum Non-Detect	0.53
Variance Detects	19.42	Percent Non-Detects	28.57%
Mean Detects	3.914	SD Detects	4.407
Median Detects	2.7	CV Detects	1.126
Skewness Detects	1.609	Kurtosis Detects	2.637
Mean of Logged Detects	0.79	SD of Logged Detects	1.259

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.825	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	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

Mean	2.944	Standard Error of Mean	1.55
SD	3.667	95% KM (BCA) UCL	5.713
95% KM (t) UCL	5.956	95% KM (Percentile Bootstrap) UCL	5.456
95% KM (z) UCL	5.493	95% KM Bootstrap t UCL	8.251
90% KM Chebyshev UCL	7.594	95% KM Chebyshev UCL	9.7
97.5% KM Chebyshev UCL	12.62	99% KM Chebyshev UCL	18.36

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.282	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.691	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.233	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.364	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)	1.004	k star (bias corrected MLE)	0.535
Theta hat (MLE)	3.897	Theta star (bias corrected MLE)	7.315
nu hat (MLE)	10.04	nu star (bias corrected)	5.35
MLE Mean (bias corrected)	3.914	MLE Sd (bias corrected)	5.351

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.645	nu hat (KM)	9.023
Approximate Chi Square Value (9.02, α)	3.341	Adjusted Chi Square Value (9.02, β)	2.386
95% Gamma Approximate KM-UCL (use when n>=50)	7.952	95% Gamma Adjusted KM-UCL (use when n<50)	11.13

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.799
Maximum	11.3	Median	0.72
SD	4.072	CV	1.455
k hat (MLE)	0.374	k star (bias corrected MLE)	0.309
Theta hat (MLE)	7.49	Theta star (bias corrected MLE)	9.064
nu hat (MLE)	5.231	nu star (bias corrected)	4.323
MLE Mean (bias corrected)	2.799	MLE Sd (bias corrected)	5.036
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (4.32, α)	0.853	Adjusted Chi Square Value (4.32, β)	0.485
95% Gamma Approximate UCL (use when n>=50)	14.18	95% Gamma Adjusted UCL (use when n<50)	24.92

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.819	Mean in Log Scale	-0.154
SD in Original Scale	4.056	SD in Log Scale	1.913
95% t UCL (assumes normality of ROS data)	5.797	95% Percentile Bootstrap UCL	5.33
95% BCA Bootstrap UCL	5.957	95% Bootstrap t UCL	9.083
95% H-UCL (Log ROS)	834.8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.377	95% H-UCL (KM -Log)	19.94
KM SD (logged)	1.154	95% Critical H Value (KM-Log)	4.14
KM Standard Error of Mean (logged)	0.488		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.871	Mean in Log Scale	0.182
SD in Original Scale	4.015	SD in Log Scale	1.461
95% t UCL (Assumes normality)	5.82	95% H-Stat UCL	71.46

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	5.956	95% KM (Percentile Bootstrap) UCL	5.456

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

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	2.8	Mean	34.91
Maximum	153	Median	9.5
SD	55.4	Std. Error of Mean	20.94
Coefficient of Variation	1.587	Skewness	2.118

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 5.0

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Normal GOF Test

Shapiro Wilk Test Statistic	0.658	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.383	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.335	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	75.6	95% Adjusted-CLT UCL (Chen-1995)	87.27
		95% Modified-t UCL (Johnson-1978)	78.4

Gamma GOF Test

A-D Test Statistic	0.697	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.348	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.325	Data Not Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.64	k star (bias corrected MLE)	0.461
Theta hat (MLE)	54.57	Theta star (bias corrected MLE)	75.76
nu hat (MLE)	8.957	nu star (bias corrected)	6.452
MLE Mean (bias corrected)	34.91	MLE Sd (bias corrected)	51.43
		Approximate Chi Square Value (0.05)	1.875
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	1.224

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	120.1	95% Adjusted Gamma UCL (use when n<50)	184.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.275	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.03	Mean of logged Data	2.596
Maximum of Logged Data	5.03	SD of logged Data	1.426

Assuming Lognormal Distribution

95% H-UCL	663.9	90% Chebyshev (MVUE) UCL	76.77
95% Chebyshev (MVUE) UCL	98.11	97.5% Chebyshev (MVUE) UCL	127.7
99% Chebyshev (MVUE) UCL	185.9		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	69.36	95% Jackknife UCL	75.6
95% Standard Bootstrap UCL	67.06	95% Bootstrap-t UCL	557.7
95% Hall's Bootstrap UCL	360.2	95% Percentile Bootstrap UCL	70.07
95% BCA Bootstrap UCL	90.04		
90% Chebyshev(Mean, Sd) UCL	97.73	95% Chebyshev(Mean, Sd) UCL	126.2
97.5% Chebyshev(Mean, Sd) UCL	165.7	99% Chebyshev(Mean, Sd) UCL	243.3

Suggested UCL to Use

95% Adjusted Gamma UCL 184.1

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	0.78	Mean	3.574
Maximum	11.3	Median	2.6
SD	3.742	Std. Error of Mean	1.414
Coefficient of Variation	1.047	Skewness	1.83

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.275	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	6.322	95% Adjusted-CLT UCL (Chen-1995)	6.946
		95% Modified-t UCL (Johnson-1978)	6.485

Gamma GOF Test

A-D Test Statistic	0.345	**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	0.206	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.318	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.342	k star (bias corrected MLE)	0.862
Theta hat (MLE)	2.663	Theta star (bias corrected MLE)	4.146
nu hat (MLE)	18.79	nu star (bias corrected)	12.07
MLE Mean (bias corrected)	3.574	MLE Sd (bias corrected)	3.849
		Approximate Chi Square Value (0.05)	5.274
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	4.001

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	8.181	95% Adjusted Gamma UCL (use when n<50)	10.78

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.185	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.248	Mean of logged Data	0.857
Maximum of Logged Data	2.425	SD of logged Data	0.972

Assuming Lognormal Distribution

95% H-UCL	15.91	90% Chebyshev (MVUE) UCL	7.311
95% Chebyshev (MVUE) UCL	9.052	97.5% Chebyshev (MVUE) UCL	11.47
99% Chebyshev (MVUE) UCL	16.21		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	5.9	95% Jackknife UCL	6.322
95% Standard Bootstrap UCL	5.707	95% Bootstrap-t UCL	10.86
95% Hall's Bootstrap UCL	16.98	95% Percentile Bootstrap UCL	5.949
95% BCA Bootstrap UCL	6.891		
90% Chebyshev(Mean, Sd) UCL	7.817	95% Chebyshev(Mean, Sd) UCL	9.738
97.5% Chebyshev(Mean, Sd) UCL	12.41	99% Chebyshev(Mean, Sd) UCL	17.64

Suggested UCL to Use

95% Student's-t UCL	6.322

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Copper

General Statistics

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	3.3	Mean	736.6
Maximum	4070	Median	65
SD	1501	Std. Error of Mean	567.3
Coefficient of Variation	2.038	Skewness	2.441

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.583	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	1839	95% Adjusted-CLT UCL (Chen-1995)	2229
		95% Modified-t UCL (Johnson-1978)	1926

Gamma GOF Test

A-D Test Statistic	0.444	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.784	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.258	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.335	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.302	k star (bias corrected MLE)	0.268
Theta hat (MLE)	2438	Theta star (bias corrected MLE)	2750
nu hat (MLE)	4.23	nu star (bias corrected)	3.75
MLE Mean (bias corrected)	736.6	MLE Sd (bias corrected)	1423
		Approximate Chi Square Value (0.05)	0.626
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	0.339

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	4416	95% Adjusted Gamma UCL (use when n<50)	8160

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.138	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.194	Mean of logged Data	4.322

Maximum of Logged Data	8.311	SD of logged Data	2.59

Assuming Lognormal Distribution

95% H-UCL	19789574	90% Chebyshev (MVUE) UCL	2497
95% Chebyshev (MVUE) UCL	3301	97.5% Chebyshev (MVUE) UCL	4416
99% Chebyshev (MVUE) UCL	6607		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1670	95% Jackknife UCL	1839
95% Standard Bootstrap UCL	1567	95% Bootstrap-t UCL	22515
95% Hall's Bootstrap UCL	13266	95% Percentile Bootstrap UCL	1786
95% BCA Bootstrap UCL	2008		
90% Chebyshev(Mean, Sd) UCL	2439	95% Chebyshev(Mean, Sd) UCL	3209
97.5% Chebyshev(Mean, Sd) UCL	4279	99% Chebyshev(Mean, Sd) UCL	6381

Suggested UCL to Use

95% Adjusted Gamma UCL 8160

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cyanide

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 Cyanide was not processed!

Iron

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	2850	Mean	22756
Maximum	89300	Median	8370
SD	30745	Std. Error of Mean	11621
Coefficient of Variation	1.351	Skewness	2.188

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.694	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.32	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	45337	95% Adjusted-CLT UCL (Chen-1995)	52141
		95% Modified-t UCL (Johnson-1978)	46939

Gamma GOF Test

A-D Test Statistic	0.455	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.238	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.321	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.888	k star (bias corrected MLE)	0.602
Theta hat (MLE)	25636	Theta star (bias corrected MLE)	37771
nu hat (MLE)	12.43	nu star (bias corrected)	8.435
MLE Mean (bias corrected)	22756	MLE Sd (bias corrected)	29317
		Approximate Chi Square Value (0.05)	2.989
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	2.101

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	64210	95% Adjusted Gamma UCL (use when n<50)	91369

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.955	Mean of logged Data	9.373
Maximum of Logged Data	11.4	SD of logged Data	1.211

Assuming Lognormal Distribution

95% H-UCL	206526	90% Chebyshev (MVUE) UCL	50072
95% Chebyshev (MVUE) UCL	63175	97.5% Chebyshev (MVUE) UCL	81361
99% Chebyshev (MVUE) UCL	117085		

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	41870	95% Jackknife UCL	45337
95% Standard Bootstrap UCL	40425	95% Bootstrap-t UCL	81253
95% Hall's Bootstrap UCL	106011	95% Percentile Bootstrap UCL	43049
95% BCA Bootstrap UCL	52557		
90% Chebyshev(Mean, Sd) UCL	57618	95% Chebyshev(Mean, Sd) UCL	73409
97.5% Chebyshev(Mean, Sd) UCL	95326	99% Chebyshev(Mean, Sd) UCL	138379

Suggested UCL to Use

95% Student's-t UCL 45337

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	33.5	Mean	414.8
Maximum	1200	Median	148
SD	450.8	Std. Error of Mean	170.4
Coefficient of Variation	1.087	Skewness	0.949

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.834	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.294	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	745.9	95% Adjusted-CLT UCL (Chen-1995)	760.4
		95% Modified-t UCL (Johnson-1978)	756.1

Gamma GOF Test

A-D Test Statistic	0.432	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.733	Detected data appear Gamma Distributed at 5% Significance Level

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

K-S Test Statistic	0.231	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.322	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.828	k star (bias corrected MLE)	0.568
Theta hat (MLE)	501.2	Theta star (bias corrected MLE)	730
nu hat (MLE)	11.59	nu star (bias corrected)	7.955
MLE Mean (bias corrected)	414.8	MLE Sd (bias corrected)	550.3
		Approximate Chi Square Value (0.05)	2.709
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	1.876

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1218	95% Adjusted Gamma UCL (use when n<50)	1759

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.225	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.512	Mean of logged Data	5.314
Maximum of Logged Data	7.09	SD of logged Data	1.401

Assuming Lognormal Distribution

95% H-UCL	8819	90% Chebyshev (MVUE) UCL	1122
95% Chebyshev (MVUE) UCL	1432	97.5% Chebyshev (MVUE) UCL	1863
99% Chebyshev (MVUE) UCL	2708		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	695.1	95% Jackknife UCL	745.9
95% Standard Bootstrap UCL	671.7	95% Bootstrap-t UCL	918.5
95% Hall's Bootstrap UCL	648.6	95% Percentile Bootstrap UCL	673.2
95% BCA Bootstrap UCL	727.8		
90% Chebyshev(Mean, Sd) UCL	926	95% Chebyshev(Mean, Sd) UCL	1158
97.5% Chebyshev(Mean, Sd) UCL	1479	99% Chebyshev(Mean, Sd) UCL	2110

Suggested UCL to Use

95% Student's-t UCL	745.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	36.9	Mean	222.6
Maximum	674	Median	125
SD	246.9	Std. Error of Mean	93.33
Coefficient of Variation	1.109	Skewness	1.359

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.784	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.316	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	403.9	95% Adjusted-CLT UCL (Chen-1995)	427.3
		95% Modified-t UCL (Johnson-1978)	411.9

Gamma GOF Test

A-D Test Statistic	0.466	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.727	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.228	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.319	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.061	k star (bias corrected MLE)	0.701
Theta hat (MLE)	209.9	Theta star (bias corrected MLE)	317.4
nu hat (MLE)	14.85	nu star (bias corrected)	9.818
MLE Mean (bias corrected)	222.6	MLE Sd (bias corrected)	265.8
		Approximate Chi Square Value (0.05)	3.828
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	2.787

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	570.8	95% Adjusted Gamma UCL (use when n<50)	784.2

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.213	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Appendix C-1
ProUCL Output - Current/Future Surface Soil - Scrapyard Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Lognormal Statistics

Minimum of Logged Data	3.608	Mean of logged Data	4.865
Maximum of Logged Data	6.513	SD of logged Data	1.126

Assuming Lognormal Distribution

95% H-UCL	1577	90% Chebyshev (MVUE) UCL	491.7
95% Chebyshev (MVUE) UCL	616.6	97.5% Chebyshev (MVUE) UCL	790
99% Chebyshev (MVUE) UCL	1130		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	376.1	95% Jackknife UCL	403.9
95% Standard Bootstrap UCL	367.5	95% Bootstrap-t UCL	873.1
95% Hall's Bootstrap UCL	1349	95% Percentile Bootstrap UCL	374.6
95% BCA Bootstrap UCL	403.8		
90% Chebyshev(Mean, Sd) UCL	502.6	95% Chebyshev(Mean, Sd) UCL	629.4
97.5% Chebyshev(Mean, Sd) UCL	805.4	99% Chebyshev(Mean, Sd) UCL	1151

Suggested UCL to Use

95% Student's-t UCL 403.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
Number of Detects	5	Number of Non-Detects	2
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	0.035	Minimum Non-Detect	0.1
Maximum Detect	2.9	Maximum Non-Detect	0.11
Variance Detects	1.343	Percent Non-Detects	28.57%
Mean Detects	0.865	SD Detects	1.159
Median Detects	0.53	CV Detects	1.34
Skewness Detects	2.031	Kurtosis Detects	4.314
Mean of Logged Detects	-0.952	SD of Logged Detects	1.6

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.731	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level

Lilliefors Test Statistic	0.394	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.628	Standard Error of Mean	0.403
SD	0.953	95% KM (BCA) UCL	1.367
95% KM (t) UCL	1.41	95% KM (Percentile Bootstrap) UCL	1.3
95% KM (z) UCL	1.29	95% KM Bootstrap t UCL	2.939
90% KM Chebyshev UCL	1.836	95% KM Chebyshev UCL	2.383
97.5% KM Chebyshev UCL	3.143	99% KM Chebyshev UCL	4.634

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.296	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.699	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.264	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.367	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)	0.743	k star (bias corrected MLE)	0.43
Theta hat (MLE)	1.164	Theta star (bias corrected MLE)	2.009
nu hat (MLE)	7.429	nu star (bias corrected)	4.305
MLE Mean (bias corrected)	0.865	MLE Sd (bias corrected)	1.318

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.434	nu hat (KM)	6.078
Approximate Chi Square Value (6.08, α)	1.68	Adjusted Chi Square Value (6.08, β)	1.076
95% Gamma Approximate KM-UCL (use when n>=50)	2.272	95% Gamma Adjusted KM-UCL (use when n<50)	3.545

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.621
Maximum	2.9	Median	0.27
SD	1.034	CV	1.666
k hat (MLE)	0.429	k star (bias corrected MLE)	0.34
Theta hat (MLE)	1.449	Theta star (bias corrected MLE)	1.825
nu hat (MLE)	5.999	nu star (bias corrected)	4.761
MLE Mean (bias corrected)	0.621	MLE Sd (bias corrected)	1.064
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (4.76, α)	1.044	Adjusted Chi Square Value (4.76, β)	0.615
95% Gamma Approximate UCL (use when n>=50)	2.832	95% Gamma Adjusted UCL (use when n<50)	4.806

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.628	Mean in Log Scale	-1.629
SD in Original Scale	1.029	SD in Log Scale	1.744
95% t UCL (assumes normality of ROS data)	1.384	95% Percentile Bootstrap UCL	1.342
95% BCA Bootstrap UCL	1.455	95% Bootstrap t UCL	3.064
95% H-UCL (Log ROS)	61.85		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.638	95% H-UCL (KM -Log)	29.18
KM SD (logged)	1.624	95% Critical H Value (KM-Log)	5.568
KM Standard Error of Mean (logged)	0.686		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.633	Mean in Log Scale	-1.522
SD in Original Scale	1.026	SD in Log Scale	1.63
95% t UCL (Assumes normality)	1.386	95% H-Stat UCL	33.81

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.41	95% KM (Percentile Bootstrap) UCL	1.3

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.

Nickel

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	2	Mean	43.01
Maximum	218	Median	13.3
SD	78.38	Std. Error of Mean	29.62
Coefficient of Variation	1.822	Skewness	2.486

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.595	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.362	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	100.6	95% Adjusted-CLT UCL (Chen-1995)	121.5
		95% Modified-t UCL (Johnson-1978)	105.2

Gamma GOF Test

A-D Test Statistic	0.509	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.256	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.327	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.53	k star (bias corrected MLE)	0.398
Theta hat (MLE)	81.1	Theta star (bias corrected MLE)	108
nu hat (MLE)	7.426	nu star (bias corrected)	5.577
MLE Mean (bias corrected)	43.01	MLE Sd (bias corrected)	68.15
		Approximate Chi Square Value (0.05)	1.427
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	0.889

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	168	95% Adjusted Gamma UCL (use when n<50)	269.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.151	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.693	Mean of logged Data	2.575
Maximum of Logged Data	5.384	SD of logged Data	1.632

Assuming Lognormal Distribution

95% H-UCL	2059	90% Chebyshev (MVUE) UCL	100.8
95% Chebyshev (MVUE) UCL	130.1	97.5% Chebyshev (MVUE) UCL	170.7
99% Chebyshev (MVUE) UCL	250.4		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	91.74	95% Jackknife UCL	100.6
95% Standard Bootstrap UCL	89.56	95% Bootstrap-t UCL	481.4
95% Hall's Bootstrap UCL	323.8	95% Percentile Bootstrap UCL	100
95% BCA Bootstrap UCL	109.8		

90% Chebyshev(Mean, Sd) UCL	131.9	95% Chebyshev(Mean, Sd) UCL	172.1
97.5% Chebyshev(Mean, Sd) UCL	228	99% Chebyshev(Mean, Sd) UCL	337.8

Suggested UCL to Use

95% Adjusted Gamma UCL 269.8

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	11.2	Mean	1420
Maximum	8760	Median	85.7
SD	3245	Std. Error of Mean	1226
Coefficient of Variation	2.285	Skewness	2.619

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.511	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.453	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	3803	95% Adjusted-CLT UCL (Chen-1995)	4734
		95% Modified-t UCL (Johnson-1978)	4005

Gamma GOF Test

A-D Test Statistic	0.662	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.782	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.272	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.335	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.312	k star (bias corrected MLE)	0.273
Theta hat (MLE)	4559	Theta star (bias corrected MLE)	5197

nu hat (MLE)	4.361	nu star (bias corrected)	3.825
MLE Mean (bias corrected)	1420	MLE Sd (bias corrected)	2717
		Approximate Chi Square Value (0.05)	0.654
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	0.356

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	8307	95% Adjusted Gamma UCL (use when n<50)	15248

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.176	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.416	Mean of logged Data	5.058
Maximum of Logged Data	9.078	SD of logged Data	2.292

Assuming Lognormal Distribution

95% H-UCL	2849529	90% Chebyshev (MVUE) UCL	3259
95% Chebyshev (MVUE) UCL	4286	97.5% Chebyshev (MVUE) UCL	5711
99% Chebyshev (MVUE) UCL	8511		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3437	95% Jackknife UCL	3803
95% Standard Bootstrap UCL	3236	95% Bootstrap-t UCL	35893
95% Hall's Bootstrap UCL	32640	95% Percentile Bootstrap UCL	3852
95% BCA Bootstrap UCL	5022		
90% Chebyshev(Mean, Sd) UCL	5099	95% Chebyshev(Mean, Sd) UCL	6766
97.5% Chebyshev(Mean, Sd) UCL	9079	99% Chebyshev(Mean, Sd) UCL	13622

Suggested UCL to Use

95% Adjusted Gamma UCL 15248

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 10:28:22 PM
From File	ProUCL_Input_SS-OFW.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Trichloroethene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	6
Number of Distinct Detects	1	Number of Distinct Non-Detects	5

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 Trichloroethene was not processed!

Benzo(a)anthracene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	1
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	19	Minimum Non-Detect	180
Maximum Detect	1300	Maximum Non-Detect	180
Variance Detects	250551	Percent Non-Detects	14.29%
Mean Detects	294.5	SD Detects	500.6
Median Detects	76.5	CV Detects	1.7
Skewness Detects	2.287	Kurtosis Detects	5.321
Mean of Logged Detects	4.615	SD of Logged Detects	1.554

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.636	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.361	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	259.8	Standard Error of Mean	178.8
SD	431.7	95% KM (BCA) UCL	591.4

95% KM (t) UCL	607.3	95% KM (Percentile Bootstrap) UCL	588.4
95% KM (z) UCL	554	95% KM Bootstrap t UCL	2604
90% KM Chebyshev UCL	796.3	95% KM Chebyshev UCL	1039
97.5% KM Chebyshev UCL	1377	99% KM Chebyshev UCL	2039

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.51	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.24	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.347	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)	0.58	k star (bias corrected MLE)	0.401
Theta hat (MLE)	507.4	Theta star (bias corrected MLE)	733.9
nu hat (MLE)	6.964	nu star (bias corrected)	4.816
MLE Mean (bias corrected)	294.5	MLE Sd (bias corrected)	464.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.362	nu hat (KM)	5.072
Approximate Chi Square Value (5.07, α)	1.185	Adjusted Chi Square Value (5.07, β)	0.715
95% Gamma Approximate KM-UCL (use when n>=50)	1112	95% Gamma Adjusted KM-UCL (use when n<50)	1844

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	252.4
Maximum	1300	Median	43
SD	470.3	CV	1.863
k hat (MLE)	0.308	k star (bias corrected MLE)	0.271
Theta hat (MLE)	820.8	Theta star (bias corrected MLE)	931.5
nu hat (MLE)	4.306	nu star (bias corrected)	3.794
MLE Mean (bias corrected)	252.4	MLE Sd (bias corrected)	484.9
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (3.79, α)	0.642	Adjusted Chi Square Value (3.79, β)	0.349
95% Gamma Approximate UCL (use when n>=50)	1492	95% Gamma Adjusted UCL (use when n<50)	2746

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.209	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	259.1	Mean in Log Scale	4.504
SD in Original Scale	466.5	SD in Log Scale	1.449
95% t UCL (assumes normality of ROS data)	601.6	95% Percentile Bootstrap UCL	587.9
95% BCA Bootstrap UCL	761.1	95% Bootstrap t UCL	3486

95% H-UCL (Log ROS)	5045

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.49	95% H-UCL (KM -Log)	3303
KM SD (logged)	1.369	95% Critical H Value (KM-Log)	4.784
KM Standard Error of Mean (logged)	0.578		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	265.3	Mean in Log Scale	4.599
SD in Original Scale	463.4	SD in Log Scale	1.419
95% t UCL (Assumes normality)	605.7	95% H-Stat UCL	4748

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	607.3	95% KM (Percentile Bootstrap) UCL	588.4

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	4
Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	35	Minimum Non-Detect	180
Maximum Detect	440	Maximum Non-Detect	190
Variance Detects	48160	Percent Non-Detects	57.14%
Mean Detects	188.7	SD Detects	219.5
Median Detects	91	CV Detects	1.163
Skewness Detects	1.606	Kurtosis Detects	N/A
Mean of Logged Detects	4.718	SD of Logged Detects	1.278

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level

Lilliefors Test Statistic	0.339	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.512	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

Mean	116.9	Standard Error of Mean	64.51
SD	134.4	95% KM (BCA) UCL	N/A
95% KM (t) UCL	242.2	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	223	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	310.4	95% KM Chebyshev UCL	398
97.5% KM Chebyshev UCL	519.7	99% KM Chebyshev UCL	758.7

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.094	k star (bias corrected MLE)	N/A
Theta hat (MLE)	172.5	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	6.563	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.755	nu hat (KM)	10.58
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (10.58, α)	4.305	Adjusted Chi Square Value (10.58, β)	3.184
95% Gamma Approximate KM-UCL (use when n>=50)	287.1	95% Gamma Adjusted KM-UCL (use when n<50)	388.2

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.512	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	116.5	Mean in Log Scale	4.325
SD in Original Scale	145.2	SD in Log Scale	0.907
95% t UCL (assumes normality of ROS data)	223.2	95% Percentile Bootstrap UCL	224.2
95% BCA Bootstrap UCL	239.9	95% Bootstrap t UCL	471.7
95% H-UCL (Log ROS)	407.8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.326	95% H-UCL (KM -Log)	333.2
KM SD (logged)	0.844	95% Critical H Value (KM-Log)	3.269
KM Standard Error of Mean (logged)	0.486		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	133.7	Mean in Log Scale	4.609
SD in Original Scale	136.7	SD in Log Scale	0.745
95% t UCL (Assumes normality)	234.1	95% H-Stat UCL	331.6

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	242.2	95% KM (Percentile Bootstrap) UCL	N/A

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	1
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	23	Minimum Non-Detect	180
Maximum Detect	1000	Maximum Non-Detect	180
Variance Detects	159964	Percent Non-Detects	14.29%
Mean Detects	322	SD Detects	400
Median Detects	126	CV Detects	1.242
Skewness Detects	1.27	Kurtosis Detects	0.251
Mean of Logged Detects	4.938	SD of Logged Detects	1.512

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.799	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.362	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

Mean	287.1	Standard Error of Mean	145
SD	349.3	95% KM (BCA) UCL	531
95% KM (t) UCL	568.9	95% KM (Percentile Bootstrap) UCL	529
95% KM (z) UCL	525.6	95% KM Bootstrap t UCL	1490
90% KM Chebyshev UCL	722.1	95% KM Chebyshev UCL	919.1
97.5% KM Chebyshev UCL	1193	99% KM Chebyshev UCL	1730

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.343	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.2	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.344	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)	0.719	k star (bias corrected MLE)	0.471
Theta hat (MLE)	447.6	Theta star (bias corrected MLE)	683.9
nu hat (MLE)	8.633	nu star (bias corrected)	5.65
MLE Mean (bias corrected)	322	MLE Sd (bias corrected)	469.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.676	nu hat (KM)	9.46
Approximate Chi Square Value (9.46, α)	3.607	Adjusted Chi Square Value (9.46, β)	2.604
95% Gamma Approximate KM-UCL (use when n>=50)	753.1	95% Gamma Adjusted KM-UCL (use when n<50)	1043

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	23	Mean	285.1
Maximum	1000	Median	82
SD	377.9	CV	1.326
k hat (MLE)	0.727	k star (bias corrected MLE)	0.51
Theta hat (MLE)	392.3	Theta star (bias corrected MLE)	558.4
nu hat (MLE)	10.17	nu star (bias corrected)	7.147
MLE Mean (bias corrected)	285.1	MLE Sd (bias corrected)	399
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (7.15, α)	2.252	Adjusted Chi Square Value (7.15, β)	1.515
95% Gamma Approximate UCL (use when n>=50)	904.9	95% Gamma Adjusted UCL (use when n<50)	1345

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.171	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	285.2	Mean in Log Scale	4.827
SD in Original Scale	377.9	SD in Log Scale	1.411
95% t UCL (assumes normality of ROS data)	562.7	95% Percentile Bootstrap UCL	531
95% BCA Bootstrap UCL	589.7	95% Bootstrap t UCL	1878
95% H-UCL (Log ROS)	5728		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.814	95% H-UCL (KM -Log)	4043
KM SD (logged)	1.345	95% Critical H Value (KM-Log)	4.71
KM Standard Error of Mean (logged)	0.573		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	288.9	Mean in Log Scale	4.875
SD in Original Scale	375.5	SD in Log Scale	1.391
95% t UCL (Assumes normality)	564.6	95% H-Stat UCL	5400

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	568.9	95% KM (Percentile Bootstrap) UCL	529

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	4
Number of Detects	2	Number of Non-Detects	5
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	40	Minimum Non-Detect	180
Maximum Detect	140	Maximum Non-Detect	190
Variance Detects	5000	Percent Non-Detects	71.43%
Mean Detects	90	SD Detects	70.71
Median Detects	90	CV Detects	0.786
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	4.315	SD of Logged Detects	0.886

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 5.0

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

Mean	90	Standard Error of Mean	50
SD	50	95% KM (BCA) UCL	N/A
95% KM (t) UCL	187.2	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	172.2	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	240	95% KM Chebyshev UCL	307.9
97.5% KM Chebyshev UCL	402.2	99% KM Chebyshev UCL	587.5

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	2.865	k star (bias corrected MLE)	N/A
Theta hat (MLE)	31.41	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	11.46	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.24	nu hat (KM)	45.36
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (45.36, α)	30.91	Adjusted Chi Square Value (45.36, β)	27.36
95% Gamma Approximate KM-UCL (use when n>=50)	132.1	95% Gamma Adjusted KM-UCL (use when n<50)	149.2

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	94.64	Mean in Log Scale	4.315
SD in Original Scale	65.73	SD in Log Scale	0.763
95% t UCL (assumes normality of ROS data)	142.9	95% Percentile Bootstrap UCL	133.4
95% BCA Bootstrap UCL	133.5	95% Bootstrap t UCL	156.9
95% H-UCL (Log ROS)	259.7		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	92.14	Mean in Log Scale	4.47
SD in Original Scale	28.99	SD in Log Scale	0.378
95% t UCL (Assumes normality)	113.4	95% H-Stat UCL	133.4

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

95% KM (t) UCL	187.2	95% KM (% Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Warning: Recommended UCL exceeds the maximum observation

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	4
Number of Distinct Detects	3	Number of Distinct Non-Detects	2

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Minimum Detect	51	Minimum Non-Detect	180
Maximum Detect	340	Maximum Non-Detect	190
Variance Detects	23920	Percent Non-Detects	57.14%
Mean Detects	163.7	SD Detects	154.7
Median Detects	100	CV Detects	0.945
Skewness Detects	1.539	Kurtosis Detects	N/A
Mean of Logged Detects	4.789	SD of Logged Detects	0.962

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.873	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.326	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	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

Mean	113.3	Standard Error of Mean	46.55
SD	95.29	95% KM (BCA) UCL	N/A
95% KM (t) UCL	203.7	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	189.8	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	252.9	95% KM Chebyshev UCL	316.2
97.5% KM Chebyshev UCL	404	99% KM Chebyshev UCL	576.4

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.766	k star (bias corrected MLE)	N/A
Theta hat (MLE)	92.7	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	10.59	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.413	nu hat (KM)	19.79
		Adjusted Level of Significance (β)	0.0158
Approximate Chi Square Value (19.79, α)	10.69	Adjusted Chi Square Value (19.79, β)	8.748
95% Gamma Approximate KM-UCL (use when n>=50)	209.6	95% Gamma Adjusted KM-UCL (use when n<50)	256.2

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**

5% Lilliefors Critical Value	0.512	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	113.6	Mean in Log Scale	4.493
SD in Original Scale	103	SD in Log Scale	0.683
95% t UCL (assumes normality of ROS data)	189.2	95% Percentile Bootstrap UCL	181.9
95% BCA Bootstrap UCL	216	95% Bootstrap t UCL	318.2
95% H-UCL (Log ROS)	250.6		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.491	95% H-UCL (KM -Log)	219.6
KM SD (logged)	0.629	95% Critical H Value (KM-Log)	2.737
KM Standard Error of Mean (logged)	0.355		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	123	Mean in Log Scale	4.639
SD in Original Scale	97.08	SD in Log Scale	0.573
95% t UCL (Assumes normality)	194.3	95% H-Stat UCL	224.7

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	203.7	95% KM (Percentile Bootstrap) UCL	N/A

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.

Dioxin

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	0.891	Mean	9.205
Maximum	36.25	Median	4.686
SD	12.5	Std. Error of Mean	4.724
Coefficient of Variation	1.358	Skewness	2.181

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.712	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.31	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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	18.39	95% Adjusted-CLT UCL (Chen-1995)	21.14
		95% Modified-t UCL (Johnson-1978)	19.03

Gamma GOF Test

A-D Test Statistic	0.314	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.163	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.322	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.809	k star (bias corrected MLE)	0.557
Theta hat (MLE)	11.38	Theta star (bias corrected MLE)	16.51
nu hat (MLE)	11.32	nu star (bias corrected)	7.804
MLE Mean (bias corrected)	9.205	MLE Sd (bias corrected)	12.33
		Approximate Chi Square Value (0.05)	2.622
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	1.806

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	27.4	95% Adjusted Gamma UCL (use when n<50)	39.76

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.151	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.335	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.116	Mean of logged Data	1.487
Maximum of Logged Data	3.591	SD of logged Data	1.34

Assuming Lognormal Distribution

95% H-UCL	141.6	90% Chebyshev (MVUE) UCL	22.46
95% Chebyshev (MVUE) UCL	28.56	97.5% Chebyshev (MVUE) UCL	37.04
99% Chebyshev (MVUE) UCL	53.69		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	16.98	95% Jackknife UCL	18.39
95% Standard Bootstrap UCL	16.35	95% Bootstrap-t UCL	31.85

95% Hall's Bootstrap UCL	45.61	95% Percentile Bootstrap UCL	17.89
95% BCA Bootstrap UCL	19.84		
90% Chebyshev(Mean, Sd) UCL	23.38	95% Chebyshev(Mean, Sd) UCL	29.8
97.5% Chebyshev(Mean, Sd) UCL	38.71	99% Chebyshev(Mean, Sd) UCL	56.21

Suggested UCL to Use

95% Student's-t UCL 18.39

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Aroclor 1254

General Statistics

Total Number of Observations	25	Number of Distinct Observations	15
Number of Detects	11	Number of Non-Detects	14
Number of Distinct Detects	11	Number of Distinct Non-Detects	5
Minimum Detect	36	Minimum Non-Detect	35
Maximum Detect	1200	Maximum Non-Detect	39
Variance Detects	164986	Percent Non-Detects	56%
Mean Detects	387.1	SD Detects	406.2
Median Detects	320	CV Detects	1.049
Skewness Detects	1.372	Kurtosis Detects	0.836
Mean of Logged Detects	5.381	SD of Logged Detects	1.218

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.795	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.267	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	189.9	Standard Error of Mean	65.17
SD	310.7	95% KM (BCA) UCL	313.3
95% KM (t) UCL	301.4	95% KM (Percentile Bootstrap) UCL	305
95% KM (z) UCL	297.1	95% KM Bootstrap t UCL	404.3
90% KM Chebyshev UCL	385.5	95% KM Chebyshev UCL	474
97.5% KM Chebyshev UCL	596.9	99% KM Chebyshev UCL	838.4

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.331	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.133	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.262	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)	1	k star (bias corrected MLE)	0.788

Theta hat (MLE)	387.1	Theta star (bias corrected MLE)	491.4
nu hat (MLE)	22	nu star (bias corrected)	17.33
MLE Mean (bias corrected)	387.1	MLE Sd (bias corrected)	436.1

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.374	nu hat (KM)	18.69
Approximate Chi Square Value (18.69, α)	9.889	Adjusted Chi Square Value (18.69, β)	9.453
95% Gamma Approximate KM-UCL (use when n>=50)	358.9	95% Gamma Adjusted KM-UCL (use when n<50)	375.5

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	170.3
Maximum	1200	Median	0.01
SD	327.4	CV	1.922
k hat (MLE)	0.144	k star (bias corrected MLE)	0.154
Theta hat (MLE)	1179	Theta star (bias corrected MLE)	1107
nu hat (MLE)	7.224	nu star (bias corrected)	7.69
MLE Mean (bias corrected)	170.3	MLE Sd (bias corrected)	434.3
		Adjusted Level of Significance (β)	0.0395
Approximate Chi Square Value (7.69, α)	2.557	Adjusted Chi Square Value (7.69, β)	2.359
95% Gamma Approximate UCL (use when n>=50)	512.3	95% Gamma Adjusted UCL (use when n<50)	555.2

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	175.5	Mean in Log Scale	3.426
SD in Original Scale	324.7	SD in Log Scale	2.055
95% t UCL (assumes normality of ROS data)	286.6	95% Percentile Bootstrap UCL	280
95% BCA Bootstrap UCL	316.4	95% Bootstrap t UCL	409.8
95% H-UCL (Log ROS)	1400		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.359	95% H-UCL (KM -Log)	308.7
KM SD (logged)	1.189	95% Critical H Value (KM-Log)	2.745
KM Standard Error of Mean (logged)	0.249		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	180.5	Mean in Log Scale	3.989
SD in Original Scale	322	SD in Log Scale	1.485
95% t UCL (Assumes normality)	290.6	95% H-Stat UCL	425.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	301.4	95% KM (Percentile Bootstrap) UCL	305

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.

Aroclor 1260

General Statistics

Total Number of Observations	24	Number of Distinct Observations	18
		Number of Missing Observations	1
Number of Detects	14	Number of Non-Detects	10
Number of Distinct Detects	14	Number of Distinct Non-Detects	5
Minimum Detect	28	Minimum Non-Detect	35
Maximum Detect	3000	Maximum Non-Detect	39
Variance Detects	589791	Percent Non-Detects	41.67%
Mean Detects	479.1	SD Detects	768
Median Detects	295	CV Detects	1.603
Skewness Detects	3.093	Kurtosis Detects	10.44
Mean of Logged Detects	5.31	SD of Logged Detects	1.398

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.584	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.31	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	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

Mean	291.2	Standard Error of Mean	128.7
SD	607.4	95% KM (BCA) UCL	519.9
95% KM (t) UCL	511.7	95% KM (Percentile Bootstrap) UCL	520.7
95% KM (z) UCL	502.8	95% KM Bootstrap t UCL	867.4
90% KM Chebyshev UCL	677.2	95% KM Chebyshev UCL	852
97.5% KM Chebyshev UCL	1095	99% KM Chebyshev UCL	1571

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.536	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.775	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.164	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.238	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)	0.701	k star (bias corrected MLE)	0.598
Theta hat (MLE)	683.5	Theta star (bias corrected MLE)	800.7

nu hat (MLE)	19.63	nu star (bias corrected)	16.75
MLE Mean (bias corrected)	479.1	MLE Sd (bias corrected)	619.4

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.23	nu hat (KM)	11.03
Approximate Chi Square Value (11.03, α)	4.597	Adjusted Chi Square Value (11.03, β)	4.308
95% Gamma Approximate KM-UCL (use when n>=50)	698.9	95% Gamma Adjusted KM-UCL (use when n<50)	745.8

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	279.5
Maximum	3000	Median	41
SD	625.8	CV	2.239
k hat (MLE)	0.169	k star (bias corrected MLE)	0.176
Theta hat (MLE)	1649	Theta star (bias corrected MLE)	1588
nu hat (MLE)	8.134	nu star (bias corrected)	8.451
MLE Mean (bias corrected)	279.5	MLE Sd (bias corrected)	666.1
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (8.45, α)	2.999	Adjusted Chi Square Value (8.45, β)	2.774
95% Gamma Approximate UCL (use when n>=50)	787.7	95% Gamma Adjusted UCL (use when n<50)	851.4

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	285.6	Mean in Log Scale	4.14
SD in Original Scale	623	SD in Log Scale	1.815
95% t UCL (assumes normality of ROS data)	503.6	95% Percentile Bootstrap UCL	520.3
95% BCA Bootstrap UCL	650.7	95% Bootstrap t UCL	873.2
95% H-UCL (Log ROS)	1366		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.487	95% H-UCL (KM -Log)	613.5
KM SD (logged)	1.417	95% Critical H Value (KM-Log)	3.145
KM Standard Error of Mean (logged)	0.3		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	287	Mean in Log Scale	4.302
SD in Original Scale	622.3	SD in Log Scale	1.61
95% t UCL (Assumes normality)	504.7	95% H-Stat UCL	857.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	519.9	95% GROS Adjusted Gamma UCL	851.4
95% Adjusted Gamma KM-UCL	745.8		

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.

Heptachlor Epoxide

General Statistics

Total Number of Observations	8	Number of Distinct Observations	4
Number of Detects	2	Number of Non-Detects	6
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	15	Minimum Non-Detect	1.8
Maximum Detect	120	Maximum Non-Detect	1.9
Variance Detects	5513	Percent Non-Detects	75%
Mean Detects	67.5	SD Detects	74.25
Median Detects	67.5	CV Detects	1.1
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	3.748	SD of Logged Detects	1.47

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 5.0

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

Mean	18.23	Standard Error of Mean	19.35
SD	38.71	95% KM (BCA) UCL	N/A
95% KM (t) UCL	54.89	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	50.06	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	76.29	95% KM Chebyshev UCL	102.6
97.5% KM Chebyshev UCL	139.1	99% KM Chebyshev UCL	210.8

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.216	k star (bias corrected MLE)	N/A
Theta hat (MLE)	55.49	Theta star (bias corrected MLE)	N/A

nu hat (MLE)	4.866	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.222	nu hat (KM)	3.547
		Adjusted Level of Significance (β)	0.0195
Approximate Chi Square Value (3.55, α)	0.551	Adjusted Chi Square Value (3.55, β)	0.326
95% Gamma Approximate KM-UCL (use when n>=50)	117.3	95% Gamma Adjusted KM-UCL (use when n<50)	198

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	16.95	Mean in Log Scale	-1.981
SD in Original Scale	41.96	SD in Log Scale	4.111
95% t UCL (assumes normality of ROS data)	45.06	95% Percentile Bootstrap UCL	45.12
95% BCA Bootstrap UCL	60.09	95% Bootstrap t UCL	4979
95% H-UCL (Log ROS)	1.183E+11		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	17.58	Mean in Log Scale	0.885
SD in Original Scale	41.68	SD in Log Scale	1.852
95% t UCL (Assumes normality)	45.49	95% H-Stat UCL	738.6

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

95% KM (BCA) UCL N/A

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.

Aluminum

General Statistics

Total Number of Observations	19	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	1250	Mean	2431
Maximum	11900	Median	1910
SD	2329	Std. Error of Mean	534.2
Coefficient of Variation	0.958	Skewness	4.143

Normal GOF Test

Shapiro Wilk Test Statistic	0.399	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.38	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	3357	95% Adjusted-CLT UCL (Chen-1995)	3852
		95% Modified-t UCL (Johnson-1978)	3442

Gamma GOF Test

A-D Test Statistic	2.847	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.323	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.2	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.131	k star (bias corrected MLE)	2.672
Theta hat (MLE)	776.4	Theta star (bias corrected MLE)	909.9
nu hat (MLE)	119	nu star (bias corrected)	101.5
MLE Mean (bias corrected)	2431	MLE Sd (bias corrected)	1487
		Approximate Chi Square Value (0.05)	79.28
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	77.57

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3113	95% Adjusted Gamma UCL (use when n<50)	3182

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.672	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.27	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.131	Mean of logged Data	7.628
Maximum of Logged Data	9.384	SD of logged Data	0.473

Assuming Lognormal Distribution

95% H-UCL	2868	90% Chebyshev (MVUE) UCL	3052
95% Chebyshev (MVUE) UCL	3399	97.5% Chebyshev (MVUE) UCL	3882
99% Chebyshev (MVUE) UCL	4830		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	3310	95% Jackknife UCL	3357
95% Standard Bootstrap UCL	3298	95% Bootstrap-t UCL	6720
95% Hall's Bootstrap UCL	7302	95% Percentile Bootstrap UCL	3460
95% BCA Bootstrap UCL	4074		

90% Chebyshev(Mean, Sd) UCL	4034	95% Chebyshev(Mean, Sd) UCL	4760
97.5% Chebyshev(Mean, Sd) UCL	5767	99% Chebyshev(Mean, Sd) UCL	7747

Suggested UCL to Use

95% Student's-t UCL	3357	or 95% Modified-t UCL	3442

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	19	Number of Distinct Observations	13
Number of Detects	11	Number of Non-Detects	8
Number of Distinct Detects	11	Number of Distinct Non-Detects	2
Minimum Detect	0.22	Minimum Non-Detect	1
Maximum Detect	18.6	Maximum Non-Detect	1.1
Variance Detects	39.14	Percent Non-Detects	42.11%
Mean Detects	5.072	SD Detects	6.256
Median Detects	1.2	CV Detects	1.233
Skewness Detects	1.231	Kurtosis Detects	0.593
Mean of Logged Detects	0.576	SD of Logged Detects	1.701

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.798	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	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

Mean	3.112	Standard Error of Mean	1.226
SD	5.089	95% KM (BCA) UCL	5.137
95% KM (t) UCL	5.238	95% KM (Percentile Bootstrap) UCL	5.093
95% KM (z) UCL	5.128	95% KM Bootstrap t UCL	6.379
90% KM Chebyshev UCL	6.789	95% KM Chebyshev UCL	8.455
97.5% KM Chebyshev UCL	10.77	99% KM Chebyshev UCL	15.31

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.566	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.774	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.213	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.268	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)	0.591	k star (bias corrected MLE)	0.491
Theta hat (MLE)	8.579	Theta star (bias corrected MLE)	10.34
nu hat (MLE)	13.01	nu star (bias corrected)	10.79

MLE Mean (bias corrected)	5.072	MLE Sd (bias corrected)	7.241

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.374	nu hat (KM)	14.21
Approximate Chi Square Value (14.21, α)	6.718	Adjusted Chi Square Value (14.21, β)	6.271
95% Gamma Approximate KM-UCL (use when n>=50)	6.585	95% Gamma Adjusted KM-UCL (use when n<50)	7.054

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3.124
Maximum	18.6	Median	0.62
SD	5.244	CV	1.678
k hat (MLE)	0.332	k star (bias corrected MLE)	0.314
Theta hat (MLE)	9.424	Theta star (bias corrected MLE)	9.941
nu hat (MLE)	12.6	nu star (bias corrected)	11.94
MLE Mean (bias corrected)	3.124	MLE Sd (bias corrected)	5.573
		Adjusted Level of Significance (β)	0.0369
Approximate Chi Square Value (11.94, α)	5.189	Adjusted Chi Square Value (11.94, β)	4.804
95% Gamma Approximate UCL (use when n>=50)	7.19	95% Gamma Adjusted UCL (use when n<50)	7.766

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.889	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.17	Mean in Log Scale	-0.0536
SD in Original Scale	5.203	SD in Log Scale	1.59
95% t UCL (assumes normality of ROS data)	5.24	95% Percentile Bootstrap UCL	5.144
95% BCA Bootstrap UCL	5.493	95% Bootstrap t UCL	7.047
95% H-UCL (Log ROS)	12.63		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.09	95% H-UCL (KM -Log)	9.265
KM SD (logged)	1.498	95% Critical H Value (KM-Log)	3.384
KM Standard Error of Mean (logged)	0.383		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.165	Mean in Log Scale	0.0769
SD in Original Scale	5.198	SD in Log Scale	1.404
95% t UCL (Assumes normality)	5.233	95% H-Stat UCL	8.416

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Suggested UCL to Use

95% KM (BCA) UCL	5.137	95% GROS Adjusted Gamma UCL	7.766
95% Adjusted Gamma KM-UCL	7.054		

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.

Arsenic

General Statistics

Total Number of Observations	19	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	1.3	Mean	3.221
Maximum	8	Median	2.3
SD	2.071	Std. Error of Mean	0.475
Coefficient of Variation	0.643	Skewness	1.352

Normal GOF Test

Shapiro Wilk Test Statistic	0.804	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	4.045	95% Adjusted-CLT UCL (Chen-1995)	4.16
		95% Modified-t UCL (Johnson-1978)	4.07

Gamma GOF Test

A-D Test Statistic	0.862	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.747	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.174	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.2	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.216	k star (bias corrected MLE)	2.743
Theta hat (MLE)	1.002	Theta star (bias corrected MLE)	1.174
nu hat (MLE)	122.2	nu star (bias corrected)	104.2
MLE Mean (bias corrected)	3.221	MLE Sd (bias corrected)	1.945
		Approximate Chi Square Value (0.05)	81.69
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	79.94

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	4.111	95% Adjusted Gamma UCL (use when n<50)	4.2

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.162	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.262	Mean of logged Data	1.006
Maximum of Logged Data	2.079	SD of logged Data	0.564

Assuming Lognormal Distribution

95% H-UCL	4.225	90% Chebyshev (MVUE) UCL	4.465
95% Chebyshev (MVUE) UCL	5.049	97.5% Chebyshev (MVUE) UCL	5.858
99% Chebyshev (MVUE) UCL	7.449		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	4.003	95% Jackknife UCL	4.045
95% Standard Bootstrap UCL	3.977	95% Bootstrap-t UCL	4.386
95% Hall's Bootstrap UCL	4.048	95% Percentile Bootstrap UCL	4.032
95% BCA Bootstrap UCL	4.163		
90% Chebyshev(Mean, Sd) UCL	4.646	95% Chebyshev(Mean, Sd) UCL	5.292
97.5% Chebyshev(Mean, Sd) UCL	6.188	99% Chebyshev(Mean, Sd) UCL	7.949

Suggested UCL to Use

95% Adjusted Gamma UCL	4.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cadmium

General Statistics

Total Number of Observations	19	Number of Distinct Observations	13
Number of Detects	7	Number of Non-Detects	12
Number of Distinct Detects	7	Number of Distinct Non-Detects	6
Minimum Detect	0.14	Minimum Non-Detect	0.52
Maximum Detect	9.5	Maximum Non-Detect	0.58
Variance Detects	11.66	Percent Non-Detects	63.16%
Mean Detects	1.996	SD Detects	3.415
Median Detects	0.27	CV Detects	1.711
Skewness Detects	2.336	Kurtosis Detects	5.626
Mean of Logged Detects	-0.478	SD of Logged Detects	1.629

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.636	**Shapiro Wilk GOF Test**

5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.31	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.857	Standard Error of Mean	0.523
SD	2.107	95% KM (BCA) UCL	1.803
95% KM (t) UCL	1.763	95% KM (Percentile Bootstrap) UCL	1.771
95% KM (z) UCL	1.716	95% KM Bootstrap t UCL	5.71
90% KM Chebyshev UCL	2.425	95% KM Chebyshev UCL	3.135
97.5% KM Chebyshev UCL	4.121	99% KM Chebyshev UCL	6.057

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.63	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.303	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.327	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)	0.537	k star (bias corrected MLE)	0.402
Theta hat (MLE)	3.713	Theta star (bias corrected MLE)	4.96
nu hat (MLE)	7.525	nu star (bias corrected)	5.633
MLE Mean (bias corrected)	1.996	MLE Sd (bias corrected)	3.146

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.165	nu hat (KM)	6.281
Approximate Chi Square Value (6.28, α)	1.785	Adjusted Chi Square Value (6.28, β)	1.585
95% Gamma Approximate KM-UCL (use when n>=50)	3.015	95% Gamma Adjusted KM-UCL (use when n<50)	3.397

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.824
Maximum	9.5	Median	0.14
SD	2.186	CV	2.652
k hat (MLE)	0.301	k star (bias corrected MLE)	0.288
Theta hat (MLE)	2.74	Theta star (bias corrected MLE)	2.858
nu hat (MLE)	11.43	nu star (bias corrected)	10.96
MLE Mean (bias corrected)	0.824	MLE Sd (bias corrected)	1.535
		Adjusted Level of Significance (β)	0.0369
Approximate Chi Square Value (10.96, α)	4.552	Adjusted Chi Square Value (10.96, β)	4.196
95% Gamma Approximate UCL (use when n>=50)	1.985	95% Gamma Adjusted UCL (use when n<50)	2.154

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.871	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**

5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.896	Mean in Log Scale	-1.154
SD in Original Scale	2.156	SD in Log Scale	1.192
95% t UCL (assumes normality of ROS data)	1.754	95% Percentile Bootstrap UCL	1.807
95% BCA Bootstrap UCL	2.369	95% Bootstrap t UCL	5.773
95% H-UCL (Log ROS)	1.449		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.239	95% H-UCL (KM -Log)	1.095
KM SD (logged)	1.105	95% Critical H Value (KM-Log)	2.763
KM Standard Error of Mean (logged)	0.293		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.907	Mean in Log Scale	-1
SD in Original Scale	2.149	SD in Log Scale	1.026
95% t UCL (Assumes normality)	1.761	95% H-Stat UCL	1.182

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.763	95% KM (Percentile Bootstrap) UCL	1.771

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

General Statistics

Total Number of Observations	19	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	2.5	Mean	8.395
Maximum	39.9	Median	3.7
SD	9.392	Std. Error of Mean	2.155
Coefficient of Variation	1.119	Skewness	2.476

Normal GOF Test

Shapiro Wilk Test Statistic	0.665	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.203	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	12.13	95% Adjusted-CLT UCL (Chen-1995)	13.25
		95% Modified-t UCL (Johnson-1978)	12.33

Gamma GOF Test

A-D Test Statistic	1.415	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.759	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.24	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.202	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.425	k star (bias corrected MLE)	1.235
Theta hat (MLE)	5.889	Theta star (bias corrected MLE)	6.795
nu hat (MLE)	54.17	nu star (bias corrected)	46.95
MLE Mean (bias corrected)	8.395	MLE Sd (bias corrected)	7.552
		Approximate Chi Square Value (0.05)	32.22
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	31.16

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	12.23	95% Adjusted Gamma UCL (use when n<50)	12.65

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.223	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.916	Mean of logged Data	1.738
Maximum of Logged Data	3.686	SD of logged Data	0.832

Assuming Lognormal Distribution

95% H-UCL	12.82	90% Chebyshev (MVUE) UCL	12.74
95% Chebyshev (MVUE) UCL	14.95	97.5% Chebyshev (MVUE) UCL	18.02
99% Chebyshev (MVUE) UCL	24.05		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	11.94	95% Jackknife UCL	12.13
95% Standard Bootstrap UCL	11.83	95% Bootstrap-t UCL	15.33
95% Hall's Bootstrap UCL	26.99	95% Percentile Bootstrap UCL	12.11
95% BCA Bootstrap UCL	13.51		
90% Chebyshev(Mean, Sd) UCL	14.86	95% Chebyshev(Mean, Sd) UCL	17.79
97.5% Chebyshev(Mean, Sd) UCL	21.85	99% Chebyshev(Mean, Sd) UCL	29.83

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 17.79

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	19	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.37	Mean	1.377
Maximum	4.4	Median	0.8
SD	1.228	Std. Error of Mean	0.282
Coefficient of Variation	0.892	Skewness	1.695

Normal GOF Test

Shapiro Wilk Test Statistic	0.706	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	1.866	95% Adjusted-CLT UCL (Chen-1995)	1.958
		95% Modified-t UCL (Johnson-1978)	1.884

Gamma GOF Test

A-D Test Statistic	1.519	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.27	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.201	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.952	k star (bias corrected MLE)	1.679
Theta hat (MLE)	0.705	Theta star (bias corrected MLE)	0.82
nu hat (MLE)	74.19	nu star (bias corrected)	63.81
MLE Mean (bias corrected)	1.377	MLE Sd (bias corrected)	1.063
		Approximate Chi Square Value (0.05)	46.43
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	45.14

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.893	95% Adjusted Gamma UCL (use when n<50)	1.947

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.884	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.225	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.994	Mean of logged Data	0.0427
Maximum of Logged Data	1.482	SD of logged Data	0.711

Assuming Lognormal Distribution

95% H-UCL	1.953	90% Chebyshev (MVUE) UCL	2.012
95% Chebyshev (MVUE) UCL	2.324	97.5% Chebyshev (MVUE) UCL	2.758
99% Chebyshev (MVUE) UCL	3.609		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	1.841	95% Jackknife UCL	1.866
95% Standard Bootstrap UCL	1.829	95% Bootstrap-t UCL	2.053
95% Hall's Bootstrap UCL	1.821	95% Percentile Bootstrap UCL	1.847
95% BCA Bootstrap UCL	1.968		
90% Chebyshev(Mean, Sd) UCL	2.223	95% Chebyshev(Mean, Sd) UCL	2.605
97.5% Chebyshev(Mean, Sd) UCL	3.137	99% Chebyshev(Mean, Sd) UCL	4.181

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	2.605

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cyanide

General Statistics

Total Number of Observations	19	Number of Distinct Observations	10
Number of Detects	1	Number of Non-Detects	18
Number of Distinct Detects	1	Number of Distinct Non-Detects	9

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 Cyanide was not processed!

Iron

General Statistics

Total Number of Observations	19	Number of Distinct Observations	18
		Number of Missing Observations	0

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Minimum	2280	Mean	13798
Maximum	85300	Median	5580
SD	23180	Std. Error of Mean	5318
Coefficient of Variation	1.68	Skewness	2.638

Normal GOF Test

Shapiro Wilk Test Statistic	0.531	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.374	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	23020	95% Adjusted-CLT UCL (Chen-1995)	25985
		95% Modified-t UCL (Johnson-1978)	23557

Gamma GOF Test

A-D Test Statistic	2.015	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.777	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.282	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.206	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.801	k star (bias corrected MLE)	0.71
Theta hat (MLE)	17217	Theta star (bias corrected MLE)	19435
nu hat (MLE)	30.45	nu star (bias corrected)	26.98
MLE Mean (bias corrected)	13798	MLE Sd (bias corrected)	16376
		Approximate Chi Square Value (0.05)	16.14
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	15.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	23072	95% Adjusted Gamma UCL (use when n<50)	24167

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.181	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.732	Mean of logged Data	8.792
Maximum of Logged Data	11.35	SD of logged Data	1.079

Assuming Lognormal Distribution

95% H-UCL	23560	90% Chebyshev (MVUE) UCL	20694
95% Chebyshev (MVUE) UCL	24966	97.5% Chebyshev (MVUE) UCL	30896
99% Chebyshev (MVUE) UCL	42543		

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	22546	95% Jackknife UCL	23020
95% Standard Bootstrap UCL	22376	95% Bootstrap-t UCL	52131
95% Hall's Bootstrap UCL	62070	95% Percentile Bootstrap UCL	23871
95% BCA Bootstrap UCL	27521		
90% Chebyshev(Mean, Sd) UCL	29752	95% Chebyshev(Mean, Sd) UCL	36979
97.5% Chebyshev(Mean, Sd) UCL	47009	99% Chebyshev(Mean, Sd) UCL	66711

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 36979

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	19	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	7.3	Mean	1153
Maximum	10100	Median	52.6
SD	2915	Std. Error of Mean	668.7
Coefficient of Variation	2.529	Skewness	2.676

Normal GOF Test

Shapiro Wilk Test Statistic	0.447	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.466	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	2312	95% Adjusted-CLT UCL (Chen-1995)	2692
		95% Modified-t UCL (Johnson-1978)	2381

Gamma GOF Test

A-D Test Statistic	3.017	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.858	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.388	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.217	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.268	k star (bias corrected MLE)	0.26

Theta hat (MLE)	4309	Theta star (bias corrected MLE)	4427
nu hat (MLE)	10.17	nu star (bias corrected)	9.895
MLE Mean (bias corrected)	1153	MLE Sd (bias corrected)	2259
		Approximate Chi Square Value (0.05)	3.876
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	3.552

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2943	95% Adjusted Gamma UCL (use when n<50)	3211

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.827	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.257	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.988	Mean of logged Data	4.424
Maximum of Logged Data	9.22	SD of logged Data	2.102

Assuming Lognormal Distribution

95% H-UCL	6845	90% Chebyshev (MVUE) UCL	1569
95% Chebyshev (MVUE) UCL	2023	97.5% Chebyshev (MVUE) UCL	2652
99% Chebyshev (MVUE) UCL	3890		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	2253	95% Jackknife UCL	2312
95% Standard Bootstrap UCL	2246	95% Bootstrap-t UCL	6016
95% Hall's Bootstrap UCL	7905	95% Percentile Bootstrap UCL	2248
95% BCA Bootstrap UCL	2817		
90% Chebyshev(Mean, Sd) UCL	3159	95% Chebyshev(Mean, Sd) UCL	4068
97.5% Chebyshev(Mean, Sd) UCL	5329	99% Chebyshev(Mean, Sd) UCL	7807

Suggested UCL to Use

99% Chebyshev (Mean, Sd) UCL	7807

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	19	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	16.2	Mean	97.75

Maximum	427	Median	60.3
SD	118.5	Std. Error of Mean	27.19
Coefficient of Variation	1.213	Skewness	2.518

Normal GOF Test

Shapiro Wilk Test Statistic	0.561	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	144.9	95% Adjusted-CLT UCL (Chen-1995)	159.3
		95% Modified-t UCL (Johnson-1978)	147.5

Gamma GOF Test

A-D Test Statistic	1.92	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.759	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.301	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.202	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.425	k star (bias corrected MLE)	1.235
Theta hat (MLE)	68.61	Theta star (bias corrected MLE)	79.16
nu hat (MLE)	54.14	nu star (bias corrected)	46.92
MLE Mean (bias corrected)	97.75	MLE Sd (bias corrected)	87.97
		Approximate Chi Square Value (0.05)	32.2
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	31.14

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	142.4	95% Adjusted Gamma UCL (use when n<50)	147.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.233	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.785	Mean of logged Data	4.192
Maximum of Logged Data	6.057	SD of logged Data	0.801

Assuming Lognormal Distribution

95% H-UCL	141.8	90% Chebyshev (MVUE) UCL	142.4
95% Chebyshev (MVUE) UCL	166.5	97.5% Chebyshev (MVUE) UCL	199.9
99% Chebyshev (MVUE) UCL	265.5		

Nonparametric Distribution Free UCL Statistics

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	142.5	95% Jackknife UCL	144.9
95% Standard Bootstrap UCL	141	95% Bootstrap-t UCL	268.3
95% Hall's Bootstrap UCL	363.8	95% Percentile Bootstrap UCL	144.7
95% BCA Bootstrap UCL	159.4		
90% Chebyshev(Mean, Sd) UCL	179.3	95% Chebyshev(Mean, Sd) UCL	216.3
97.5% Chebyshev(Mean, Sd) UCL	267.6	99% Chebyshev(Mean, Sd) UCL	368.3

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 216.3

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Vanadium

General Statistics

Total Number of Observations	19	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	3.9	Mean	14.15
Maximum	146	Median	5.3
SD	32.08	Std. Error of Mean	7.359
Coefficient of Variation	2.266	Skewness	4.293

Normal GOF Test

Shapiro Wilk Test Statistic	0.318	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.436	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	26.91	95% Adjusted-CLT UCL (Chen-1995)	34
		95% Modified-t UCL (Johnson-1978)	28.12

Gamma GOF Test

A-D Test Statistic	3.602	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.773	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.307	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.205	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.904	k star (bias corrected MLE)	0.796
Theta hat (MLE)	15.66	Theta star (bias corrected MLE)	17.78

nu hat (MLE)	34.34	nu star (bias corrected)	30.25
MLE Mean (bias corrected)	14.15	MLE Sd (bias corrected)	15.86
		Approximate Chi Square Value (0.05)	18.69
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	17.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	22.91	95% Adjusted Gamma UCL (use when n<50)	23.92

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.664	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.219	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.361	Mean of logged Data	2.003
Maximum of Logged Data	4.984	SD of logged Data	0.82

Assuming Lognormal Distribution

95% H-UCL	16.4	90% Chebyshev (MVUE) UCL	16.35
95% Chebyshev (MVUE) UCL	19.17	97.5% Chebyshev (MVUE) UCL	23.07
99% Chebyshev (MVUE) UCL	30.74		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	26.26	95% Jackknife UCL	26.91
95% Standard Bootstrap UCL	26.21	95% Bootstrap-t UCL	123.4
95% Hall's Bootstrap UCL	76.95	95% Percentile Bootstrap UCL	28.4
95% BCA Bootstrap UCL	36.05		
90% Chebyshev(Mean, Sd) UCL	36.23	95% Chebyshev(Mean, Sd) UCL	46.23
97.5% Chebyshev(Mean, Sd) UCL	60.11	99% Chebyshev(Mean, Sd) UCL	87.37

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	46.23

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	19	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	9.3	Mean	833.2
Maximum	13400	Median	23.7

SD	3061	Std. Error of Mean	702.3
Coefficient of Variation	3.674	Skewness	4.277

Normal GOF Test

Shapiro Wilk Test Statistic	0.296	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.442	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	2051	95% Adjusted-CLT UCL (Chen-1995)	2725
		95% Modified-t UCL (Johnson-1978)	2166

Gamma GOF Test

A-D Test Statistic	4.063	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.871	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.437	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.218	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.242	k star (bias corrected MLE)	0.239
Theta hat (MLE)	3436	Theta star (bias corrected MLE)	3482
nu hat (MLE)	9.214	nu star (bias corrected)	9.092
MLE Mean (bias corrected)	833.2	MLE Sd (bias corrected)	1703
		Approximate Chi Square Value (0.05)	3.383
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	3.084

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2239	95% Adjusted Gamma UCL (use when n<50)	2456

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.29	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.23	Mean of logged Data	3.781
Maximum of Logged Data	9.503	SD of logged Data	1.907

Assuming Lognormal Distribution

95% H-UCL	1696	90% Chebyshev (MVUE) UCL	563.5
95% Chebyshev (MVUE) UCL	720.4	97.5% Chebyshev (MVUE) UCL	938.3
99% Chebyshev (MVUE) UCL	1366		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Appendix C-2
ProUCL Output - Current/Future Surface Soil - Open Field/Waste Disposal Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCLs

95% CLT UCL	1988	95% Jackknife UCL	2051
95% Standard Bootstrap UCL	1977	95% Bootstrap-t UCL	16112
95% Hall's Bootstrap UCL	16215	95% Percentile Bootstrap UCL	2205
95% BCA Bootstrap UCL	3014		
90% Chebyshev(Mean, Sd) UCL	2940	95% Chebyshev(Mean, Sd) UCL	3895
97.5% Chebyshev(Mean, Sd) UCL	5219	99% Chebyshev(Mean, Sd) UCL	7821

Suggested UCL to Use

99% Chebyshev (Mean, Sd) UCL 7821

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 10:30:40 PM
From File	ProUCL_Input_SS-RHA.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	27	Minimum Non-Detect	180
Maximum Detect	130000	Maximum Non-Detect	180
Variance Detects	1.875E+9	Percent Non-Detects	10%
Mean Detects	14536	SD Detects	43299
Median Detects	72	CV Detects	2.979
Skewness Detects	3	Kurtosis Detects	9
Mean of Logged Detects	5.163	SD of Logged Detects	2.603

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.392	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.518	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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

Mean	13089	Standard Error of Mean	13071
SD	38970	95% KM (BCA) UCL	39072
95% KM (t) UCL	37050	95% KM (Percentile Bootstrap) UCL	39058
95% KM (z) UCL	34589	95% KM Bootstrap t UCL	8963543
90% KM Chebyshev UCL	52302	95% KM Chebyshev UCL	70065
97.5% KM Chebyshev UCL	94718	99% KM Chebyshev UCL	143144

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.196	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.873	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.493	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.311	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)	0.171	k star (bias corrected MLE)	0.188
Theta hat (MLE)	85231	Theta star (bias corrected MLE)	77414
nu hat (MLE)	3.07	nu star (bias corrected)	3.38
MLE Mean (bias corrected)	14536	MLE Sd (bias corrected)	33546

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.113	nu hat (KM)	2.256
Approximate Chi Square Value (2.26, α)	0.191	Adjusted Chi Square Value (2.26, β)	0.137
95% Gamma Approximate KM-UCL (use when n>=50)	154486	95% Gamma Adjusted KM-UCL (use when n<50)	215945

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	13083
Maximum	130000	Median	68.5
SD	41081	CV	3.14
k hat (MLE)	0.146	k star (bias corrected MLE)	0.169
Theta hat (MLE)	89729	Theta star (bias corrected MLE)	77537
nu hat (MLE)	2.916	nu star (bias corrected)	3.375
MLE Mean (bias corrected)	13083	MLE Sd (bias corrected)	31850
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (3.37, α)	0.492	Adjusted Chi Square Value (3.37, β)	0.342
95% Gamma Approximate UCL (use when n>=50)	89819	95% Gamma Adjusted UCL (use when n<50)	129120

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.676	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.34	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	13089	Mean in Log Scale	5.059
SD in Original Scale	41078	SD in Log Scale	2.476
95% t UCL (assumes normality of ROS data)	36901	95% Percentile Bootstrap UCL	39060
95% BCA Bootstrap UCL	52063	95% Bootstrap t UCL	9030082
95% H-UCL (Log ROS)	760258		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	13092	Mean in Log Scale	5.097
SD in Original Scale	41077	SD in Log Scale	2.463
95% t UCL (Assumes normality)	36904	95% H-Stat UCL	724308

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

99% KM (Chebyshev) UCL 143144

Warning: Recommended UCL exceeds the maximum observation

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.

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	29	Minimum Non-Detect	180
Maximum Detect	79000	Maximum Non-Detect	180
Variance Detects	6.917E+8	Percent Non-Detects	10%
Mean Detects	8869	SD Detects	26299
Median Detects	77	CV Detects	2.965
Skewness Detects	3	Kurtosis Detects	9
Mean of Logged Detects	5.158	SD of Logged Detects	2.4

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.392	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.518	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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

Mean	7989	Standard Error of Mean	7939
SD	23670	95% KM (BCA) UCL	23776
95% KM (t) UCL	22542	95% KM (Percentile Bootstrap) UCL	23766
95% KM (z) UCL	21048	95% KM Bootstrap t UCL	3734950
90% KM Chebyshev UCL	31807	95% KM Chebyshev UCL	42596
97.5% KM Chebyshev UCL	57570	99% KM Chebyshev UCL	86984

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.218	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.857	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.498	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.309	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)	0.189	k star (bias corrected MLE)	0.2
Theta hat (MLE)	46970	Theta star (bias corrected MLE)	44354
nu hat (MLE)	3.399	nu star (bias corrected)	3.599
MLE Mean (bias corrected)	8869	MLE Sd (bias corrected)	19833

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.114	nu hat (KM)	2.278
Approximate Chi Square Value (2.28, α)	0.195	Adjusted Chi Square Value (2.28, β)	0.139
95% Gamma Approximate KM-UCL (use when n>=50)	93224	95% Gamma Adjusted KM-UCL (use when n<50)	130871

Gamma ROS Statistics using Imputed Non-Detects

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	7982
Maximum	79000	Median	75
SD	24953	CV	3.126
k hat (MLE)	0.159	k star (bias corrected MLE)	0.178
Theta hat (MLE)	50297	Theta star (bias corrected MLE)	44904
nu hat (MLE)	3.174	nu star (bias corrected)	3.555
MLE Mean (bias corrected)	7982	MLE Sd (bias corrected)	18932
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (3.56, α)	0.554	Adjusted Chi Square Value (3.56, β)	0.389
95% Gamma Approximate UCL (use when n>=50)	51197	95% Gamma Adjusted UCL (use when n<50)	72933

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.669	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.357	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	7988	Mean in Log Scale	5.063
SD in Original Scale	24951	SD in Log Scale	2.283
95% t UCL (assumes normality of ROS data)	22452	95% Percentile Bootstrap UCL	23763
95% BCA Bootstrap UCL	31661	95% Bootstrap t UCL	3790547
95% H-UCL (Log ROS)	219264		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	7991	Mean in Log Scale	5.092
SD in Original Scale	24950	SD in Log Scale	2.273
95% t UCL (Assumes normality)	22454	95% H-Stat UCL	212044

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
99% KM (Chebyshev) UCL 86984
Warning: Recommended UCL exceeds the maximum observation

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.

Benzo(b)fluoranthene

General Statistics

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	41	Minimum Non-Detect	180
Maximum Detect	110000	Maximum Non-Detect	180
Variance Detects	1.341E+9	Percent Non-Detects	10%
Mean Detects	12363	SD Detects	36614
Median Detects	140	CV Detects	2.962
Skewness Detects	3	Kurtosis Detects	9
Mean of Logged Detects	5.568	SD of Logged Detects	2.382

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.393	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.518	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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

Mean	11135	Standard Error of Mean	11053
SD	32955	95% KM (BCA) UCL	33115
95% KM (t) UCL	31397	95% KM (Percentile Bootstrap) UCL	33079
95% KM (z) UCL	29317	95% KM Bootstrap t UCL	4794179
90% KM Chebyshev UCL	44296	95% KM Chebyshev UCL	59316
97.5% KM Chebyshev UCL	80164	99% KM Chebyshev UCL	121116

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.165	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.854	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.492	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.309	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)	0.192	k star (bias corrected MLE)	0.202
Theta hat (MLE)	64350	Theta star (bias corrected MLE)	61156
nu hat (MLE)	3.458	nu star (bias corrected)	3.639
MLE Mean (bias corrected)	12363	MLE Sd (bias corrected)	27497

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.114	nu hat (KM)	2.283
Approximate Chi Square Value (2.28, α)	0.196	Adjusted Chi Square Value (2.28, β)	0.14
95% Gamma Approximate KM-UCL (use when n>=50)	129586	95% Gamma Adjusted KM-UCL (use when n<50)	182096

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	11127
Maximum	110000	Median	125

SD	34741	CV	3.122
k hat (MLE)	0.16	k star (bias corrected MLE)	0.179
Theta hat (MLE)	69644	Theta star (bias corrected MLE)	62334
nu hat (MLE)	3.195	nu star (bias corrected)	3.57
MLE Mean (bias corrected)	11127	MLE Sd (bias corrected)	26336
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (3.57, α)	0.56	Adjusted Chi Square Value (3.57, β)	0.393
95% Gamma Approximate UCL (use when n>=50)	70984	95% Gamma Adjusted UCL (use when n<50)	101043

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.689	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.345	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	11134	Mean in Log Scale	5.441
SD in Original Scale	34738	SD in Log Scale	2.281
95% t UCL (assumes normality of ROS data)	31271	95% Percentile Bootstrap UCL	33085
95% BCA Bootstrap UCL	44092	95% Bootstrap t UCL	4622029
95% H-UCL (Log ROS)	316716		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	11136	Mean in Log Scale	5.461
SD in Original Scale	34737	SD in Log Scale	2.271
95% t UCL (Assumes normality)	31272	95% H-Stat UCL	303504

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

99% KM (Chebyshev) UCL 121116

Warning: Recommended UCL exceeds the maximum observation

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.

Benzo(k)fluoranthene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	6
Number of Detects	6	Number of Non-Detects	4
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	50	Minimum Non-Detect	180
Maximum Detect	63000	Maximum Non-Detect	190
Variance Detects	6.594E+8	Percent Non-Detects	40%

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Mean Detects	10584	SD Detects	25679
Median Detects	101	CV Detects	2.426
Skewness Detects	2.449	Kurtosis Detects	6
Mean of Logged Detects	5.596	SD of Logged Detects	2.712

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.498	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.491	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	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

Mean	6386	Standard Error of Mean	6537
SD	18872	95% KM (BCA) UCL	18971
95% KM (t) UCL	18369	95% KM (Percentile Bootstrap) UCL	18961
95% KM (z) UCL	17139	95% KM Bootstrap t UCL	3452870
90% KM Chebyshev UCL	25997	95% KM Chebyshev UCL	34881
97.5% KM Chebyshev UCL	47211	99% KM Chebyshev UCL	71431

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.401	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.802	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.485	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.364	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)	0.2	k star (bias corrected MLE)	0.211
Theta hat (MLE)	52813	Theta star (bias corrected MLE)	50087
nu hat (MLE)	2.405	nu star (bias corrected)	2.536
MLE Mean (bias corrected)	10584	MLE Sd (bias corrected)	23024

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.114	nu hat (KM)	2.29
Approximate Chi Square Value (2.29, α)	0.197	Adjusted Chi Square Value (2.29, β)	0.14
95% Gamma Approximate KM-UCL (use when n>=50)	74059	95% Gamma Adjusted KM-UCL (use when n<50)	104194

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	6350
Maximum	63000	Median	61
SD	19905	CV	3.134
k hat (MLE)	0.111	k star (bias corrected MLE)	0.144
Theta hat (MLE)	57363	Theta star (bias corrected MLE)	44051
nu hat (MLE)	2.214	nu star (bias corrected)	2.883
MLE Mean (bias corrected)	6350	MLE Sd (bias corrected)	16725
		Adjusted Level of Significance (β)	0.0267

Approximate Chi Square Value (2.88, α)	0.339	Adjusted Chi Square Value (2.88, β)	0.232
95% Gamma Approximate UCL (use when n>=50)	54062	95% Gamma Adjusted UCL (use when n<50)	79050

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.653	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.392	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	6406	Mean in Log Scale	5.195
SD in Original Scale	19885	SD in Log Scale	2.164
95% t UCL (assumes normality of ROS data)	17933	95% Percentile Bootstrap UCL	18973
95% BCA Bootstrap UCL	25258	95% Bootstrap t UCL	2254301
95% H-UCL (Log ROS)	122494		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6387	Mean in Log Scale	5.168
SD in Original Scale	19892	SD in Log Scale	2.095
95% t UCL (Assumes normality)	17918	95% H-Stat UCL	80321

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

99% KM (Chebyshev) UCL 71431

Warning: Recommended UCL exceeds the maximum observation

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.

Chrysene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	35	Minimum Non-Detect	180
Maximum Detect	110000	Maximum Non-Detect	180
Variance Detects	1.341E+9	Percent Non-Detects	10%
Mean Detects	12336	SD Detects	36624
Median Detects	99	CV Detects	2.969
Skewness Detects	3	Kurtosis Detects	9
Mean of Logged Detects	5.366	SD of Logged Detects	2.455

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.392	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.518	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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

Mean	11110	Standard Error of Mean	11056
SD	32963	95% KM (BCA) UCL	33084
95% KM (t) UCL	31377	95% KM (Percentile Bootstrap) UCL	33077
95% KM (z) UCL	29296	95% KM Bootstrap t UCL	5428798
90% KM Chebyshev UCL	44279	95% KM Chebyshev UCL	59303
97.5% KM Chebyshev UCL	80156	99% KM Chebyshev UCL	121119

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.193	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.862	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.493	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.31	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)	0.184	k star (bias corrected MLE)	0.197
Theta hat (MLE)	67084	Theta star (bias corrected MLE)	62725
nu hat (MLE)	3.31	nu star (bias corrected)	3.54
MLE Mean (bias corrected)	12336	MLE Sd (bias corrected)	27816

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.114	nu hat (KM)	2.272
Approximate Chi Square Value (2.27, α)	0.194	Adjusted Chi Square Value (2.27, β)	0.138
95% Gamma Approximate KM-UCL (use when n>=50)	130064	95% Gamma Adjusted KM-UCL (use when n<50)	182373

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	11102
Maximum	110000	Median	91.5
SD	34749	CV	3.13
k hat (MLE)	0.155	k star (bias corrected MLE)	0.175
Theta hat (MLE)	71769	Theta star (bias corrected MLE)	63458
nu hat (MLE)	3.094	nu star (bias corrected)	3.499
MLE Mean (bias corrected)	11102	MLE Sd (bias corrected)	26543
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (3.50, α)	0.534	Adjusted Chi Square Value (3.50, β)	0.374
95% Gamma Approximate UCL (use when n>=50)	72687	95% Gamma Adjusted UCL (use when n<50)	103846

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.677	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.345	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	11110	Mean in Log Scale	5.268
SD in Original Scale	34746	SD in Log Scale	2.335
95% t UCL (assumes normality of ROS data)	31252	95% Percentile Bootstrap UCL	33080
95% BCA Bootstrap UCL	44076	95% Bootstrap t UCL	5713759
95% H-UCL (Log ROS)	373558		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	11111	Mean in Log Scale	5.279
SD in Original Scale	34746	SD in Log Scale	2.331
95% t UCL (Assumes normality)	31253	95% H-Stat UCL	367468

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

99% KM (Chebyshev) UCL 121119

Warning: Recommended UCL exceeds the maximum observation

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	6
Number of Detects	3	Number of Non-Detects	7
Number of Distinct Detects	3	Number of Distinct Non-Detects	3
Minimum Detect	40	Minimum Non-Detect	180
Maximum Detect	23000	Maximum Non-Detect	200
Variance Detects	1.755E+8	Percent Non-Detects	70%
Mean Detects	7703	SD Detects	13248
Median Detects	69	CV Detects	1.72
Skewness Detects	1.732	Kurtosis Detects	N/A
Mean of Logged Detects	5.989	SD of Logged Detects	3.522

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.751	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level

Lilliefors Test Statistic	0.384	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2349	Standard Error of Mean	2666
SD	6884	95% KM (BCA) UCL	N/A
95% KM (t) UCL	7236	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	6734	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	10347	95% KM Chebyshev UCL	13970
97.5% KM Chebyshev UCL	18999	99% KM Chebyshev UCL	28876

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	0.241	k star (bias corrected MLE)	N/A
Theta hat (MLE)	31925	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	1.448	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.116	nu hat (KM)	2.329
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (2.33, α)	0.205	Adjusted Chi Square Value (2.33, β)	0.145
95% Gamma Approximate KM-UCL (use when n>=50)	26689	95% Gamma Adjusted KM-UCL (use when n<50)	37802

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.814	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.357	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2416	Mean in Log Scale	4.699
SD in Original Scale	7234	SD in Log Scale	2.271
95% t UCL (assumes normality of ROS data)	6610	95% Percentile Bootstrap UCL	6960
95% BCA Bootstrap UCL	9301	95% Bootstrap t UCL	272359
95% H-UCL (Log ROS)	142112		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.57	95% H-UCL (KM -Log)	11487
KM SD (logged)	1.843	95% Critical H Value (KM-Log)	5.016
KM Standard Error of Mean (logged)	0.738		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2376	Mean in Log Scale	4.968
SD in Original Scale	7247	SD in Log Scale	1.804
95% t UCL (Assumes normality)	6577	95% H-Stat UCL	14116

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	7236	95% KM (Percentile Bootstrap) UCL	N/A

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	8
Number of Detects	6	Number of Non-Detects	4
Number of Distinct Detects	6	Number of Distinct Non-Detects	2
Minimum Detect	45	Minimum Non-Detect	180
Maximum Detect	35000	Maximum Non-Detect	190
Variance Detects	2.031E+8	Percent Non-Detects	40%
Mean Detects	5907	SD Detects	14253
Median Detects	100.5	CV Detects	2.413
Skewness Detects	2.449	Kurtosis Detects	6
Mean of Logged Detects	5.399	SD of Logged Detects	2.518

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.499	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.49	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.362	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

Mean	3579	Standard Error of Mean	3628
SD	10474	95% KM (BCA) UCL	10569
95% KM (t) UCL	10230	95% KM (Percentile Bootstrap) UCL	10557
95% KM (z) UCL	9547	95% KM Bootstrap t UCL	1177582
90% KM Chebyshev UCL	14464	95% KM Chebyshev UCL	19394
97.5% KM Chebyshev UCL	26237	99% KM Chebyshev UCL	39679

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.394	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.795	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.49	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.363	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)	0.221	k star (bias corrected MLE)	0.221
Theta hat (MLE)	26775	Theta star (bias corrected MLE)	26677
nu hat (MLE)	2.647	nu star (bias corrected)	2.657
MLE Mean (bias corrected)	5907	MLE Sd (bias corrected)	12553

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.117	nu hat (KM)	2.335
Approximate Chi Square Value (2.34, α)	0.206	Adjusted Chi Square Value (2.34, β)	0.145
95% Gamma Approximate KM-UCL (use when n>=50)	40526	95% Gamma Adjusted KM-UCL (use when n<50)	57460

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3656
Maximum	35000	Median	100.5
SD	11015	CV	3.013
k hat (MLE)	0.164	k star (bias corrected MLE)	0.182
Theta hat (MLE)	22271	Theta star (bias corrected MLE)	20134
nu hat (MLE)	3.283	nu star (bias corrected)	3.631
MLE Mean (bias corrected)	3656	MLE Sd (bias corrected)	8579
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (3.63, α)	0.582	Adjusted Chi Square Value (3.63, β)	0.41
95% Gamma Approximate UCL (use when n>=50)	22820	95% Gamma Adjusted UCL (use when n<50)	32380

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.659	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.405	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3610	Mean in Log Scale	5.136
SD in Original Scale	11030	SD in Log Scale	2
95% t UCL (assumes normality of ROS data)	10003	95% Percentile Bootstrap UCL	10573
95% BCA Bootstrap UCL	14099	95% Bootstrap t UCL	540215
95% H-UCL (Log ROS)	45909		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3581	Mean in Log Scale	5.05
SD in Original Scale	11040	SD in Log Scale	1.93
95% t UCL (Assumes normality)	9980	95% H-Stat UCL	29043

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

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

99% KM (Chebyshev) UCL 39679

Warning: Recommended UCL exceeds the maximum observation

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.

Pyrene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	41	Mean	18147
Maximum	180000	Median	125
SD	56869	Std. Error of Mean	17984
Coefficient of Variation	3.134	Skewness	3.162

Normal GOF Test

Shapiro Wilk Test Statistic	0.368	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.523	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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	51113	95% Adjusted-CLT UCL (Chen-1995)	66943
		95% Modified-t UCL (Johnson-1978)	54110

Gamma GOF Test

A-D Test Statistic	2.547	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.877	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.493	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.297	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.176	k star (bias corrected MLE)	0.19
Theta hat (MLE)	103241	Theta star (bias corrected MLE)	95657
nu hat (MLE)	3.515	nu star (bias corrected)	3.794
MLE Mean (bias corrected)	18147	MLE Sd (bias corrected)	41664
		Approximate Chi Square Value (0.05)	0.642
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	0.456

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	107231	95% Adjusted Gamma UCL (use when n<50)	150853

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.658	**Shapiro Wilk Lognormal GOF Test**

5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.325	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.714	Mean of logged Data	5.535
Maximum of Logged Data	12.1	SD of logged Data	2.425

Assuming Lognormal Distribution

95% H-UCL	873756	90% Chebyshev (MVUE) UCL	7600
95% Chebyshev (MVUE) UCL	9985	97.5% Chebyshev (MVUE) UCL	13296
99% Chebyshev (MVUE) UCL	19800		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	47728	95% Jackknife UCL	51113
95% Standard Bootstrap UCL	45672	95% Bootstrap-t UCL	10195881
95% Hall's Bootstrap UCL	8251038	95% Percentile Bootstrap UCL	54098
95% BCA Bootstrap UCL	72100		
90% Chebyshev(Mean, Sd) UCL	72098	95% Chebyshev(Mean, Sd) UCL	96536
97.5% Chebyshev(Mean, Sd) UCL	130455	99% Chebyshev(Mean, Sd) UCL	197083

Suggested UCL to Use

99% Chebyshev (Mean, Sd) UCL 197083

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Aroclor 1254

General Statistics

Total Number of Observations	10	Number of Distinct Observations	5
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	4
Minimum Detect	39	Minimum Non-Detect	35
Maximum Detect	210	Maximum Non-Detect	40
Variance Detects	14621	Percent Non-Detects	80%
Mean Detects	124.5	SD Detects	120.9
Median Detects	124.5	CV Detects	0.971
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	4.505	SD of Logged Detects	1.19

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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

Mean	52.95	Standard Error of Mean	23.42
SD	52.37	95% KM (BCA) UCL	N/A
95% KM (t) UCL	95.88	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	91.47	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	123.2	95% KM Chebyshev UCL	155
97.5% KM Chebyshev UCL	199.2	99% KM Chebyshev UCL	286

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.715	k star (bias corrected MLE)	N/A
Theta hat (MLE)	72.58	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	6.861	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.022	nu hat (KM)	20.45
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (20.45, α)	11.18	Adjusted Chi Square Value (20.45, β)	10.01
95% Gamma Approximate KM-UCL (use when n>=50)	96.82	95% Gamma Adjusted KM-UCL (use when n<50)	108.1

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	26.64	Mean in Log Scale	1.099
SD in Original Scale	65.49	SD in Log Scale	2.123
95% t UCL (assumes normality of ROS data)	64.61	95% Percentile Bootstrap UCL	65.06
95% BCA Bootstrap UCL	88.93	95% Bootstrap t UCL	751
95% H-UCL (Log ROS)	1604		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	39.6	Mean in Log Scale	3.229
SD in Original Scale	60.23	SD in Log Scale	0.782
95% t UCL (Assumes normality)	74.51	95% H-Stat UCL	68.91

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

95% KM (BCA) UCL N/A

Warning: One or more Recommended UCL(s) not available!

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	4	Number of Non-Detects	6
Number of Distinct Detects	4	Number of Distinct Non-Detects	6
Minimum Detect	0.9	Minimum Non-Detect	0.73
Maximum Detect	3.2	Maximum Non-Detect	0.85
Variance Detects	1.183	Percent Non-Detects	60%
Mean Detects	1.793	SD Detects	1.088
Median Detects	1.535	CV Detects	0.607
Skewness Detects	0.803	Kurtosis Detects	-1.528
Mean of Logged Detects	0.442	SD of Logged Detects	0.615

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.275	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	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

Mean	1.155	Standard Error of Mean	0.289
SD	0.791	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.685	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.63	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	2.022	95% KM Chebyshev UCL	2.414
97.5% KM Chebyshev UCL	2.959	99% KM Chebyshev UCL	4.029

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.395	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.313	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.396	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)	3.697	k star (bias corrected MLE)	1.091
Theta hat (MLE)	0.485	Theta star (bias corrected MLE)	1.643
nu hat (MLE)	29.58	nu star (bias corrected)	8.728
MLE Mean (bias corrected)	1.793	MLE Sd (bias corrected)	1.716

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.132	nu hat (KM)	42.63
Approximate Chi Square Value (42.63, α)	28.66	Adjusted Chi Square Value (42.63, β)	26.69

95% Gamma Approximate KM-UCL (use when n>=50)	1.718	95% Gamma Adjusted KM-UCL (use when n<50)	1.845

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.723
Maximum	3.2	Median	0.01
SD	1.114	CV	1.541
k hat (MLE)	0.304	k star (bias corrected MLE)	0.28
Theta hat (MLE)	2.377	Theta star (bias corrected MLE)	2.586
nu hat (MLE)	6.084	nu star (bias corrected)	5.592
MLE Mean (bias corrected)	0.723	MLE Sd (bias corrected)	1.367
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (5.59, α)	1.435	Adjusted Chi Square Value (5.59, β)	1.103
95% Gamma Approximate UCL (use when n>=50)	2.817	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.832	Mean in Log Scale	-0.813
SD in Original Scale	1.038	SD in Log Scale	1.137
95% t UCL (assumes normality of ROS data)	1.434	95% Percentile Bootstrap UCL	1.409
95% BCA Bootstrap UCL	1.441	95% Bootstrap t UCL	2.366
95% H-UCL (Log ROS)	3.064		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.0119	95% H-UCL (KM -Log)	1.623
KM SD (logged)	0.501	95% Critical H Value (KM-Log)	2.221
KM Standard Error of Mean (logged)	0.183		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.954	Mean in Log Scale	-0.383
SD in Original Scale	0.957	SD in Log Scale	0.795
95% t UCL (Assumes normality)	1.508	95% H-Stat UCL	1.914

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.685	95% KM (Percentile Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Arsenic

General Statistics

Total Number of Observations	10	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1.5	Mean	2.26
Maximum	3.7	Median	2.15
SD	0.62	Std. Error of Mean	0.196
Coefficient of Variation	0.275	Skewness	1.44

Normal GOF Test

Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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	2.62	95% Adjusted-CLT UCL (Chen-1995)	2.678
		95% Modified-t UCL (Johnson-1978)	2.635

Gamma GOF Test

A-D Test Statistic	0.353	**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	0.211	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	16.79	k star (bias corrected MLE)	11.82
Theta hat (MLE)	0.135	Theta star (bias corrected MLE)	0.191
nu hat (MLE)	335.8	nu star (bias corrected)	236.4
MLE Mean (bias corrected)	2.26	MLE Sd (bias corrected)	0.657
		Approximate Chi Square Value (0.05)	201.8
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	196.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2.647	95% Adjusted Gamma UCL (use when n<50)	2.722

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.195	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.405	Mean of logged Data	0.785
Maximum of Logged Data	1.308	SD of logged Data	0.252

Assuming Lognormal Distribution

95% H-UCL	2.662	90% Chebyshev (MVUE) UCL	2.799
95% Chebyshev (MVUE) UCL	3.045	97.5% Chebyshev (MVUE) UCL	3.386
99% Chebyshev (MVUE) UCL	4.056		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.583	95% Jackknife UCL	2.62
95% Standard Bootstrap UCL	2.565	95% Bootstrap-t UCL	2.839
95% Hall's Bootstrap UCL	4.153	95% Percentile Bootstrap UCL	2.6
95% BCA Bootstrap UCL	2.66		
90% Chebyshev(Mean, Sd) UCL	2.849	95% Chebyshev(Mean, Sd) UCL	3.115
97.5% Chebyshev(Mean, Sd) UCL	3.485	99% Chebyshev(Mean, Sd) UCL	4.212

Suggested UCL to Use

95% Student's-t UCL 2.62

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Chromium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	6.4	Mean	11.79
Maximum	40.2	Median	8.15
SD	10.19	Std. Error of Mean	3.223
Coefficient of Variation	0.864	Skewness	2.931

Normal GOF Test

Shapiro Wilk Test Statistic	0.542	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.388	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.28	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	17.7	95% Adjusted-CLT UCL (Chen-1995)	20.28

95% Modified-t UCL (Johnson-1978)	18.2

Gamma GOF Test

A-D Test Statistic	1.399	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.305	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.269	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.909	k star (bias corrected MLE)	2.103
Theta hat (MLE)	4.052	Theta star (bias corrected MLE)	5.606
nu hat (MLE)	58.19	nu star (bias corrected)	42.06
MLE Mean (bias corrected)	11.79	MLE Sd (bias corrected)	8.13
		Approximate Chi Square Value (0.05)	28.2
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	26.24

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	17.59	95% Adjusted Gamma UCL (use when n<50)	18.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.731	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.251	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.856	Mean of logged Data	2.286
Maximum of Logged Data	3.694	SD of logged Data	0.544

Assuming Lognormal Distribution

95% H-UCL	17.24	90% Chebyshev (MVUE) UCL	17.12
95% Chebyshev (MVUE) UCL	19.8	97.5% Chebyshev (MVUE) UCL	23.51
99% Chebyshev (MVUE) UCL	30.8		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	17.09	95% Jackknife UCL	17.7
95% Standard Bootstrap UCL	16.88	95% Bootstrap-t UCL	35.07
95% Hall's Bootstrap UCL	35.88	95% Percentile Bootstrap UCL	17.86
95% BCA Bootstrap UCL	20.85		
90% Chebyshev(Mean, Sd) UCL	21.46	95% Chebyshev(Mean, Sd) UCL	25.84
97.5% Chebyshev(Mean, Sd) UCL	31.92	99% Chebyshev(Mean, Sd) UCL	43.86

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	25.84

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	10	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	1.2	Mean	1.71
Maximum	2.6	Median	1.65
SD	0.472	Std. Error of Mean	0.149
Coefficient of Variation	0.276	Skewness	0.704

Normal GOF Test

Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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	1.984	95% Adjusted-CLT UCL (Chen-1995)	1.991
		95% Modified-t UCL (Johnson-1978)	1.989

Gamma GOF Test

A-D Test Statistic	0.461	**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	0.227	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	15.38	k star (bias corrected MLE)	10.83
Theta hat (MLE)	0.111	Theta star (bias corrected MLE)	0.158
nu hat (MLE)	307.6	nu star (bias corrected)	216.7
MLE Mean (bias corrected)	1.71	MLE Sd (bias corrected)	0.52
		Approximate Chi Square Value (0.05)	183.6
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	178.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2.018	95% Adjusted Gamma UCL (use when n<50)	2.078

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.217	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.182	Mean of logged Data	0.504
Maximum of Logged Data	0.956	SD of logged Data	0.267

Assuming Lognormal Distribution

95% H-UCL	2.039	90% Chebyshev (MVUE) UCL	2.145
95% Chebyshev (MVUE) UCL	2.342	97.5% Chebyshev (MVUE) UCL	2.616
99% Chebyshev (MVUE) UCL	3.155		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.956	95% Jackknife UCL	1.984
95% Standard Bootstrap UCL	1.934	95% Bootstrap-t UCL	2.064
95% Hall's Bootstrap UCL	1.964	95% Percentile Bootstrap UCL	1.95
95% BCA Bootstrap UCL	1.97		
90% Chebyshev(Mean, Sd) UCL	2.158	95% Chebyshev(Mean, Sd) UCL	2.361
97.5% Chebyshev(Mean, Sd) UCL	2.643	99% Chebyshev(Mean, Sd) UCL	3.197

Suggested UCL to Use

95% Student's-t UCL 1.984

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	5960	Mean	9196
Maximum	13300	Median	9095
SD	2742	Std. Error of Mean	867.1
Coefficient of Variation	0.298	Skewness	0.36

Normal GOF Test

Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.164	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.28	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	10786	95% Adjusted-CLT UCL (Chen-1995)	10728
		95% Modified-t UCL (Johnson-1978)	10802

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma GOF Test

A-D Test Statistic	0.34	**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	0.167	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.58	k star (bias corrected MLE)	8.872
Theta hat (MLE)	731.1	Theta star (bias corrected MLE)	1037
nu hat (MLE)	251.6	nu star (bias corrected)	177.4
MLE Mean (bias corrected)	9196	MLE Sd (bias corrected)	3087
		Approximate Chi Square Value (0.05)	147.6
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	142.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	11053	95% Adjusted Gamma UCL (use when n<50)	11418

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.924	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.149	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.693	Mean of logged Data	9.086
Maximum of Logged Data	9.496	SD of logged Data	0.3

Assuming Lognormal Distribution

95% H-UCL	11257	90% Chebyshev (MVUE) UCL	11830
95% Chebyshev (MVUE) UCL	13024	97.5% Chebyshev (MVUE) UCL	14680
99% Chebyshev (MVUE) UCL	17933		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	10622	95% Jackknife UCL	10786
95% Standard Bootstrap UCL	10535	95% Bootstrap-t UCL	10885
95% Hall's Bootstrap UCL	10713	95% Percentile Bootstrap UCL	10548
95% BCA Bootstrap UCL	10611		
90% Chebyshev(Mean, Sd) UCL	11797	95% Chebyshev(Mean, Sd) UCL	12976
97.5% Chebyshev(Mean, Sd) UCL	14611	99% Chebyshev(Mean, Sd) UCL	17824

Suggested UCL to Use

95% Student's-t UCL 10786

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)

and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	64.5	Mean	281.4
Maximum	763	Median	281
SD	200.9	Std. Error of Mean	63.52
Coefficient of Variation	0.714	Skewness	1.564

Normal GOF Test

Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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	397.8	95% Adjusted-CLT UCL (Chen-1995)	419.4
		95% Modified-t UCL (Johnson-1978)	403

Gamma GOF Test

A-D Test Statistic	0.306	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.173	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.269	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.379	k star (bias corrected MLE)	1.732
Theta hat (MLE)	118.3	Theta star (bias corrected MLE)	162.4
nu hat (MLE)	47.58	nu star (bias corrected)	34.64
MLE Mean (bias corrected)	281.4	MLE Sd (bias corrected)	213.8
		Approximate Chi Square Value (0.05)	22.18
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	20.46

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	439.5	95% Adjusted Gamma UCL (use when n<50)	476.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.209	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Lognormal Statistics

Minimum of Logged Data	4.167	Mean of logged Data	5.415
Maximum of Logged Data	6.637	SD of logged Data	0.728

Assuming Lognormal Distribution

95% H-UCL	548.5	90% Chebyshev (MVUE) UCL	486.6
95% Chebyshev (MVUE) UCL	578.5	97.5% Chebyshev (MVUE) UCL	705.9
99% Chebyshev (MVUE) UCL	956.2		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	385.8	95% Jackknife UCL	397.8
95% Standard Bootstrap UCL	378.5	95% Bootstrap-t UCL	451
95% Hall's Bootstrap UCL	884	95% Percentile Bootstrap UCL	389.5
95% BCA Bootstrap UCL	410.9		
90% Chebyshev(Mean, Sd) UCL	471.9	95% Chebyshev(Mean, Sd) UCL	558.2
97.5% Chebyshev(Mean, Sd) UCL	678	99% Chebyshev(Mean, Sd) UCL	913.4

Suggested UCL to Use

95% Student's-t UCL 397.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	60.5	Mean	153.8
Maximum	722	Median	91.4
SD	202	Std. Error of Mean	63.87
Coefficient of Variation	1.313	Skewness	3.034

Normal GOF Test

Shapiro Wilk Test Statistic	0.492	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.386	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.28	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	270.8	95% Adjusted-CLT UCL (Chen-1995)	324.3
		95% Modified-t UCL (Johnson-1978)	281

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma GOF Test

A-D Test Statistic	1.595	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.739	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.344	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.271	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.517	k star (bias corrected MLE)	1.129
Theta hat (MLE)	101.4	Theta star (bias corrected MLE)	136.2
nu hat (MLE)	30.34	nu star (bias corrected)	22.57
MLE Mean (bias corrected)	153.8	MLE Sd (bias corrected)	144.7
		Approximate Chi Square Value (0.05)	12.77
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	11.51

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	271.8	95% Adjusted Gamma UCL (use when n<50)	301.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.727	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.284	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.103	Mean of logged Data	4.671
Maximum of Logged Data	6.582	SD of logged Data	0.735

Assuming Lognormal Distribution

95% H-UCL	264.3	90% Chebyshev (MVUE) UCL	233.2
95% Chebyshev (MVUE) UCL	277.5	97.5% Chebyshev (MVUE) UCL	338.9
99% Chebyshev (MVUE) UCL	459.6		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	258.8	95% Jackknife UCL	270.8
95% Standard Bootstrap UCL	253.4	95% Bootstrap-t UCL	1033
95% Hall's Bootstrap UCL	799.4	95% Percentile Bootstrap UCL	273.4
95% BCA Bootstrap UCL	338.2		
90% Chebyshev(Mean, Sd) UCL	345.4	95% Chebyshev(Mean, Sd) UCL	432.1
97.5% Chebyshev(Mean, Sd) UCL	552.6	99% Chebyshev(Mean, Sd) UCL	789.2

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	432.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

For additional insight the user may want to consult a statistician.

Thallium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.03	Mean	0.0464
Maximum	0.084	Median	0.041
SD	0.0153	Std. Error of Mean	0.00483
Coefficient of Variation	0.329	Skewness	1.868

Normal GOF Test

Shapiro Wilk Test Statistic	0.801	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.288	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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	0.0553	95% Adjusted-CLT UCL (Chen-1995)	0.0574
		95% Modified-t UCL (Johnson-1978)	0.0557

Gamma GOF Test

A-D Test Statistic	0.652	**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	0.269	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.267	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.64	k star (bias corrected MLE)	8.912
Theta hat (MLE)	0.00367	Theta star (bias corrected MLE)	0.00521
nu hat (MLE)	252.7	nu star (bias corrected)	178.2
MLE Mean (bias corrected)	0.0464	MLE Sd (bias corrected)	0.0155
		Approximate Chi Square Value (0.05)	148.4
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	143.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.0557	95% Adjusted Gamma UCL (use when n<50)	0.0576

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.25	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Appendix C-3
ProUCL Output - Current Surface Soil - Rental Home Area
Matteo Sons, Inc. Site
Thorofare, New Jersey

Minimum of Logged Data	-3.507	Mean of logged Data	-3.111
Maximum of Logged Data	-2.477	SD of logged Data	0.286

Assuming Lognormal Distribution

95% H-UCL	0.056	90% Chebyshev (MVUE) UCL	0.0588
95% Chebyshev (MVUE) UCL	0.0646	97.5% Chebyshev (MVUE) UCL	0.0725
99% Chebyshev (MVUE) UCL	0.0881		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0543	95% Jackknife UCL	0.0553
95% Standard Bootstrap UCL	0.054	95% Bootstrap-t UCL	0.0624
95% Hall's Bootstrap UCL	0.089	95% Percentile Bootstrap UCL	0.055
95% BCA Bootstrap UCL	0.0574		
90% Chebyshev(Mean, Sd) UCL	0.0609	95% Chebyshev(Mean, Sd) UCL	0.0675
97.5% Chebyshev(Mean, Sd) UCL	0.0766	99% Chebyshev(Mean, Sd) UCL	0.0945

Suggested UCL to Use

95% Adjusted Gamma UCL	0.0576

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 10:33:12 PM
From File	ProUCL_Input_SS-WW.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	8	Number of Non-Detects	2
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	71	Minimum Non-Detect	180
Maximum Detect	620	Maximum Non-Detect	190
Variance Detects	34021	Percent Non-Detects	20%
Mean Detects	341.4	SD Detects	184.4
Median Detects	355	CV Detects	0.54
Skewness Detects	-0.0265	Kurtosis Detects	-0.711
Mean of Logged Detects	5.649	SD of Logged Detects	0.724

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	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

Mean	294.2	Standard Error of Mean	61.81
SD	181.5	95% KM (BCA) UCL	395
95% KM (t) UCL	407.5	95% KM (Percentile Bootstrap) UCL	393.1
95% KM (z) UCL	395.9	95% KM Bootstrap t UCL	415.3
90% KM Chebyshev UCL	479.6	95% KM Chebyshev UCL	563.6
97.5% KM Chebyshev UCL	680.2	99% KM Chebyshev UCL	909.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.296	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.22	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.296	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)	2.876	k star (bias corrected MLE)	1.881
Theta hat (MLE)	118.7	Theta star (bias corrected MLE)	181.5
nu hat (MLE)	46.02	nu star (bias corrected)	30.1
MLE Mean (bias corrected)	341.4	MLE Sd (bias corrected)	248.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.626	nu hat (KM)	52.53
Approximate Chi Square Value (52.53, α)	36.88	Adjusted Chi Square Value (52.53, β)	34.61
95% Gamma Approximate KM-UCL (use when n>=50)	419	95% Gamma Adjusted KM-UCL (use when n<50)	446.5

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	71	Mean	296.9
Maximum	620	Median	300
SD	187.7	CV	0.632
k hat (MLE)	2.446	k star (bias corrected MLE)	1.779
Theta hat (MLE)	121.4	Theta star (bias corrected MLE)	166.9
nu hat (MLE)	48.91	nu star (bias corrected)	35.57
MLE Mean (bias corrected)	296.9	MLE Sd (bias corrected)	222.6
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (35.57, α)	22.92	Adjusted Chi Square Value (35.57, β)	21.17
95% Gamma Approximate UCL (use when n>=50)	460.7	95% Gamma Adjusted UCL (use when n<50)	498.8

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	295.6	Mean in Log Scale	5.464
SD in Original Scale	189.1	SD in Log Scale	0.748
95% t UCL (assumes normality of ROS data)	405.2	95% Percentile Bootstrap UCL	391.5
95% BCA Bootstrap UCL	395	95% Bootstrap t UCL	417
95% H-UCL (Log ROS)	599.7		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.44	95% H-UCL (KM -Log)	589.6
KM SD (logged)	0.752	95% Critical H Value (KM-Log)	2.622
KM Standard Error of Mean (logged)	0.264		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	291.6	Mean in Log Scale	5.425
SD in Original Scale	193.6	SD in Log Scale	0.795
95% t UCL (Assumes normality)	403.8	95% H-Stat UCL	636.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	407.5	95% KM (Percentile Bootstrap) UCL	393.1

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	8	Number of Non-Detects	2
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	100	Minimum Non-Detect	180
Maximum Detect	670	Maximum Non-Detect	190
Variance Detects	47336	Percent Non-Detects	20%
Mean Detects	407.5	SD Detects	217.6
Median Detects	445	CV Detects	0.534
Skewness Detects	-0.255	Kurtosis Detects	-1.503
Mean of Logged Detects	5.832	SD of Logged Detects	0.704

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.313	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

Mean	351	Standard Error of Mean	72.73
SD	214.5	95% KM (BCA) UCL	465
95% KM (t) UCL	484.3	95% KM (Percentile Bootstrap) UCL	468
95% KM (z) UCL	470.6	95% KM Bootstrap t UCL	501.5
90% KM Chebyshev UCL	569.2	95% KM Chebyshev UCL	668
97.5% KM Chebyshev UCL	805.2	99% KM Chebyshev UCL	1075

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.397	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.211	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.296	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)	2.957	k star (bias corrected MLE)	1.931
Theta hat (MLE)	137.8	Theta star (bias corrected MLE)	211
nu hat (MLE)	47.31	nu star (bias corrected)	30.9
MLE Mean (bias corrected)	407.5	MLE Sd (bias corrected)	293.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.677	nu hat (KM)	53.53

Approximate Chi Square Value (53.53, α)	37.72	Adjusted Chi Square Value (53.53, β)	35.43
95% Gamma Approximate KM-UCL (use when n>=50)	498.1	95% Gamma Adjusted KM-UCL (use when n<50)	530.4

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	100	Mean	356.2
Maximum	670	Median	330
SD	220.2	CV	0.618
k hat (MLE)	2.573	k star (bias corrected MLE)	1.868
Theta hat (MLE)	138.5	Theta star (bias corrected MLE)	190.7
nu hat (MLE)	51.46	nu star (bias corrected)	37.35
MLE Mean (bias corrected)	356.2	MLE Sd (bias corrected)	260.7
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (37.35, α)	24.36	Adjusted Chi Square Value (37.35, β)	22.55
95% Gamma Approximate UCL (use when n>=50)	546.2	95% Gamma Adjusted UCL (use when n<50)	590

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	353.8	Mean in Log Scale	5.652
SD in Original Scale	222.7	SD in Log Scale	0.726
95% t UCL (assumes normality of ROS data)	483	95% Percentile Bootstrap UCL	461.9
95% BCA Bootstrap UCL	467	95% Bootstrap t UCL	498.2
95% H-UCL (Log ROS)	692.5		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.627	95% H-UCL (KM -Log)	670.1
KM SD (logged)	0.723	95% Critical H Value (KM-Log)	2.571
KM Standard Error of Mean (logged)	0.248		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	344.5	Mean in Log Scale	5.571
SD in Original Scale	233.4	SD in Log Scale	0.829
95% t UCL (Assumes normality)	479.8	95% H-Stat UCL	795.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	484.3	95% KM (Percentile Bootstrap) UCL	468

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	47	Minimum Non-Detect	190
Maximum Detect	1100	Maximum Non-Detect	190
Variance Detects	165619	Percent Non-Detects	10%
Mean Detects	606.3	SD Detects	407
Median Detects	590	CV Detects	0.671
Skewness Detects	-0.0119	Kurtosis Detects	-1.672
Mean of Logged Detects	6.054	SD of Logged Detects	1.066

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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

Mean	555.6	Standard Error of Mean	132.6
SD	394.9	95% KM (BCA) UCL	761
95% KM (t) UCL	798.7	95% KM (Percentile Bootstrap) UCL	754
95% KM (z) UCL	773.7	95% KM Bootstrap t UCL	805.3
90% KM Chebyshev UCL	953.4	95% KM Chebyshev UCL	1134
97.5% KM Chebyshev UCL	1384	99% KM Chebyshev UCL	1875

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.366	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.16	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.284	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)	1.561	k star (bias corrected MLE)	1.115
Theta hat (MLE)	388.5	Theta star (bias corrected MLE)	544
nu hat (MLE)	28.09	nu star (bias corrected)	20.06
MLE Mean (bias corrected)	606.3	MLE Sd (bias corrected)	574.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.979	nu hat (KM)	39.58
Approximate Chi Square Value (39.58, α)	26.16	Adjusted Chi Square Value (39.58, β)	24.28
95% Gamma Approximate KM-UCL (use when n>=50)	840.3	95% Gamma Adjusted KM-UCL (use when n<50)	905.4

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	47	Mean	561.3
Maximum	1100	Median	510
SD	409.3	CV	0.729
k hat (MLE)	1.472	k star (bias corrected MLE)	1.097
Theta hat (MLE)	381.4	Theta star (bias corrected MLE)	511.7
nu hat (MLE)	29.44	nu star (bias corrected)	21.94
MLE Mean (bias corrected)	561.3	MLE Sd (bias corrected)	535.9
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (21.94, α)	12.29	Adjusted Chi Square Value (21.94, β)	11.06
95% Gamma Approximate UCL (use when n>=50)	1002	95% Gamma Adjusted UCL (use when n<50)	1114

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	556.3	Mean in Log Scale	5.915
SD in Original Scale	415	SD in Log Scale	1.097
95% t UCL (assumes normality of ROS data)	796.9	95% Percentile Bootstrap UCL	767
95% BCA Bootstrap UCL	762	95% Bootstrap t UCL	807.5
95% H-UCL (Log ROS)	2267		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.892	95% H-UCL (KM -Log)	2145
KM SD (logged)	1.086	95% Critical H Value (KM-Log)	3.283
KM Standard Error of Mean (logged)	0.372		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	555.2	Mean in Log Scale	5.904
SD in Original Scale	416.4	SD in Log Scale	1.112
95% t UCL (Assumes normality)	796.6	95% H-Stat UCL	2340

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	798.7	95% KM (Percentile Bootstrap) UCL	754

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.

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Number of Detects	7	Number of Non-Detects	3
Number of Distinct Detects	6	Number of Distinct Non-Detects	3
Minimum Detect	38	Minimum Non-Detect	180
Maximum Detect	160	Maximum Non-Detect	260
Variance Detects	2345	Percent Non-Detects	30%
Mean Detects	106.7	SD Detects	48.42
Median Detects	120	CV Detects	0.454
Skewness Detects	-0.267	Kurtosis Detects	-1.658
Mean of Logged Detects	4.558	SD of Logged Detects	0.545

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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

Mean	106.7	Standard Error of Mean	18.3
SD	44.83	95% KM (BCA) UCL	135.7
95% KM (t) UCL	140.3	95% KM (Percentile Bootstrap) UCL	135.6
95% KM (z) UCL	136.8	95% KM Bootstrap t UCL	140.4
90% KM Chebyshev UCL	161.6	95% KM Chebyshev UCL	186.5
97.5% KM Chebyshev UCL	221	99% KM Chebyshev UCL	288.8

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.364	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.231	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.313	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)	4.623	k star (bias corrected MLE)	2.737
Theta hat (MLE)	23.09	Theta star (bias corrected MLE)	38.99
nu hat (MLE)	64.72	nu star (bias corrected)	38.31
MLE Mean (bias corrected)	106.7	MLE Sd (bias corrected)	64.51

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	5.666	nu hat (KM)	113.3
Approximate Chi Square Value (113.32, α)	89.74	Adjusted Chi Square Value (113.32, β)	86.1
95% Gamma Approximate KM-UCL (use when n>=50)	134.7	95% Gamma Adjusted KM-UCL (use when n<50)	140.4

Gamma ROS Statistics using Imputed Non-Detects

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	38	Mean	105.2
Maximum	160	Median	101.7
SD	39.61	CV	0.376
k hat (MLE)	6.518	k star (bias corrected MLE)	4.629
Theta hat (MLE)	16.14	Theta star (bias corrected MLE)	22.73
nu hat (MLE)	130.4	nu star (bias corrected)	92.58
MLE Mean (bias corrected)	105.2	MLE Sd (bias corrected)	48.91
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (92.58, α)	71.39	Adjusted Chi Square Value (92.58, β)	68.17
95% Gamma Approximate UCL (use when n>=50)	136.5	95% Gamma Adjusted UCL (use when n<50)	142.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	103.3	Mean in Log Scale	4.558
SD in Original Scale	39.91	SD in Log Scale	0.445
95% t UCL (assumes normality of ROS data)	126.5	95% Percentile Bootstrap UCL	123.6
95% BCA Bootstrap UCL	125	95% Bootstrap t UCL	127.7
95% H-UCL (Log ROS)	144.8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.558	95% H-UCL (KM -Log)	157.5
KM SD (logged)	0.504	95% Critical H Value (KM-Log)	2.226
KM Standard Error of Mean (logged)	0.206		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	106.2	Mean in Log Scale	4.583
SD in Original Scale	40.86	SD in Log Scale	0.456
95% t UCL (Assumes normality)	129.9	95% H-Stat UCL	150.7

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	140.3	95% KM (Percentile Bootstrap) UCL	135.6

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Number of Detects	8	Number of Non-Detects	2
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	89	Minimum Non-Detect	180
Maximum Detect	480	Maximum Non-Detect	190
Variance Detects	26702	Percent Non-Detects	20%
Mean Detects	301.1	SD Detects	163.4
Median Detects	310	CV Detects	0.543
Skewness Detects	-0.193	Kurtosis Detects	-1.873
Mean of Logged Detects	5.532	SD of Logged Detects	0.686

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	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

Mean	259.8	Standard Error of Mean	54.03
SD	159.8	95% KM (BCA) UCL	347
95% KM (t) UCL	358.8	95% KM (Percentile Bootstrap) UCL	346.8
95% KM (z) UCL	348.7	95% KM Bootstrap t UCL	358.2
90% KM Chebyshev UCL	421.9	95% KM Chebyshev UCL	495.3
97.5% KM Chebyshev UCL	597.2	99% KM Chebyshev UCL	797.4

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.494	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.211	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.296	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)	3.003	k star (bias corrected MLE)	1.96
Theta hat (MLE)	100.3	Theta star (bias corrected MLE)	153.6
nu hat (MLE)	48.04	nu star (bias corrected)	31.36
MLE Mean (bias corrected)	301.1	MLE Sd (bias corrected)	215.1

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.644	nu hat (KM)	52.88
Approximate Chi Square Value (52.88, α)	37.17	Adjusted Chi Square Value (52.88, β)	34.9
95% Gamma Approximate KM-UCL (use when n>=50)	369.6	95% Gamma Adjusted KM-UCL (use when n<50)	393.7

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	89	Mean	263.5
Maximum	480	Median	230
SD	164.5	CV	0.624
k hat (MLE)	2.615	k star (bias corrected MLE)	1.897
Theta hat (MLE)	100.8	Theta star (bias corrected MLE)	138.9
nu hat (MLE)	52.29	nu star (bias corrected)	37.94
MLE Mean (bias corrected)	263.5	MLE Sd (bias corrected)	191.3
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (37.94, α)	24.83	Adjusted Chi Square Value (37.94, β)	23.01
95% Gamma Approximate UCL (use when n>=50)	402.5	95% Gamma Adjusted UCL (use when n<50)	434.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	262.2	Mean in Log Scale	5.359
SD in Original Scale	165.8	SD in Log Scale	0.706
95% t UCL (assumes normality of ROS data)	358.3	95% Percentile Bootstrap UCL	348.6
95% BCA Bootstrap UCL	348.3	95% Bootstrap t UCL	370.5
95% H-UCL (Log ROS)	496.3		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.335	95% H-UCL (KM -Log)	475.5
KM SD (logged)	0.697	95% Critical H Value (KM-Log)	2.526
KM Standard Error of Mean (logged)	0.236		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	259.4	Mean in Log Scale	5.331
SD in Original Scale	168.8	SD in Log Scale	0.739
95% t UCL (Assumes normality)	357.3	95% H-Stat UCL	514.9

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	358.8	95% KM (Percentile Bootstrap) UCL	346.8

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.

Arsenic

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	0.63	Minimum Non-Detect	0.53
Maximum Detect	14.8	Maximum Non-Detect	0.53
Variance Detects	17.35	Percent Non-Detects	10%
Mean Detects	4.126	SD Detects	4.165
Median Detects	2.8	CV Detects	1.01
Skewness Detects	2.563	Kurtosis Detects	7.15
Mean of Logged Detects	1.098	SD of Logged Detects	0.831

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.656	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.325	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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

Mean	3.766	Standard Error of Mean	1.301
SD	3.879	95% KM (BCA) UCL	6.146
95% KM (t) UCL	6.151	95% KM (Percentile Bootstrap) UCL	6.046
95% KM (z) UCL	5.906	95% KM Bootstrap t UCL	9.689
90% KM Chebyshev UCL	7.669	95% KM Chebyshev UCL	9.437
97.5% KM Chebyshev UCL	11.89	99% KM Chebyshev UCL	16.71

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.669	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.23	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.283	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)	1.714	k star (bias corrected MLE)	1.217
Theta hat (MLE)	2.407	Theta star (bias corrected MLE)	3.391
nu hat (MLE)	30.85	nu star (bias corrected)	21.9
MLE Mean (bias corrected)	4.126	MLE Sd (bias corrected)	3.74

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.943	nu hat (KM)	18.86
Approximate Chi Square Value (18.86, α)	10.01	Adjusted Chi Square Value (18.86, β)	8.912
95% Gamma Approximate KM-UCL (use when n>=50)	7.093	95% Gamma Adjusted KM-UCL (use when n<50)	7.967

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3.714
Maximum	14.8	Median	2.8
SD	4.137	CV	1.114
k hat (MLE)	0.762	k star (bias corrected MLE)	0.6
Theta hat (MLE)	4.877	Theta star (bias corrected MLE)	6.193
nu hat (MLE)	15.23	nu star (bias corrected)	11.99
MLE Mean (bias corrected)	3.714	MLE Sd (bias corrected)	4.796
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (11.99, α)	5.223	Adjusted Chi Square Value (11.99, β)	4.472
95% Gamma Approximate UCL (use when n>=50)	8.529	95% Gamma Adjusted UCL (use when n<50)	9.962

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.757	Mean in Log Scale	0.906
SD in Original Scale	4.097	SD in Log Scale	0.992
95% t UCL (assumes normality of ROS data)	6.132	95% Percentile Bootstrap UCL	6.046
95% BCA Bootstrap UCL	6.964	95% Bootstrap t UCL	9.868
95% H-UCL (Log ROS)	11.22		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.925	95% H-UCL (KM -Log)	9.192
KM SD (logged)	0.907	95% Critical H Value (KM-Log)	2.916
KM Standard Error of Mean (logged)	0.304		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.74	Mean in Log Scale	0.855
SD in Original Scale	4.113	SD in Log Scale	1.097
95% t UCL (Assumes normality)	6.123	95% H-Stat UCL	14.37

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	9.437	95% GROS Adjusted Gamma UCL	9.962
95% Adjusted Gamma KM-UCL	7.967		

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

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	2.1	Minimum Non-Detect	1.1
Maximum Detect	13.3	Maximum Non-Detect	1.1
Variance Detects	11.1	Percent Non-Detects	10%
Mean Detects	5.333	SD Detects	3.332
Median Detects	4.4	CV Detects	0.625
Skewness Detects	2.008	Kurtosis Detects	4.538
Mean of Logged Detects	1.54	SD of Logged Detects	0.525

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.785	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.282	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	4.91	Standard Error of Mean	1.086
SD	3.239	95% KM (BCA) UCL	6.82
95% KM (t) UCL	6.902	95% KM (Percentile Bootstrap) UCL	6.81
95% KM (z) UCL	6.697	95% KM Bootstrap t UCL	8.517
90% KM Chebyshev UCL	8.169	95% KM Chebyshev UCL	9.646
97.5% KM Chebyshev UCL	11.7	99% KM Chebyshev UCL	15.72

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.44	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.215	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.281	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)	3.883	k star (bias corrected MLE)	2.663
Theta hat (MLE)	1.373	Theta star (bias corrected MLE)	2.003
nu hat (MLE)	69.9	nu star (bias corrected)	47.93
MLE Mean (bias corrected)	5.333	MLE Sd (bias corrected)	3.268

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.298	nu hat (KM)	45.95
Approximate Chi Square Value (45.95, α)	31.4	Adjusted Chi Square Value (45.95, β)	29.32
95% Gamma Approximate KM-UCL (use when n>=50)	7.186	95% Gamma Adjusted KM-UCL (use when n<50)	7.695

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4.801

Maximum	13.3	Median	4.3
SD	3.564	CV	0.742
k hat (MLE)	0.907	k star (bias corrected MLE)	0.702
Theta hat (MLE)	5.291	Theta star (bias corrected MLE)	6.84
nu hat (MLE)	18.15	nu star (bias corrected)	14.04
MLE Mean (bias corrected)	4.801	MLE Sd (bias corrected)	5.731
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (14.04, α)	6.597	Adjusted Chi Square Value (14.04, β)	5.734
95% Gamma Approximate UCL (use when n>=50)	10.22	95% Gamma Adjusted UCL (use when n<50)	11.75

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4.931	Mean in Log Scale	1.413
SD in Original Scale	3.389	SD in Log Scale	0.638
95% t UCL (assumes normality of ROS data)	6.895	95% Percentile Bootstrap UCL	6.77
95% BCA Bootstrap UCL	7.24	95% Bootstrap t UCL	8.677
95% H-UCL (Log ROS)	8.43		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.395	95% H-UCL (KM -Log)	8.304
KM SD (logged)	0.639	95% Critical H Value (KM-Log)	2.43
KM Standard Error of Mean (logged)	0.214		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.855	Mean in Log Scale	1.326
SD in Original Scale	3.486	SD in Log Scale	0.838
95% t UCL (Assumes normality)	6.876	95% H-Stat UCL	11.63

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	6.902	95% KM (Percentile Bootstrap) UCL	6.81

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

General Statistics

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Total Number of Observations	10	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	4420	Mean	7168
Maximum	16500	Median	5925
SD	3523	Std. Error of Mean	1114
Coefficient of Variation	0.492	Skewness	2.468

Normal GOF Test

Shapiro Wilk Test Statistic	0.68	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.319	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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	9210	95% Adjusted-CLT UCL (Chen-1995)	9930
		95% Modified-t UCL (Johnson-1978)	9355

Gamma GOF Test

A-D Test Statistic	0.967	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.728	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.273	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.267	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.79	k star (bias corrected MLE)	4.819
Theta hat (MLE)	1056	Theta star (bias corrected MLE)	1487
nu hat (MLE)	135.8	nu star (bias corrected)	96.39
MLE Mean (bias corrected)	7168	MLE Sd (bias corrected)	3265
		Approximate Chi Square Value (0.05)	74.74
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	71.44

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	9244	95% Adjusted Gamma UCL (use when n<50)	9672

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.826	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.245	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.394	Mean of logged Data	8.802
Maximum of Logged Data	9.711	SD of logged Data	0.376

Assuming Lognormal Distribution

95% H-UCL	9231	90% Chebyshev (MVUE) UCL	9629
95% Chebyshev (MVUE) UCL	10784	97.5% Chebyshev (MVUE) UCL	12387

99% Chebyshev (MVUE) UCL	15535

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	9001	95% Jackknife UCL	9210
95% Standard Bootstrap UCL	8926	95% Bootstrap-t UCL	13770
95% Hall's Bootstrap UCL	18318	95% Percentile Bootstrap UCL	9171
95% BCA Bootstrap UCL	9831		
90% Chebyshev(Mean, Sd) UCL	10510	95% Chebyshev(Mean, Sd) UCL	12024
97.5% Chebyshev(Mean, Sd) UCL	14126	99% Chebyshev(Mean, Sd) UCL	18253

Suggested UCL to Use

95% Student's-t UCL	9210	or 95% Modified-t UCL	9355

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	10.3	Minimum Non-Detect	0.53
Maximum Detect	75.5	Maximum Non-Detect	0.53
Variance Detects	411.2	Percent Non-Detects	10%
Mean Detects	28.66	SD Detects	20.28
Median Detects	18.8	CV Detects	0.708
Skewness Detects	1.746	Kurtosis Detects	3.408
Mean of Logged Detects	3.172	SD of Logged Detects	0.621

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.802	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.295	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	25.84	Standard Error of Mean	6.71
SD	20	95% KM (BCA) UCL	38.3
95% KM (t) UCL	38.14	95% KM (Percentile Bootstrap) UCL	37.15
95% KM (z) UCL	36.88	95% KM Bootstrap t UCL	43.88
90% KM Chebyshev UCL	45.97	95% KM Chebyshev UCL	55.09
97.5% KM Chebyshev UCL	67.74	99% KM Chebyshev UCL	92.6

Gamma GOF Tests on Detected Observations Only

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

A-D Test Statistic	0.47	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.727	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.234	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.281	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)	2.876	k star (bias corrected MLE)	1.991
Theta hat (MLE)	9.963	Theta star (bias corrected MLE)	14.39
nu hat (MLE)	51.77	nu star (bias corrected)	35.85
MLE Mean (bias corrected)	28.66	MLE Sd (bias corrected)	20.31

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.669	nu hat (KM)	33.38
Approximate Chi Square Value (33.38, α)	21.17	Adjusted Chi Square Value (33.38, β)	19.49
95% Gamma Approximate KM-UCL (use when n>=50)	40.75	95% Gamma Adjusted KM-UCL (use when n<50)	44.25

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	25.79
Maximum	75.5	Median	17.6
SD	21.16	CV	0.82
k hat (MLE)	0.705	k star (bias corrected MLE)	0.56
Theta hat (MLE)	36.57	Theta star (bias corrected MLE)	46.03
nu hat (MLE)	14.1	nu star (bias corrected)	11.21
MLE Mean (bias corrected)	25.79	MLE Sd (bias corrected)	34.46
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (11.21, α)	4.709	Adjusted Chi Square Value (11.21, β)	4.002
95% Gamma Approximate UCL (use when n>=50)	61.38	95% Gamma Adjusted UCL (use when n<50)	72.21

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	26.31	Mean in Log Scale	3.02
SD in Original Scale	20.5	SD in Log Scale	0.757
95% t UCL (assumes normality of ROS data)	38.2	95% Percentile Bootstrap UCL	37.22
95% BCA Bootstrap UCL	39.83	95% Bootstrap t UCL	46.23
95% H-UCL (Log ROS)	53.01		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.791	95% H-UCL (KM -Log)	173.6
KM SD (logged)	1.27	95% Critical H Value (KM-Log)	3.683
KM Standard Error of Mean (logged)	0.426		

Appendix C-4
ProUCL Output - Current/Future Surface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	25.82	Mean in Log Scale	2.722
SD in Original Scale	21.12	SD in Log Scale	1.539
95% t UCL (Assumes normality)	38.06	95% H-Stat UCL	450.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	38.14	95% KM (Percentile Bootstrap) UCL	37.15

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.

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/2/2015 10:56:23 AM
From File	ProUCL_Input_SS-Matteo.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Trichloroethene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	17
		Number of Missing Observations	1
Number of Detects	2	Number of Non-Detects	21
Number of Distinct Detects	2	Number of Distinct Non-Detects	15
Minimum Detect	2.4	Minimum Non-Detect	4
Maximum Detect	7	Maximum Non-Detect	7.6
Variance Detects	10.58	Percent Non-Detects	91.3%
Mean Detects	4.7	SD Detects	3.253
Median Detects	4.7	CV Detects	0.692
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	1.411	SD of Logged Detects	0.757

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	2.619	Standard Error of Mean	0.302
SD	0.98	95% KM (BCA) UCL	N/A
95% KM (t) UCL	3.138	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	3.116	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	3.526	95% KM Chebyshev UCL	3.937
97.5% KM Chebyshev UCL	4.507	99% KM Chebyshev UCL	5.627

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	3.812	k star (bias corrected MLE)	N/A
Theta hat (MLE)	1.233	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	15.25	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	7.148	nu hat (KM)	328.8
		Adjusted Level of Significance (β)	0.0389

Approximate Chi Square Value (328.80, α)	287.8	Adjusted Chi Square Value (328.80, β)	285
95% Gamma Approximate KM-UCL (use when n>=50)	2.992	95% Gamma Adjusted KM-UCL (use when n<50)	3.021

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.634	Mean in Log Scale	0.923
SD in Original Scale	1.032	SD in Log Scale	0.277
95% t UCL (assumes normality of ROS data)	3.004	95% Percentile Bootstrap UCL	3.015
95% BCA Bootstrap UCL	3.26	95% Bootstrap t UCL	3.471
95% H-UCL (Log ROS)	2.911		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.915	Mean in Log Scale	1.035
SD in Original Scale	0.982	SD in Log Scale	0.245
95% t UCL (Assumes normality)	3.267	95% H-Stat UCL	3.185

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

95% KM (t) UCL	3.138	95% KM (% Bootstrap) UCL	N/A

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.

Benzo(a)anthracene

General Statistics

Total Number of Observations	24	Number of Distinct Observations	20
Number of Detects	19	Number of Non-Detects	5
Number of Distinct Detects	18	Number of Distinct Non-Detects	2
Minimum Detect	19	Minimum Non-Detect	180
Maximum Detect	130000	Maximum Non-Detect	190
Variance Detects	8.861E+8	Percent Non-Detects	20.83%
Mean Detects	7082	SD Detects	29768
Median Detects	140	CV Detects	4.203
Skewness Detects	4.358	Kurtosis Detects	18.99
Mean of Logged Detects	5.19	SD of Logged Detects	2.007

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.251	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.524	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.203	Detected Data Not Normal at 5% Significance Level	

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	5619	Standard Error of Mean	5439
SD	25937	95% KM (BCA) UCL	16487
95% KM (t) UCL	14941	95% KM (Percentile Bootstrap) UCL	16409
95% KM (z) UCL	14566	95% KM Bootstrap t UCL	815224
90% KM Chebyshev UCL	21937	95% KM Chebyshev UCL	29329
97.5% KM Chebyshev UCL	39588	99% KM Chebyshev UCL	59740

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.138	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.891	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.413	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.22	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)	0.2	k star (bias corrected MLE)	0.204
Theta hat (MLE)	35374	Theta star (bias corrected MLE)	34770
nu hat (MLE)	7.608	nu star (bias corrected)	7.74
MLE Mean (bias corrected)	7082	MLE Sd (bias corrected)	15692

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0469	nu hat (KM)	2.253
Approximate Chi Square Value (2.25, α)	0.19	Adjusted Chi Square Value (2.25, β)	0.165
95% Gamma Approximate KM-UCL (use when n>=50)	66441	95% Gamma Adjusted KM-UCL (use when n<50)	76488

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5606
Maximum	130000	Median	68.5
SD	26497	CV	4.726
k hat (MLE)	0.141	k star (bias corrected MLE)	0.151
Theta hat (MLE)	39653	Theta star (bias corrected MLE)	37008
nu hat (MLE)	6.787	nu star (bias corrected)	7.272
MLE Mean (bias corrected)	5606	MLE Sd (bias corrected)	14404
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (7.27, α)	2.321	Adjusted Chi Square Value (7.27, β)	2.129
95% Gamma Approximate UCL (use when n>=50)	17566	95% Gamma Adjusted UCL (use when n<50)	19149

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5619	Mean in Log Scale	4.922
SD in Original Scale	26495	SD in Log Scale	1.879
95% t UCL (assumes normality of ROS data)	14888	95% Percentile Bootstrap UCL	16425
95% BCA Bootstrap UCL	21890	95% Bootstrap t UCL	845499
95% H-UCL (Log ROS)	3682		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.918	95% H-UCL (KM -Log)	3197
KM SD (logged)	1.838	95% Critical H Value (KM-Log)	3.819
KM Standard Error of Mean (logged)	0.392		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5626	Mean in Log Scale	5.053
SD in Original Scale	26493	SD in Log Scale	1.796
95% t UCL (Assumes normality)	14894	95% H-Stat UCL	3197

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 59740

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	24	Number of Distinct Observations	15
Number of Detects	16	Number of Non-Detects	8
Number of Distinct Detects	14	Number of Distinct Non-Detects	2
Minimum Detect	29	Minimum Non-Detect	180
Maximum Detect	79000	Maximum Non-Detect	190
Variance Detects	3.880E+8	Percent Non-Detects	33.33%
Mean Detects	5137	SD Detects	19698
Median Detects	170	CV Detects	3.834
Skewness Detects	3.999	Kurtosis Detects	16
Mean of Logged Detects	5.288	SD of Logged Detects	1.89

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.281	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.528	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	3451	Standard Error of Mean	3321
SD	15754	95% KM (BCA) UCL	10043
95% KM (t) UCL	9143	95% KM (Percentile Bootstrap) UCL	10014
95% KM (z) UCL	8914	95% KM Bootstrap t UCL	379803
90% KM Chebyshev UCL	13415	95% KM Chebyshev UCL	17928
97.5% KM Chebyshev UCL	24192	99% KM Chebyshev UCL	36497

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.589	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.873	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.448	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.237	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)	0.222	k star (bias corrected MLE)	0.222
Theta hat (MLE)	23109	Theta star (bias corrected MLE)	23110
nu hat (MLE)	7.114	nu star (bias corrected)	7.113
MLE Mean (bias corrected)	5137	MLE Sd (bias corrected)	10896

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.048	nu hat (KM)	2.304
Approximate Chi Square Value (2.30, α)	0.2	Adjusted Chi Square Value (2.30, β)	0.173
95% Gamma Approximate KM-UCL (use when n>=50)	39739	95% Gamma Adjusted KM-UCL (use when n<50)	45897

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3425
Maximum	79000	Median	63
SD	16099	CV	4.701
k hat (MLE)	0.128	k star (bias corrected MLE)	0.14
Theta hat (MLE)	26783	Theta star (bias corrected MLE)	24521
nu hat (MLE)	6.138	nu star (bias corrected)	6.704
MLE Mean (bias corrected)	3425	MLE Sd (bias corrected)	9164
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (6.70, α)	2.01	Adjusted Chi Square Value (6.70, β)	1.834
95% Gamma Approximate UCL (use when n>=50)	11425	95% Gamma Adjusted UCL (use when n<50)	12518

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.78	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3454	Mean in Log Scale	4.918
SD in Original Scale	16092	SD in Log Scale	1.683
95% t UCL (assumes normality of ROS data)	9083	95% Percentile Bootstrap UCL	10012
95% BCA Bootstrap UCL	13328	95% Bootstrap t UCL	407792
95% H-UCL (Log ROS)	1971		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.922	95% H-UCL (KM -Log)	1643
KM SD (logged)	1.62	95% Critical H Value (KM-Log)	3.464
KM Standard Error of Mean (logged)	0.355		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3456	Mean in Log Scale	5.037
SD in Original Scale	16092	SD in Log Scale	1.569
95% t UCL (Assumes normality)	9085	95% H-Stat UCL	1594

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 36497

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	24	Number of Distinct Observations	21
Number of Detects	19	Number of Non-Detects	5
Number of Distinct Detects	19	Number of Distinct Non-Detects	2
Minimum Detect	23	Minimum Non-Detect	180
Maximum Detect	110000	Maximum Non-Detect	190
Variance Detects	6.333E+8	Percent Non-Detects	20.83%
Mean Detects	6088	SD Detects	25165
Median Detects	210	CV Detects	4.134
Skewness Detects	4.358	Kurtosis Detects	18.99
Mean of Logged Detects	5.532	SD of Logged Detects	1.861

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.253	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.527	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.203	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

Mean	4836	Standard Error of Mean	4599
SD	21930	95% KM (BCA) UCL	13988
95% KM (t) UCL	12719	95% KM (Percentile Bootstrap) UCL	13959
95% KM (z) UCL	12401	95% KM Bootstrap t UCL	449820
90% KM Chebyshev UCL	18634	95% KM Chebyshev UCL	24883
97.5% KM Chebyshev UCL	33558	99% KM Chebyshev UCL	50597

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.985	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.878	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.431	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.219	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)	0.227	k star (bias corrected MLE)	0.226
Theta hat (MLE)	26848	Theta star (bias corrected MLE)	26933
nu hat (MLE)	8.617	nu star (bias corrected)	8.589
MLE Mean (bias corrected)	6088	MLE Sd (bias corrected)	12805

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0486	nu hat (KM)	2.335
Approximate Chi Square Value (2.33, α)	0.206	Adjusted Chi Square Value (2.33, β)	0.178
95% Gamma Approximate KM-UCL (use when n>=50)	54785	95% Gamma Adjusted KM-UCL (use when n<50)	63382

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4820
Maximum	110000	Median	125
SD	22405	CV	4.649
k hat (MLE)	0.152	k star (bias corrected MLE)	0.16
Theta hat (MLE)	31782	Theta star (bias corrected MLE)	30034
nu hat (MLE)	7.279	nu star (bias corrected)	7.703
MLE Mean (bias corrected)	4820	MLE Sd (bias corrected)	12031
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (7.70, α)	2.564	Adjusted Chi Square Value (7.70, β)	2.36
95% Gamma Approximate UCL (use when n>=50)	14479	95% Gamma Adjusted UCL (use when n<50)	15730

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.838	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4836	Mean in Log Scale	5.25
SD in Original Scale	22402	SD in Log Scale	1.763
95% t UCL (assumes normality of ROS data)	12673	95% Percentile Bootstrap UCL	13966
95% BCA Bootstrap UCL	18583	95% Bootstrap t UCL	457059
95% H-UCL (Log ROS)	3505		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.257	95% H-UCL (KM -Log)	3116
KM SD (logged)	1.722	95% Critical H Value (KM-Log)	3.63
KM Standard Error of Mean (logged)	0.369		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4839	Mean in Log Scale	5.324
SD in Original Scale	22401	SD in Log Scale	1.698
95% t UCL (Assumes normality)	12676	95% H-Stat UCL	3093

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 50597

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.

Benzo(k)fluoranthene

General Statistics

Total Number of Observations	24	Number of Distinct Observations	13
Number of Detects	13	Number of Non-Detects	11
Number of Distinct Detects	12	Number of Distinct Non-Detects	2
Minimum Detect	50	Minimum Non-Detect	180
Maximum Detect	63000	Maximum Non-Detect	190
Variance Detects	3.025E+8	Percent Non-Detects	45.83%
Mean Detects	5124	SD Detects	17392
Median Detects	210	CV Detects	3.394
Skewness Detects	3.604	Kurtosis Detects	12.99
Mean of Logged Detects	5.726	SD of Logged Detects	1.861

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.324	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.52	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	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

Mean	2815	Standard Error of Mean	2667
SD	12551	95% KM (BCA) UCL	8073
95% KM (t) UCL	7385	95% KM (Percentile Bootstrap) UCL	8023
95% KM (z) UCL	7201	95% KM Bootstrap t UCL	213497
90% KM Chebyshev UCL	10815	95% KM Chebyshev UCL	14439
97.5% KM Chebyshev UCL	19468	99% KM Chebyshev UCL	29348

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.709	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.851	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.428	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.259	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)	0.252	k star (bias corrected MLE)	0.245
Theta hat (MLE)	20342	Theta star (bias corrected MLE)	20911
nu hat (MLE)	6.55	nu star (bias corrected)	6.371
MLE Mean (bias corrected)	5124	MLE Sd (bias corrected)	10351

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0503	nu hat (KM)	2.414
Approximate Chi Square Value (2.41, α)	0.222	Adjusted Chi Square Value (2.41, β)	0.192
95% Gamma Approximate KM-UCL (use when n>=50)	30561	95% Gamma Adjusted KM-UCL (use when n<50)	35478

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2776
Maximum	63000	Median	60.5
SD	12830	CV	4.622
k hat (MLE)	0.115	k star (bias corrected MLE)	0.128
Theta hat (MLE)	24144	Theta star (bias corrected MLE)	21622
nu hat (MLE)	5.518	nu star (bias corrected)	6.162
MLE Mean (bias corrected)	2776	MLE Sd (bias corrected)	7747
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (6.16, α)	1.723	Adjusted Chi Square Value (6.16, β)	1.564
95% Gamma Approximate UCL (use when n>=50)	9926	95% Gamma Adjusted UCL (use when n<50)	10936

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.785	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2818	Mean in Log Scale	5.033

SD in Original Scale	12821	SD in Log Scale	1.655
95% t UCL (assumes normality of ROS data)	7303	95% Percentile Bootstrap UCL	8046
95% BCA Bootstrap UCL	10740	95% Bootstrap t UCL	207627
95% H-UCL (Log ROS)	2029		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.106	95% H-UCL (KM -Log)	1410
KM SD (logged)	1.498	95% Critical H Value (KM-Log)	3.272
KM Standard Error of Mean (logged)	0.329		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2818	Mean in Log Scale	5.18
SD in Original Scale	12821	SD in Log Scale	1.474
95% t UCL (Assumes normality)	7303	95% H-Stat UCL	1424

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 29348

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.

Chrysene

General Statistics

Total Number of Observations	24	Number of Distinct Observations	20
Number of Detects	19	Number of Non-Detects	5
Number of Distinct Detects	18	Number of Distinct Non-Detects	2
Minimum Detect	27	Minimum Non-Detect	180
Maximum Detect	110000	Maximum Non-Detect	190
Variance Detects	6.336E+8	Percent Non-Detects	20.83%
Mean Detects	6065	SD Detects	25171
Median Detects	160	CV Detects	4.15
Skewness Detects	4.358	Kurtosis Detects	18.99
Mean of Logged Detects	5.394	SD of Logged Detects	1.903

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.253	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.527	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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

Mean	4817	Standard Error of Mean	4600

SD	21934	95% KM (BCA) UCL	14022
95% KM (t) UCL	12700	95% KM (Percentile Bootstrap) UCL	13959
95% KM (z) UCL	12383	95% KM Bootstrap t UCL	470861
90% KM Chebyshev UCL	18616	95% KM Chebyshev UCL	24867
97.5% KM Chebyshev UCL	33543	99% KM Chebyshev UCL	50586

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.002	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.882	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.424	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.219	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)	0.219	k star (bias corrected MLE)	0.219
Theta hat (MLE)	27718	Theta star (bias corrected MLE)	27650
nu hat (MLE)	8.315	nu star (bias corrected)	8.335
MLE Mean (bias corrected)	6065	MLE Sd (bias corrected)	12950

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0482	nu hat (KM)	2.315
Approximate Chi Square Value (2.31, α)	0.202	Adjusted Chi Square Value (2.31, β)	0.175
95% Gamma Approximate KM-UCL (use when n>=50)	55143	95% Gamma Adjusted KM-UCL (use when n<50)	63727

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4801
Maximum	110000	Median	91.5
SD	22409	CV	4.667
k hat (MLE)	0.149	k star (bias corrected MLE)	0.158
Theta hat (MLE)	32237	Theta star (bias corrected MLE)	30369
nu hat (MLE)	7.149	nu star (bias corrected)	7.589
MLE Mean (bias corrected)	4801	MLE Sd (bias corrected)	12075
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (7.59, α)	2.499	Adjusted Chi Square Value (7.59, β)	2.298
95% Gamma Approximate UCL (use when n>=50)	14579	95% Gamma Adjusted UCL (use when n<50)	15853

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.822	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.164	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4818	Mean in Log Scale	5.139
SD in Original Scale	22406	SD in Log Scale	1.783

95% t UCL (assumes normality of ROS data)	12656	95% Percentile Bootstrap UCL	13930
95% BCA Bootstrap UCL	18626	95% Bootstrap t UCL	480992
95% H-UCL (Log ROS)	3348		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.131	95% H-UCL (KM -Log)	2948
KM SD (logged)	1.745	95% Critical H Value (KM-Log)	3.667
KM Standard Error of Mean (logged)	0.372		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4821	Mean in Log Scale	5.215
SD in Original Scale	22405	SD in Log Scale	1.721
95% t UCL (Assumes normality)	12659	95% H-Stat UCL	2976

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 50586

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	24	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	15
Number of Distinct Detects	7	Number of Distinct Non-Detects	3
Minimum Detect	40	Minimum Non-Detect	180
Maximum Detect	23000	Maximum Non-Detect	200
Variance Detects	58216029	Percent Non-Detects	62.5%
Mean Detects	2654	SD Detects	7630
Median Detects	91	CV Detects	2.875
Skewness Detects	3	Kurtosis Detects	8.998
Mean of Logged Detects	5.125	SD of Logged Detects	1.951

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.398	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.514	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.295	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

Mean	1042	Standard Error of Mean	991.4
SD	4579	95% KM (BCA) UCL	2956

95% KM (t) UCL	2741	95% KM (Percentile Bootstrap) UCL	2949
95% KM (z) UCL	2673	95% KM Bootstrap t UCL	90204
90% KM Chebyshev UCL	4016	95% KM Chebyshev UCL	5364
97.5% KM Chebyshev UCL	7233	99% KM Chebyshev UCL	10906

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.082	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.825	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.474	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.304	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)	0.256	k star (bias corrected MLE)	0.245
Theta hat (MLE)	10352	Theta star (bias corrected MLE)	10833
nu hat (MLE)	4.616	nu star (bias corrected)	4.41
MLE Mean (bias corrected)	2654	MLE Sd (bias corrected)	5362

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0518	nu hat (KM)	2.487
Approximate Chi Square Value (2.49, α)	0.238	Adjusted Chi Square Value (2.49, β)	0.205
95% Gamma Approximate KM-UCL (use when n>=50)	10883	95% Gamma Adjusted KM-UCL (use when n<50)	12662

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1108
Maximum	23000	Median	20.01
SD	4678	CV	4.222
k hat (MLE)	0.12	k star (bias corrected MLE)	0.133
Theta hat (MLE)	9236	Theta star (bias corrected MLE)	8347
nu hat (MLE)	5.758	nu star (bias corrected)	6.371
MLE Mean (bias corrected)	1108	MLE Sd (bias corrected)	3041
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (6.37, α)	1.832	Adjusted Chi Square Value (6.37, β)	1.667
95% Gamma Approximate UCL (use when n>=50)	3852	95% Gamma Adjusted UCL (use when n<50)	4235

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.693	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.325	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1059	Mean in Log Scale	4.589
SD in Original Scale	4674	SD in Log Scale	1.421
95% t UCL (assumes normality of ROS data)	2694	95% Percentile Bootstrap UCL	2962

95% BCA Bootstrap UCL	3926	95% Bootstrap t UCL	70132
95% H-UCL (Log ROS)	686.6		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1054	Mean in Log Scale	4.757
SD in Original Scale	4675	SD in Log Scale	1.187
95% t UCL (Assumes normality)	2689	95% H-Stat UCL	471.3

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

97.5% KM (Chebyshev) UCL 7233

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	24	Number of Distinct Observations	15
Number of Detects	13	Number of Non-Detects	11
Number of Distinct Detects	13	Number of Distinct Non-Detects	2
Minimum Detect	45	Minimum Non-Detect	180
Maximum Detect	35000	Maximum Non-Detect	190
Variance Detects	93193837	Percent Non-Detects	45.83%
Mean Detects	2875	SD Detects	9654
Median Detects	140	CV Detects	3.357
Skewness Detects	3.604	Kurtosis Detects	12.99
Mean of Logged Detects	5.372	SD of Logged Detects	1.739

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.325	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.519	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.246	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

Mean	1600	Standard Error of Mean	1480
SD	6966	95% KM (BCA) UCL	4527
95% KM (t) UCL	4137	95% KM (Percentile Bootstrap) UCL	4495
95% KM (z) UCL	4035	95% KM Bootstrap t UCL	98696
90% KM Chebyshev UCL	6040	95% KM Chebyshev UCL	8051
97.5% KM Chebyshev UCL	10843	99% KM Chebyshev UCL	16325

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.821	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.843	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.434	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.258	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)	0.271	k star (bias corrected MLE)	0.259
Theta hat (MLE)	10626	Theta star (bias corrected MLE)	11084
nu hat (MLE)	7.035	nu star (bias corrected)	6.745
MLE Mean (bias corrected)	2875	MLE Sd (bias corrected)	5645

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0528	nu hat (KM)	2.534
Approximate Chi Square Value (2.53, α)	0.249	Adjusted Chi Square Value (2.53, β)	0.214
95% Gamma Approximate KM-UCL (use when n>=50)	16293	95% Gamma Adjusted KM-UCL (use when n<50)	18975

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1575
Maximum	35000	Median	52
SD	7122	CV	4.523
k hat (MLE)	0.128	k star (bias corrected MLE)	0.14
Theta hat (MLE)	12264	Theta star (bias corrected MLE)	11237
nu hat (MLE)	6.163	nu star (bias corrected)	6.726
MLE Mean (bias corrected)	1575	MLE Sd (bias corrected)	4206
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (6.73, α)	2.021	Adjusted Chi Square Value (6.73, β)	1.845
95% Gamma Approximate UCL (use when n>=50)	5239	95% Gamma Adjusted UCL (use when n<50)	5739

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.757	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.222	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1611	Mean in Log Scale	4.96
SD in Original Scale	7113	SD in Log Scale	1.447
95% t UCL (assumes normality of ROS data)	4099	95% Percentile Bootstrap UCL	4502
95% BCA Bootstrap UCL	5988	95% Bootstrap t UCL	99082
95% H-UCL (Log ROS)	1063		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.946	95% H-UCL (KM -Log)	821.9
KM SD (logged)	1.349	95% Critical H Value (KM-Log)	3.042

KM Standard Error of Mean (logged)	0.304

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1600	Mean in Log Scale	4.988
SD in Original Scale	7115	SD in Log Scale	1.326
95% t UCL (Assumes normality)	4089	95% H-Stat UCL	812.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 16325

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.

Pyrene

General Statistics

Total Number of Observations	24	Number of Distinct Observations	21
Number of Detects	20	Number of Non-Detects	4
Number of Distinct Detects	20	Number of Distinct Non-Detects	2
Minimum Detect	27	Minimum Non-Detect	180
Maximum Detect	180000	Maximum Non-Detect	190
Variance Detects	1.614E+9	Percent Non-Detects	16.67%
Mean Detects	9300	SD Detects	40180
Median Detects	180	CV Detects	4.32
Skewness Detects	4.472	Kurtosis Detects	20
Mean of Logged Detects	5.491	SD of Logged Detects	1.931

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.242	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.53	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	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

Mean	7764	Standard Error of Mean	7522
SD	35915	95% KM (BCA) UCL	22756
95% KM (t) UCL	20655	95% KM (Percentile Bootstrap) UCL	22714
95% KM (z) UCL	20136	95% KM Bootstrap t UCL	1109982
90% KM Chebyshev UCL	30328	95% KM Chebyshev UCL	40550
97.5% KM Chebyshev UCL	54736	99% KM Chebyshev UCL	82603

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.542	**Anderson-Darling GOF Test**

5% A-D Critical Value	0.892	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.43	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.215	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)	0.202	k star (bias corrected MLE)	0.205
Theta hat (MLE)	46140	Theta star (bias corrected MLE)	45441
nu hat (MLE)	8.063	nu star (bias corrected)	8.187
MLE Mean (bias corrected)	9300	MLE Sd (bias corrected)	20558

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0467	nu hat (KM)	2.243
Approximate Chi Square Value (2.24, α)	0.189	Adjusted Chi Square Value (2.24, β)	0.164
95% Gamma Approximate KM-UCL (use when n>=50)	92260	95% Gamma Adjusted KM-UCL (use when n<50)	106138

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	7750
Maximum	180000	Median	125
SD	36691	CV	4.734
k hat (MLE)	0.149	k star (bias corrected MLE)	0.159
Theta hat (MLE)	51871	Theta star (bias corrected MLE)	48893
nu hat (MLE)	7.172	nu star (bias corrected)	7.609
MLE Mean (bias corrected)	7750	MLE Sd (bias corrected)	19466
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (7.61, α)	2.511	Adjusted Chi Square Value (7.61, β)	2.309
95% Gamma Approximate UCL (use when n>=50)	23488	95% Gamma Adjusted UCL (use when n<50)	25537

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.809	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.154	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	7763	Mean in Log Scale	5.276
SD in Original Scale	36688	SD in Log Scale	1.839
95% t UCL (assumes normality of ROS data)	20598	95% Percentile Bootstrap UCL	22735
95% BCA Bootstrap UCL	30244	95% Bootstrap t UCL	1142471
95% H-UCL (Log ROS)	4585		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.28	95% H-UCL (KM -Log)	4037
KM SD (logged)	1.798	95% Critical H Value (KM-Log)	3.753
KM Standard Error of Mean (logged)	0.381		

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	7766	Mean in Log Scale	5.333
SD in Original Scale	36687	SD in Log Scale	1.792
95% t UCL (Assumes normality)	20601	95% H-Stat UCL	4176

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 82603

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.

Dioxin

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	0.735	Mean	12.35
Maximum	48.37	Median	3.618
SD	15.62	Std. Error of Mean	4.174
Coefficient of Variation	1.265	Skewness	1.367

Normal GOF Test

Shapiro Wilk Test Statistic	0.763	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	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	19.74	95% Adjusted-CLT UCL (Chen-1995)	20.84
		95% Modified-t UCL (Johnson-1978)	19.99

Gamma GOF Test

A-D Test Statistic	0.658	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.776	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.228	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.239	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.687	k star (bias corrected MLE)	0.588

Theta hat (MLE)	17.96	Theta star (bias corrected MLE)	21.01
nu hat (MLE)	19.25	nu star (bias corrected)	16.46
MLE Mean (bias corrected)	12.35	MLE Sd (bias corrected)	16.1
		Approximate Chi Square Value (0.05)	8.285
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	7.526

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	24.52	95% Adjusted Gamma UCL (use when n<50)	26.99

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.184	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.237	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.307	Mean of logged Data	1.632
Maximum of Logged Data	3.879	SD of logged Data	1.449

Assuming Lognormal Distribution

95% H-UCL	61.89	90% Chebyshev (MVUE) UCL	29.57
95% Chebyshev (MVUE) UCL	37.16	97.5% Chebyshev (MVUE) UCL	47.69
99% Chebyshev (MVUE) UCL	68.38		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	19.21	95% Jackknife UCL	19.74
95% Standard Bootstrap UCL	18.88	95% Bootstrap-t UCL	23.16
95% Hall's Bootstrap UCL	19.32	95% Percentile Bootstrap UCL	19.32
95% BCA Bootstrap UCL	20.06		
90% Chebyshev(Mean, Sd) UCL	24.87	95% Chebyshev(Mean, Sd) UCL	30.54
97.5% Chebyshev(Mean, Sd) UCL	38.41	99% Chebyshev(Mean, Sd) UCL	53.88

Suggested UCL to Use

95% Adjusted Gamma UCL	26.99

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

4,4'-DDT

General Statistics

Total Number of Observations	25	Number of Distinct Observations	13
Number of Detects	10	Number of Non-Detects	15
Number of Distinct Detects	9	Number of Distinct Non-Detects	4
Minimum Detect	4.6	Minimum Non-Detect	3.5

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Maximum Detect	32000	Maximum Non-Detect	3.9
Variance Detects	1.021E+8	Percent Non-Detects	60%
Mean Detects	3250	SD Detects	10102
Median Detects	15.5	CV Detects	3.108
Skewness Detects	3.162	Kurtosis Detects	9.998
Mean of Logged Detects	3.724	SD of Logged Detects	2.73

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.372	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.517	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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

Mean	1302	Standard Error of Mean	1321
SD	6266	95% KM (BCA) UCL	3860
95% KM (t) UCL	3562	95% KM (Percentile Bootstrap) UCL	3857
95% KM (z) UCL	3475	95% KM Bootstrap t UCL	302461
90% KM Chebyshev UCL	5265	95% KM Chebyshev UCL	7061
97.5% KM Chebyshev UCL	9552	99% KM Chebyshev UCL	14447

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.937	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.88	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.389	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.297	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)	0.173	k star (bias corrected MLE)	0.187
Theta hat (MLE)	18832	Theta star (bias corrected MLE)	17336
nu hat (MLE)	3.451	nu star (bias corrected)	3.749
MLE Mean (bias corrected)	3250	MLE Sd (bias corrected)	7506

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0432	nu hat (KM)	2.159
Approximate Chi Square Value (2.16, α)	0.174	Adjusted Chi Square Value (2.16, β)	0.153
95% Gamma Approximate KM-UCL (use when n>=50)	16135	95% Gamma Adjusted KM-UCL (use when n<50)	18360

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1300
Maximum	32000	Median	0.01
SD	6396	CV	4.92
k hat (MLE)	0.0966	k star (bias corrected MLE)	0.112
Theta hat (MLE)	13457	Theta star (bias corrected MLE)	11641

nu hat (MLE)	4.83	nu star (bias corrected)	5.584
MLE Mean (bias corrected)	1300	MLE Sd (bias corrected)	3890
		Adjusted Level of Significance (β)	0.0395
Approximate Chi Square Value (5.58, α)	1.431	Adjusted Chi Square Value (5.58, β)	1.294
95% Gamma Approximate UCL (use when n>=50)	5073	95% Gamma Adjusted UCL (use when n<50)	5610

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.797	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1300	Mean in Log Scale	-1.283
SD in Original Scale	6396	SD in Log Scale	4.887
95% t UCL (assumes normality of ROS data)	3489	95% Percentile Bootstrap UCL	3859
95% BCA Bootstrap UCL	5154	95% Bootstrap t UCL	296780
95% H-UCL (Log ROS)	3.180E+8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.241	95% H-UCL (KM -Log)	400.9
KM SD (logged)	2.037	95% Critical H Value (KM-Log)	4.036
KM Standard Error of Mean (logged)	0.429		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1301	Mean in Log Scale	1.845
SD in Original Scale	6396	SD in Log Scale	2.29
95% t UCL (Assumes normality)	3490	95% H-Stat UCL	699.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 14447

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.

Delta-BHC

General Statistics

Total Number of Observations	24	Number of Distinct Observations	7
		Number of Missing Observations	1
Number of Detects	2	Number of Non-Detects	22
Number of Distinct Detects	2	Number of Distinct Non-Detects	5
Minimum Detect	72	Minimum Non-Detect	1.7

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Maximum Detect	690	Maximum Non-Detect	2.3
Variance Detects	190962	Percent Non-Detects	91.67%
Mean Detects	381	SD Detects	437
Median Detects	381	CV Detects	1.147
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	5.407	SD of Logged Detects	1.598

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	33.31	Standard Error of Mean	39.74
SD	137.6	95% KM (BCA) UCL	N/A
95% KM (t) UCL	101.4	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	98.67	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	152.5	95% KM Chebyshev UCL	206.5
97.5% KM Chebyshev UCL	281.5	99% KM Chebyshev UCL	428.7

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.068	k star (bias corrected MLE)	N/A
Theta hat (MLE)	356.6	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	4.274	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0586	nu hat (KM)	2.811
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (2.81, α)	0.319	Adjusted Chi Square Value (2.81, β)	0.273
95% Gamma Approximate KM-UCL (use when n>=50)	293.8	95% Gamma Adjusted KM-UCL (use when n<50)	342.6

Gamma (KM) may not be used when k hat (KM) is < 0.1

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	31.82	Mean in Log Scale	-6.752
SD in Original Scale	141	SD in Log Scale	5.778
95% t UCL (assumes normality of ROS data)	81.13	95% Percentile Bootstrap UCL	86.44
95% BCA Bootstrap UCL	121	95% Bootstrap t UCL	24926
95% H-UCL (Log ROS)	9.982E+9		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	32.61	Mean in Log Scale	0.393

SD in Original Scale	140.8	SD in Log Scale	1.581
95% t UCL (Assumes normality)	81.86	95% H-Stat UCL	15.86

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

97.5% KM (Chebyshev) UCL 281.5

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.

Dieldrin

General Statistics

Total Number of Observations	24	Number of Distinct Observations	11
		Number of Missing Observations	1
Number of Detects	6	Number of Non-Detects	18
Number of Distinct Detects	6	Number of Distinct Non-Detects	6
Minimum Detect	3.6	Minimum Non-Detect	3.5
Maximum Detect	2400	Maximum Non-Detect	4.5
Variance Detects	950452	Percent Non-Detects	75%
Mean Detects	410.1	SD Detects	974.9
Median Detects	10.1	CV Detects	2.377
Skewness Detects	2.449	Kurtosis Detects	5.998
Mean of Logged Detects	3.111	SD of Logged Detects	2.415

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.505	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.484	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	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

Mean	105.1	Standard Error of Mean	107
SD	478.5	95% KM (BCA) UCL	304.5
95% KM (t) UCL	288.5	95% KM (Percentile Bootstrap) UCL	304.4
95% KM (z) UCL	281.2	95% KM Bootstrap t UCL	22228
90% KM Chebyshev UCL	426.2	95% KM Chebyshev UCL	571.6
97.5% KM Chebyshev UCL	773.4	99% KM Chebyshev UCL	1170

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.133	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.786	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.417	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.361	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)	0.245	k star (bias corrected MLE)	0.234
Theta hat (MLE)	1672	Theta star (bias corrected MLE)	1755
nu hat (MLE)	2.943	nu star (bias corrected)	2.805
MLE Mean (bias corrected)	410.1	MLE Sd (bias corrected)	848.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0483	nu hat (KM)	2.317
Approximate Chi Square Value (2.32, α)	0.203	Adjusted Chi Square Value (2.32, β)	0.175
95% Gamma Approximate KM-UCL (use when n>=50)	1202	95% Gamma Adjusted KM-UCL (use when n<50)	1389

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	102.5
Maximum	2400	Median	0.01
SD	489.4	CV	4.773
k hat (MLE)	0.11	k star (bias corrected MLE)	0.124
Theta hat (MLE)	933.6	Theta star (bias corrected MLE)	827.7
nu hat (MLE)	5.272	nu star (bias corrected)	5.946
MLE Mean (bias corrected)	102.5	MLE Sd (bias corrected)	291.3
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (5.95, α)	1.612	Adjusted Chi Square Value (5.95, β)	1.46
95% Gamma Approximate UCL (use when n>=50)	378.1	95% Gamma Adjusted UCL (use when n<50)	417.6

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.775	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.275	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	102.5	Mean in Log Scale	-3.427
SD in Original Scale	489.4	SD in Log Scale	4.647
95% t UCL (assumes normality of ROS data)	273.8	95% Percentile Bootstrap UCL	302
95% BCA Bootstrap UCL	405.6	95% Bootstrap t UCL	18172
95% H-UCL (Log ROS)	8007407		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.718	95% H-UCL (KM -Log)	33.81
KM SD (logged)	1.364	95% Critical H Value (KM-Log)	3.065
KM Standard Error of Mean (logged)	0.305		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	103.9	Mean in Log Scale	1.235

SD in Original Scale	489.1	SD in Log Scale	1.58
95% t UCL (Assumes normality)	275	95% H-Stat UCL	36.66

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 1170

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.

Heptachlor Epoxide

General Statistics

Total Number of Observations	25	Number of Distinct Observations	9
Number of Detects	7	Number of Non-Detects	18
Number of Distinct Detects	6	Number of Distinct Non-Detects	3
Minimum Detect	2.5	Minimum Non-Detect	1.8
Maximum Detect	1600	Maximum Non-Detect	2
Variance Detects	355025	Percent Non-Detects	72%
Mean Detects	252.1	SD Detects	595.8
Median Detects	15	CV Detects	2.364
Skewness Detects	2.619	Kurtosis Detects	6.888
Mean of Logged Detects	3.149	SD of Logged Detects	2.229

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.5	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.445	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.335	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

Mean	71.88	Standard Error of Mean	67.57
SD	312.8	95% KM (BCA) UCL	199.5
95% KM (t) UCL	187.5	95% KM (Percentile Bootstrap) UCL	195.1
95% KM (z) UCL	183	95% KM Bootstrap t UCL	5562
90% KM Chebyshev UCL	274.6	95% KM Chebyshev UCL	366.4
97.5% KM Chebyshev UCL	493.8	99% KM Chebyshev UCL	744.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.961	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.788	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.374	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.336	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)	0.291	k star (bias corrected MLE)	0.262
Theta hat (MLE)	866.1	Theta star (bias corrected MLE)	963.8
nu hat (MLE)	4.075	nu star (bias corrected)	3.662
MLE Mean (bias corrected)	252.1	MLE Sd (bias corrected)	492.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0528	nu hat (KM)	2.64
Approximate Chi Square Value (2.64, α)	0.274	Adjusted Chi Square Value (2.64, β)	0.236
95% Gamma Approximate KM-UCL (use when n>=50)	691.7	95% Gamma Adjusted KM-UCL (use when n<50)	802.9

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	70.59
Maximum	1600	Median	0.01
SD	319.5	CV	4.527
k hat (MLE)	0.119	k star (bias corrected MLE)	0.131
Theta hat (MLE)	594.7	Theta star (bias corrected MLE)	538.3
nu hat (MLE)	5.935	nu star (bias corrected)	6.556
MLE Mean (bias corrected)	70.59	MLE Sd (bias corrected)	194.9
		Adjusted Level of Significance (β)	0.0395
Approximate Chi Square Value (6.56, α)	1.93	Adjusted Chi Square Value (6.56, β)	1.764
95% Gamma Approximate UCL (use when n>=50)	239.7	95% Gamma Adjusted UCL (use when n<50)	262.3

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	70.62	Mean in Log Scale	-3.06
SD in Original Scale	319.5	SD in Log Scale	4.863
95% t UCL (assumes normality of ROS data)	180	95% Percentile Bootstrap UCL	197.5
95% BCA Bootstrap UCL	266.4	95% Bootstrap t UCL	5349
95% H-UCL (Log ROS)	43735845		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.305	95% H-UCL (KM -Log)	38.03
KM SD (logged)	1.586	95% Critical H Value (KM-Log)	3.325
KM Standard Error of Mean (logged)	0.343		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	71.25	Mean in Log Scale	0.829
SD in Original Scale	319.4	SD in Log Scale	1.85

95% t UCL (Assumes normality)	180.5	95% H-Stat UCL	52

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 744.2

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.

Aroclor 1254

General Statistics

Total Number of Observations	42	Number of Distinct Observations	19
Number of Detects	13	Number of Non-Detects	29
Number of Distinct Detects	13	Number of Distinct Non-Detects	8
Minimum Detect	36	Minimum Non-Detect	35
Maximum Detect	1200	Maximum Non-Detect	49
Variance Detects	148431	Percent Non-Detects	69.05%
Mean Detects	346.7	SD Detects	385.3
Median Detects	210	CV Detects	1.111
Skewness Detects	1.586	Kurtosis Detects	1.642
Mean of Logged Detects	5.247	SD of Logged Detects	1.209

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.767	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.245	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.246	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	131.5	Standard Error of Mean	40.36
SD	251.3	95% KM (BCA) UCL	199.3
95% KM (t) UCL	199.4	95% KM (Percentile Bootstrap) UCL	199
95% KM (z) UCL	197.9	95% KM Bootstrap t UCL	270.8
90% KM Chebyshev UCL	252.6	95% KM Chebyshev UCL	307.5
97.5% KM Chebyshev UCL	383.6	99% KM Chebyshev UCL	533.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.389	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.759	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.139	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.243	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)	0.963	k star (bias corrected MLE)	0.792
Theta hat (MLE)	359.9	Theta star (bias corrected MLE)	437.6
nu hat (MLE)	25.05	nu star (bias corrected)	20.6
MLE Mean (bias corrected)	346.7	MLE Sd (bias corrected)	389.5

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.274	nu hat (KM)	23
Approximate Chi Square Value (23.00, α)	13.09	Adjusted Chi Square Value (23.00, β)	12.82
95% Gamma Approximate KM-UCL (use when n>=50)	231.1	95% Gamma Adjusted KM-UCL (use when n<50)	235.9

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	107.3
Maximum	1200	Median	0.01
SD	264.1	CV	2.461
k hat (MLE)	0.126	k star (bias corrected MLE)	0.133
Theta hat (MLE)	849.3	Theta star (bias corrected MLE)	805.6
nu hat (MLE)	10.61	nu star (bias corrected)	11.19
MLE Mean (bias corrected)	107.3	MLE Sd (bias corrected)	294
		Adjusted Level of Significance (β)	0.0443
Approximate Chi Square Value (11.19, α)	4.698	Adjusted Chi Square Value (11.19, β)	4.549
95% Gamma Approximate UCL (use when n>=50)	255.6	95% Gamma Adjusted UCL (use when n<50)	264

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	111.7	Mean in Log Scale	2.494
SD in Original Scale	262.4	SD in Log Scale	2.23
95% t UCL (assumes normality of ROS data)	179.8	95% Percentile Bootstrap UCL	182.1
95% BCA Bootstrap UCL	201.3	95% Bootstrap t UCL	244.4
95% H-UCL (Log ROS)	583.1		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.08	95% H-UCL (KM -Log)	143.9
KM SD (logged)	1.014	95% Critical H Value (KM-Log)	2.372
KM Standard Error of Mean (logged)	0.163		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	120.2	Mean in Log Scale	3.641
SD in Original Scale	258.9	SD in Log Scale	1.271
95% t UCL (Assumes normality)	187.4	95% H-Stat UCL	145.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	199.4	95% KM (Percentile Bootstrap) UCL	199

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.

Aroclor 1260

General Statistics

Total Number of Observations	40	Number of Distinct Observations	26
		Number of Missing Observations	2
Number of Detects	23	Number of Non-Detects	17
Number of Distinct Detects	23	Number of Distinct Non-Detects	5
Minimum Detect	20	Minimum Non-Detect	35
Maximum Detect	200000	Maximum Non-Detect	39
Variance Detects	1.734E+9	Percent Non-Detects	42.5%
Mean Detects	9023	SD Detects	41636
Median Detects	130	CV Detects	4.614
Skewness Detects	4.794	Kurtosis Detects	22.99
Mean of Logged Detects	5.269	SD of Logged Detects	1.973

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.223	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.514	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.185	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

Mean	5199	Standard Error of Mean	5044
SD	31197	95% KM (BCA) UCL	15184
95% KM (t) UCL	13697	95% KM (Percentile Bootstrap) UCL	15170
95% KM (z) UCL	13495	95% KM Bootstrap t UCL	891718
90% KM Chebyshev UCL	20329	95% KM Chebyshev UCL	27183
97.5% KM Chebyshev UCL	36696	99% KM Chebyshev UCL	55381

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.172	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.904	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.411	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.201	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)	0.193	k star (bias corrected MLE)	0.197

Theta hat (MLE)	46796	Theta star (bias corrected MLE)	45883
nu hat (MLE)	8.87	nu star (bias corrected)	9.046
MLE Mean (bias corrected)	9023	MLE Sd (bias corrected)	20347

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0278	nu hat (KM)	2.222
Approximate Chi Square Value (2.22, α)	0.185	Adjusted Chi Square Value (2.22, β)	0.172
95% Gamma Approximate KM-UCL (use when n>=50)	62451	95% Gamma Adjusted KM-UCL (use when n<50)	67303

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5188
Maximum	200000	Median	36.5
SD	31596	CV	6.09
k hat (MLE)	0.108	k star (bias corrected MLE)	0.116
Theta hat (MLE)	48244	Theta star (bias corrected MLE)	44671
nu hat (MLE)	8.604	nu star (bias corrected)	9.292
MLE Mean (bias corrected)	5188	MLE Sd (bias corrected)	15224
		Adjusted Level of Significance (β)	0.044
Approximate Chi Square Value (9.29, α)	3.504	Adjusted Chi Square Value (9.29, β)	3.372
95% Gamma Approximate UCL (use when n>=50)	13758	95% Gamma Adjusted UCL (use when n<50)	14299

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.817	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.162	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5192	Mean in Log Scale	3.82
SD in Original Scale	31595	SD in Log Scale	2.348
95% t UCL (assumes normality of ROS data)	13609	95% Percentile Bootstrap UCL	15156
95% BCA Bootstrap UCL	20312	95% Bootstrap t UCL	913063
95% H-UCL (Log ROS)	3618		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.385	95% H-UCL (KM -Log)	1083
KM SD (logged)	1.793	95% Critical H Value (KM-Log)	3.467
KM Standard Error of Mean (logged)	0.295		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5196	Mean in Log Scale	4.261
SD in Original Scale	31595	SD in Log Scale	1.9
95% t UCL (Assumes normality)	13613	95% H-Stat UCL	1297

DL/2 is not a recommended method, provided for comparisons and historical reasons

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 36696

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.

Aluminum

General Statistics

Total Number of Observations	36	Number of Distinct Observations	36
		Number of Missing Observations	0
Minimum	1250	Mean	3106
Maximum	11900	Median	2325
SD	2377	Std. Error of Mean	396.2
Coefficient of Variation	0.765	Skewness	2.951

Normal GOF Test

Shapiro Wilk Test Statistic	0.624	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.217	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	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	3775	95% Adjusted-CLT UCL (Chen-1995)	3966
		95% Modified-t UCL (Johnson-1978)	3808

Gamma GOF Test

A-D Test Statistic	1.89	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.148	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.197	k star (bias corrected MLE)	2.949
Theta hat (MLE)	971.7	Theta star (bias corrected MLE)	1053
nu hat (MLE)	230.2	nu star (bias corrected)	212.3
MLE Mean (bias corrected)	3106	MLE Sd (bias corrected)	1809
		Approximate Chi Square Value (0.05)	179.6
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	178.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3672	95% Adjusted Gamma UCL (use when n<50)	3700

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.145	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.148	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.131	Mean of logged Data	7.877
Maximum of Logged Data	9.384	SD of logged Data	0.521

Assuming Lognormal Distribution

95% H-UCL	3577	90% Chebyshev (MVUE) UCL	3829
95% Chebyshev (MVUE) UCL	4201	97.5% Chebyshev (MVUE) UCL	4719
99% Chebyshev (MVUE) UCL	5735		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3758	95% Jackknife UCL	3775
95% Standard Bootstrap UCL	3761	95% Bootstrap-t UCL	4425
95% Hall's Bootstrap UCL	7197	95% Percentile Bootstrap UCL	3805
95% BCA Bootstrap UCL	3966		
90% Chebyshev(Mean, Sd) UCL	4295	95% Chebyshev(Mean, Sd) UCL	4833
97.5% Chebyshev(Mean, Sd) UCL	5580	99% Chebyshev(Mean, Sd) UCL	7048

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 4833

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	36	Number of Distinct Observations	27
Number of Detects	20	Number of Non-Detects	16
Number of Distinct Detects	20	Number of Distinct Non-Detects	8
Minimum Detect	0.22	Minimum Non-Detect	0.73
Maximum Detect	25.2	Maximum Non-Detect	1.1
Variance Detects	46.34	Percent Non-Detects	44.44%
Mean Detects	4.895	SD Detects	6.807
Median Detects	1.75	CV Detects	1.391
Skewness Detects	1.995	Kurtosis Detects	3.614
Mean of Logged Detects	0.687	SD of Logged Detects	1.445

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.71	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.259	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	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

Mean	2.925	Standard Error of Mean	0.927
SD	5.416	95% KM (BCA) UCL	4.51
95% KM (t) UCL	4.492	95% KM (Percentile Bootstrap) UCL	4.47
95% KM (z) UCL	4.45	95% KM Bootstrap t UCL	5.959
90% KM Chebyshev UCL	5.707	95% KM Chebyshev UCL	6.967
97.5% KM Chebyshev UCL	8.715	99% KM Chebyshev UCL	12.15

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.562	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.787	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.162	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.202	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)	0.674	k star (bias corrected MLE)	0.606
Theta hat (MLE)	7.263	Theta star (bias corrected MLE)	8.075
nu hat (MLE)	26.96	nu star (bias corrected)	24.25
MLE Mean (bias corrected)	4.895	MLE Sd (bias corrected)	6.287

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.292	nu hat (KM)	21.01
Approximate Chi Square Value (21.01, α)	11.6	Adjusted Chi Square Value (21.01, β)	11.28
95% Gamma Approximate KM-UCL (use when n>=50)	5.299	95% Gamma Adjusted KM-UCL (use when n<50)	5.449

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.764
Maximum	25.2	Median	0.405
SD	5.571	CV	2.016
k hat (MLE)	0.283	k star (bias corrected MLE)	0.278
Theta hat (MLE)	9.774	Theta star (bias corrected MLE)	9.951
nu hat (MLE)	20.36	nu star (bias corrected)	20
MLE Mean (bias corrected)	2.764	MLE Sd (bias corrected)	5.244
		Adjusted Level of Significance (β)	0.0428
Approximate Chi Square Value (20.00, α)	10.85	Adjusted Chi Square Value (20.00, β)	10.54
95% Gamma Approximate UCL (use when n>=50)	5.094	95% Gamma Adjusted UCL (use when n<50)	5.242

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.0958	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.198	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.931	Mean in Log Scale	-0.0347
SD in Original Scale	5.492	SD in Log Scale	1.409
95% t UCL (assumes normality of ROS data)	4.478	95% Percentile Bootstrap UCL	4.515
95% BCA Bootstrap UCL	5.016	95% Bootstrap t UCL	5.683
95% H-UCL (Log ROS)	5.188		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.0204	95% H-UCL (KM -Log)	4.72
KM SD (logged)	1.359	95% Critical H Value (KM-Log)	2.821
KM Standard Error of Mean (logged)	0.253		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.935	Mean in Log Scale	0.0547
SD in Original Scale	5.486	SD in Log Scale	1.288
95% t UCL (Assumes normality)	4.48	95% H-Stat UCL	4.384

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	4.51	95% GROS Adjusted Gamma UCL	5.242
95% Adjusted Gamma KM-UCL	5.449		

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.

Arsenic

General Statistics

Total Number of Observations	36	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	1.3	Mean	3.014
Maximum	8	Median	2.4
SD	1.723	Std. Error of Mean	0.287
Coefficient of Variation	0.572	Skewness	1.562

Normal GOF Test

Shapiro Wilk Test Statistic	0.805	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Data Not Normal at 5% Significance Level	

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	3.499	95% Adjusted-CLT UCL (Chen-1995)	3.566
		95% Modified-t UCL (Johnson-1978)	3.512

Gamma GOF Test

A-D Test Statistic	1.311	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.161	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.148	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.107	k star (bias corrected MLE)	3.784
Theta hat (MLE)	0.734	Theta star (bias corrected MLE)	0.797
nu hat (MLE)	295.7	nu star (bias corrected)	272.4
MLE Mean (bias corrected)	3.014	MLE Sd (bias corrected)	1.549
		Approximate Chi Square Value (0.05)	235.2
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	233.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3.491	95% Adjusted Gamma UCL (use when n<50)	3.514

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.148	Data appear Lognormal at 5% Significance Level	

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.262	Mean of logged Data	0.977
Maximum of Logged Data	2.079	SD of logged Data	0.487

Assuming Lognormal Distribution

95% H-UCL	3.495	90% Chebyshev (MVUE) UCL	3.735
95% Chebyshev (MVUE) UCL	4.078	97.5% Chebyshev (MVUE) UCL	4.554
99% Chebyshev (MVUE) UCL	5.488		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3.486	95% Jackknife UCL	3.499
95% Standard Bootstrap UCL	3.472	95% Bootstrap-t UCL	3.58
95% Hall's Bootstrap UCL	3.573	95% Percentile Bootstrap UCL	3.5
95% BCA Bootstrap UCL	3.544		
90% Chebyshev(Mean, Sd) UCL	3.876	95% Chebyshev(Mean, Sd) UCL	4.266
97.5% Chebyshev(Mean, Sd) UCL	4.808	99% Chebyshev(Mean, Sd) UCL	5.872

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Suggested UCL to Use

95% Student's-t UCL	3.499	or 95% Modified-t UCL	3.512

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cadmium

General Statistics

Total Number of Observations	36	Number of Distinct Observations	24
Number of Detects	22	Number of Non-Detects	14
Number of Distinct Detects	20	Number of Distinct Non-Detects	6
Minimum Detect	0.11	Minimum Non-Detect	0.52
Maximum Detect	11.3	Maximum Non-Detect	0.58
Variance Detects	9.157	Percent Non-Detects	38.89%
Mean Detects	1.667	SD Detects	3.026
Median Detects	0.405	CV Detects	1.815
Skewness Detects	2.557	Kurtosis Detects	5.957
Mean of Logged Detects	-0.57	SD of Logged Detects	1.383

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.56	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.35	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	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

Mean	1.111	Standard Error of Mean	0.412
SD	2.415	95% KM (BCA) UCL	1.954
95% KM (t) UCL	1.808	95% KM (Percentile Bootstrap) UCL	1.814
95% KM (z) UCL	1.789	95% KM Bootstrap t UCL	3.002
90% KM Chebyshev UCL	2.348	95% KM Chebyshev UCL	2.908
97.5% KM Chebyshev UCL	3.686	99% KM Chebyshev UCL	5.214

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.898	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.798	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.266	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.195	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)	0.575	k star (bias corrected MLE)	0.527
Theta hat (MLE)	2.898	Theta star (bias corrected MLE)	3.163
nu hat (MLE)	25.31	nu star (bias corrected)	23.19
MLE Mean (bias corrected)	1.667	MLE Sd (bias corrected)	2.296

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.212	nu hat (KM)	15.23
Approximate Chi Square Value (15.23, α)	7.424	Adjusted Chi Square Value (15.23, β)	7.177
95% Gamma Approximate KM-UCL (use when n>=50)	2.279	95% Gamma Adjusted KM-UCL (use when n<50)	2.358

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.049
Maximum	11.3	Median	0.21
SD	2.474	CV	2.359
k hat (MLE)	0.348	k star (bias corrected MLE)	0.338
Theta hat (MLE)	3.013	Theta star (bias corrected MLE)	3.107
nu hat (MLE)	25.06	nu star (bias corrected)	24.31
MLE Mean (bias corrected)	1.049	MLE Sd (bias corrected)	1.805
		Adjusted Level of Significance (β)	0.0428
Approximate Chi Square Value (24.31, α)	14.08	Adjusted Chi Square Value (24.31, β)	13.73
95% Gamma Approximate UCL (use when n>=50)	1.81	95% Gamma Adjusted UCL (use when n<50)	1.857

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.886	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.125	Mean in Log Scale	-0.904
SD in Original Scale	2.445	SD in Log Scale	1.199
95% t UCL (assumes normality of ROS data)	1.813	95% Percentile Bootstrap UCL	1.811
95% BCA Bootstrap UCL	2.14	95% Bootstrap t UCL	3.013
95% H-UCL (Log ROS)	1.414		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.946	95% H-UCL (KM -Log)	1.323
KM SD (logged)	1.186	95% Critical H Value (KM-Log)	2.603
KM Standard Error of Mean (logged)	0.212		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.124	Mean in Log Scale	-0.857
SD in Original Scale	2.444	SD in Log Scale	1.132
95% t UCL (Assumes normality)	1.812	95% H-Stat UCL	1.309

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

97.5% KM (Chebyshev) UCL 3.686

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

General Statistics

Total Number of Observations	36	Number of Distinct Observations	31
		Number of Missing Observations	0
Minimum	2.5	Mean	14.49
Maximum	153	Median	7.1
SD	26.53	Std. Error of Mean	4.422
Coefficient of Variation	1.83	Skewness	4.448

Normal GOF Test

Shapiro Wilk Test Statistic	0.451	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.361	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	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	21.97	95% Adjusted-CLT UCL (Chen-1995)	25.27
		95% Modified-t UCL (Johnson-1978)	22.51

Gamma GOF Test

A-D Test Statistic	2.736	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.779	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.241	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.151	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.942	k star (bias corrected MLE)	0.882
Theta hat (MLE)	15.38	Theta star (bias corrected MLE)	16.43
nu hat (MLE)	67.83	nu star (bias corrected)	63.52
MLE Mean (bias corrected)	14.49	MLE Sd (bias corrected)	15.43
		Approximate Chi Square Value (0.05)	46.18
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	45.51

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19.93	95% Adjusted Gamma UCL (use when n<50)	20.23

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.893	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.136	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.148	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.916	Mean of logged Data	2.057
Maximum of Logged Data	5.03	SD of logged Data	0.954

Assuming Lognormal Distribution

95% H-UCL	17.94	90% Chebyshev (MVUE) UCL	18.73
95% Chebyshev (MVUE) UCL	21.73	97.5% Chebyshev (MVUE) UCL	25.9
99% Chebyshev (MVUE) UCL	34.08		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	21.77	95% Jackknife UCL	21.97
95% Standard Bootstrap UCL	21.5	95% Bootstrap-t UCL	34.23
95% Hall's Bootstrap UCL	46.85	95% Percentile Bootstrap UCL	22.79
95% BCA Bootstrap UCL	27.71		
90% Chebyshev(Mean, Sd) UCL	27.76	95% Chebyshev(Mean, Sd) UCL	33.77
97.5% Chebyshev(Mean, Sd) UCL	42.11	99% Chebyshev(Mean, Sd) UCL	58.49

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	33.77

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	36	Number of Distinct Observations	27
		Number of Missing Observations	0
Minimum	0.37	Mean	1.897
Maximum	11.3	Median	1.3
SD	1.988	Std. Error of Mean	0.331
Coefficient of Variation	1.048	Skewness	3.355

Normal GOF Test

Shapiro Wilk Test Statistic	0.646	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.229	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	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	2.457	95% Adjusted-CLT UCL (Chen-1995)	2.64
		95% Modified-t UCL (Johnson-1978)	2.488

Gamma GOF Test

A-D Test Statistic	1.177	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.763	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.194	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.149	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.755	k star (bias corrected MLE)	1.628
Theta hat (MLE)	1.081	Theta star (bias corrected MLE)	1.166
nu hat (MLE)	126.4	nu star (bias corrected)	117.2
MLE Mean (bias corrected)	1.897	MLE Sd (bias corrected)	1.487
		Approximate Chi Square Value (0.05)	93.19
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	92.22

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2.385	95% Adjusted Gamma UCL (use when n<50)	2.41

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.148	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.994	Mean of logged Data	0.329
Maximum of Logged Data	2.425	SD of logged Data	0.741

Assuming Lognormal Distribution

95% H-UCL	2.383	90% Chebyshev (MVUE) UCL	2.547
95% Chebyshev (MVUE) UCL	2.881	97.5% Chebyshev (MVUE) UCL	3.343
99% Chebyshev (MVUE) UCL	4.252		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.442	95% Jackknife UCL	2.457
95% Standard Bootstrap UCL	2.442	95% Bootstrap-t UCL	2.92
95% Hall's Bootstrap UCL	4.759	95% Percentile Bootstrap UCL	2.485
95% BCA Bootstrap UCL	2.656		
90% Chebyshev(Mean, Sd) UCL	2.891	95% Chebyshev(Mean, Sd) UCL	3.341
97.5% Chebyshev(Mean, Sd) UCL	3.966	99% Chebyshev(Mean, Sd) UCL	5.194

Suggested UCL to Use

95% H-UCL	2.383

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Copper

General Statistics

Total Number of Observations	36	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	2.8	Mean	172.8
Maximum	4070	Median	12.8
SD	684.3	Std. Error of Mean	114.1
Coefficient of Variation	3.961	Skewness	5.607

Normal GOF Test

Shapiro Wilk Test Statistic	0.265	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.416	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	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	365.5	95% Adjusted-CLT UCL (Chen-1995)	474.3
		95% Modified-t UCL (Johnson-1978)	383.2

Gamma GOF Test

A-D Test Statistic	4.663	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.852	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.264	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.159	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.32	k star (bias corrected MLE)	0.312
Theta hat (MLE)	540.4	Theta star (bias corrected MLE)	554.5
nu hat (MLE)	23.02	nu star (bias corrected)	22.44
MLE Mean (bias corrected)	172.8	MLE Sd (bias corrected)	309.5
		Approximate Chi Square Value (0.05)	12.67
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	12.33

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	306.1	95% Adjusted Gamma UCL (use when n<50)	314.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.139	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.148	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.03	Mean of logged Data	3.018
Maximum of Logged Data	8.311	SD of logged Data	1.684

Assuming Lognormal Distribution

95% H-UCL	213.6	90% Chebyshev (MVUE) UCL	164.1
95% Chebyshev (MVUE) UCL	203.4	97.5% Chebyshev (MVUE) UCL	257.8
99% Chebyshev (MVUE) UCL	364.9		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	360.4	95% Jackknife UCL	365.5
95% Standard Bootstrap UCL	355.6	95% Bootstrap-t UCL	1851
95% Hall's Bootstrap UCL	1135	95% Percentile Bootstrap UCL	387.8
95% BCA Bootstrap UCL	528.7		
90% Chebyshev(Mean, Sd) UCL	514.9	95% Chebyshev(Mean, Sd) UCL	669.9
97.5% Chebyshev(Mean, Sd) UCL	885	99% Chebyshev(Mean, Sd) UCL	1308

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	669.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cyanide

General Statistics

Total Number of Observations	36	Number of Distinct Observations	13
Number of Detects	2	Number of Non-Detects	34
Number of Distinct Detects	2	Number of Distinct Non-Detects	11
Minimum Detect	0.59	Minimum Non-Detect	0.5
Maximum Detect	0.85	Maximum Non-Detect	0.61
Variance Detects	0.0338	Percent Non-Detects	94.44%
Mean Detects	0.72	SD Detects	0.184
Median Detects	0.72	CV Detects	0.255
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.345	SD of Logged Detects	0.258

Warning: Data set has only 2 Detected Values.

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	0.512	Standard Error of Mean	0.0139
SD	0.0591	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.536	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.535	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.554	95% KM Chebyshev UCL	0.573
97.5% KM Chebyshev UCL	0.599	99% KM Chebyshev UCL	0.651

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	30.34	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0237	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	121.4	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	75.26	nu hat (KM)	5419
		Adjusted Level of Significance (β)	0.0428
Approximate Chi Square Value (N/A, α)	5249	Adjusted Chi Square Value (N/A, β)	5241
95% Gamma Approximate KM-UCL (use when n>=50)	0.529	95% Gamma Adjusted KM-UCL (use when n<50)	0.53

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.194	Mean in Log Scale	-1.82
SD in Original Scale	0.15	SD in Log Scale	0.563
95% t UCL (assumes normality of ROS data)	0.236	95% Percentile Bootstrap UCL	0.239
95% BCA Bootstrap UCL	0.254	95% Bootstrap t UCL	0.266
95% H-UCL (Log ROS)	0.229		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.298	Mean in Log Scale	-1.245
SD in Original Scale	0.109	SD in Log Scale	0.23
95% t UCL (Assumes normality)	0.329	95% H-Stat UCL	0.316

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

95% KM (t) UCL	0.536	95% KM (% Bootstrap) UCL	N/A

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Iron

General Statistics

Total Number of Observations	36	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	2280	Mean	14262
Maximum	89300	Median	6920
SD	21499	Std. Error of Mean	3583
Coefficient of Variation	1.507	Skewness	2.846

Normal GOF Test

Shapiro Wilk Test Statistic	0.538	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.323	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	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	20316	95% Adjusted-CLT UCL (Chen-1995)	21972
		95% Modified-t UCL (Johnson-1978)	20599

Gamma GOF Test

A-D Test Statistic	2.592	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.776	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.224	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.151	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.998	k star (bias corrected MLE)	0.933
Theta hat (MLE)	14294	Theta star (bias corrected MLE)	15284
nu hat (MLE)	71.84	nu star (bias corrected)	67.18
MLE Mean (bias corrected)	14262	MLE Sd (bias corrected)	14764
		Approximate Chi Square Value (0.05)	49.32
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	48.62

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19427	95% Adjusted Gamma UCL (use when n<50)	19705

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.137	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.148	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.732	Mean of logged Data	8.987
Maximum of Logged Data	11.4	SD of logged Data	0.963

Assuming Lognormal Distribution

95% H-UCL	18601	90% Chebyshev (MVUE) UCL	19389
95% Chebyshev (MVUE) UCL	22519	97.5% Chebyshev (MVUE) UCL	26863
99% Chebyshev (MVUE) UCL	35396		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	20155	95% Jackknife UCL	20316
95% Standard Bootstrap UCL	20268	95% Bootstrap-t UCL	24375
95% Hall's Bootstrap UCL	20558	95% Percentile Bootstrap UCL	20644
95% BCA Bootstrap UCL	21973		
90% Chebyshev(Mean, Sd) UCL	25011	95% Chebyshev(Mean, Sd) UCL	29880
97.5% Chebyshev(Mean, Sd) UCL	36638	99% Chebyshev(Mean, Sd) UCL	49913

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 29880

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	36	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	7.3	Mean	767.3
Maximum	10100	Median	94.15
SD	2142	Std. Error of Mean	357
Coefficient of Variation	2.792	Skewness	3.826

Normal GOF Test

Shapiro Wilk Test Statistic	0.383	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.39	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	1370	95% Adjusted-CLT UCL (Chen-1995)	1598
		95% Modified-t UCL (Johnson-1978)	1408

Gamma GOF Test

A-D Test Statistic	3.191	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.84	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.241	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.158	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.375	k star (bias corrected MLE)	0.363
Theta hat (MLE)	2043	Theta star (bias corrected MLE)	2115
nu hat (MLE)	27.04	nu star (bias corrected)	26.12
MLE Mean (bias corrected)	767.3	MLE Sd (bias corrected)	1274
		Approximate Chi Square Value (0.05)	15.47
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	15.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1295	95% Adjusted Gamma UCL (use when n<50)	1327

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.109	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.148	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.988	Mean of logged Data	4.872
Maximum of Logged Data	9.22	SD of logged Data	1.726

Assuming Lognormal Distribution

95% H-UCL	1526	90% Chebyshev (MVUE) UCL	1137
95% Chebyshev (MVUE) UCL	1413	97.5% Chebyshev (MVUE) UCL	1796
99% Chebyshev (MVUE) UCL	2548		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1354	95% Jackknife UCL	1370
95% Standard Bootstrap UCL	1355	95% Bootstrap-t UCL	3622
95% Hall's Bootstrap UCL	3706	95% Percentile Bootstrap UCL	1370
95% BCA Bootstrap UCL	1633		
90% Chebyshev(Mean, Sd) UCL	1838	95% Chebyshev(Mean, Sd) UCL	2323
97.5% Chebyshev(Mean, Sd) UCL	2997	99% Chebyshev(Mean, Sd) UCL	4319

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 2323

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	36	Number of Distinct Observations	36
		Number of Missing Observations	0
Minimum	16.2	Mean	137.6
Maximum	722	Median	66.95
SD	174.8	Std. Error of Mean	29.13
Coefficient of Variation	1.27	Skewness	2.375

Normal GOF Test

Shapiro Wilk Test Statistic	0.603	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.318	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	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	186.8	95% Adjusted-CLT UCL (Chen-1995)	197.8
		95% Modified-t UCL (Johnson-1978)	188.7

Gamma GOF Test

A-D Test Statistic	3.048	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.772	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.249	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.151	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.207	k star (bias corrected MLE)	1.125
Theta hat (MLE)	114	Theta star (bias corrected MLE)	122.3
nu hat (MLE)	86.91	nu star (bias corrected)	81
MLE Mean (bias corrected)	137.6	MLE Sd (bias corrected)	129.7
		Approximate Chi Square Value (0.05)	61.26
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	60.48

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	181.9	95% Adjusted Gamma UCL (use when n<50)	184.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.893	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**

5% Lilliefors Critical Value	0.148	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.785	Mean of logged Data	4.456
Maximum of Logged Data	6.582	SD of logged Data	0.878

Assuming Lognormal Distribution

95% H-UCL	176.8	90% Chebyshev (MVUE) UCL	186.6
95% Chebyshev (MVUE) UCL	214.6	97.5% Chebyshev (MVUE) UCL	253.5
99% Chebyshev (MVUE) UCL	329.8		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	185.5	95% Jackknife UCL	186.8
95% Standard Bootstrap UCL	185.3	95% Bootstrap-t UCL	203.6
95% Hall's Bootstrap UCL	196.4	95% Percentile Bootstrap UCL	184.7
95% BCA Bootstrap UCL	200.1		
90% Chebyshev(Mean, Sd) UCL	225	95% Chebyshev(Mean, Sd) UCL	264.6
97.5% Chebyshev(Mean, Sd) UCL	319.5	99% Chebyshev(Mean, Sd) UCL	427.4

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	264.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	36	Number of Distinct Observations	20
Number of Detects	21	Number of Non-Detects	15
Number of Distinct Detects	18	Number of Distinct Non-Detects	2
Minimum Detect	0.035	Minimum Non-Detect	0.1
Maximum Detect	2.9	Maximum Non-Detect	0.11
Variance Detects	0.38	Percent Non-Detects	41.67%
Mean Detects	0.315	SD Detects	0.617
Median Detects	0.13	CV Detects	1.955
Skewness Detects	4.043	Kurtosis Detects	17.37
Mean of Logged Detects	-1.878	SD of Logged Detects	1.045

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.434	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.339	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.213	Standard Error of Mean	0.0812
SD	0.475	95% KM (BCA) UCL	0.375
95% KM (t) UCL	0.35	95% KM (Percentile Bootstrap) UCL	0.365
95% KM (z) UCL	0.347	95% KM Bootstrap t UCL	0.668
90% KM Chebyshev UCL	0.457	95% KM Chebyshev UCL	0.567
97.5% KM Chebyshev UCL	0.72	99% KM Chebyshev UCL	1.021

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.749	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.779	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.229	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.196	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)	0.817	k star (bias corrected MLE)	0.732
Theta hat (MLE)	0.386	Theta star (bias corrected MLE)	0.431
nu hat (MLE)	34.32	nu star (bias corrected)	30.75
MLE Mean (bias corrected)	0.315	MLE Sd (bias corrected)	0.369

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.201	nu hat (KM)	14.44
Approximate Chi Square Value (14.44, α)	6.875	Adjusted Chi Square Value (14.44, β)	6.638
95% Gamma Approximate KM-UCL (use when n>=50)	0.447	95% Gamma Adjusted KM-UCL (use when n<50)	0.463

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.198
Maximum	2.9	Median	0.0762
SD	0.488	CV	2.459
k hat (MLE)	0.541	k star (bias corrected MLE)	0.514
Theta hat (MLE)	0.367	Theta star (bias corrected MLE)	0.386
nu hat (MLE)	38.95	nu star (bias corrected)	37.04
MLE Mean (bias corrected)	0.198	MLE Sd (bias corrected)	0.277
		Adjusted Level of Significance (β)	0.0428
Approximate Chi Square Value (37.04, α)	24.11	Adjusted Chi Square Value (37.04, β)	23.63
95% Gamma Approximate UCL (use when n>=50)	0.305	95% Gamma Adjusted UCL (use when n<50)	0.311

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.216	Mean in Log Scale	-2.223
SD in Original Scale	0.482	SD in Log Scale	0.969
95% t UCL (assumes normality of ROS data)	0.352	95% Percentile Bootstrap UCL	0.358
95% BCA Bootstrap UCL	0.46	95% Bootstrap t UCL	0.689
95% H-UCL (Log ROS)	0.254		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.22	95% H-UCL (KM -Log)	0.228
KM SD (logged)	0.894	95% Critical H Value (KM-Log)	2.267
KM Standard Error of Mean (logged)	0.159		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.207	Mean in Log Scale	-2.307
SD in Original Scale	0.484	SD in Log Scale	0.943
95% t UCL (Assumes normality)	0.343	95% H-Stat UCL	0.225

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	0.72

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.

Nickel

General Statistics

Total Number of Observations	36	Number of Distinct Observations	31
		Number of Missing Observations	0
Minimum	1.1	Mean	15.13
Maximum	218	Median	4.5
SD	37.85	Std. Error of Mean	6.308
Coefficient of Variation	2.502	Skewness	4.761

Normal GOF Test

Shapiro Wilk Test Statistic	0.388	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	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	25.78	95% Adjusted-CLT UCL (Chen-1995)	30.85
		95% Modified-t UCL (Johnson-1978)	26.62

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma GOF Test

A-D Test Statistic	3.607	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.804	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.27	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.154	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.586	k star (bias corrected MLE)	0.556
Theta hat (MLE)	25.81	Theta star (bias corrected MLE)	27.21
nu hat (MLE)	42.2	nu star (bias corrected)	40.02
MLE Mean (bias corrected)	15.13	MLE Sd (bias corrected)	20.29
		Approximate Chi Square Value (0.05)	26.52
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	26.02

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	22.82	95% Adjusted Gamma UCL (use when n<50)	23.26

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.148	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.148	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.0953	Mean of logged Data	1.658
Maximum of Logged Data	5.384	SD of logged Data	1.217

Assuming Lognormal Distribution

95% H-UCL	18.96	90% Chebyshev (MVUE) UCL	18.53
95% Chebyshev (MVUE) UCL	22.1	97.5% Chebyshev (MVUE) UCL	27.05
99% Chebyshev (MVUE) UCL	36.78		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	25.5	95% Jackknife UCL	25.78
95% Standard Bootstrap UCL	25.4	95% Bootstrap-t UCL	48.54
95% Hall's Bootstrap UCL	56.82	95% Percentile Bootstrap UCL	27.28
95% BCA Bootstrap UCL	32.69		
90% Chebyshev(Mean, Sd) UCL	34.05	95% Chebyshev(Mean, Sd) UCL	42.62
97.5% Chebyshev(Mean, Sd) UCL	54.52	99% Chebyshev(Mean, Sd) UCL	77.89

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	42.62

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)

and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

For additional insight the user may want to consult a statistician.

Thallium

General Statistics

Total Number of Observations	36	Number of Distinct Observations	17
Number of Detects	10	Number of Non-Detects	26
Number of Distinct Detects	9	Number of Distinct Non-Detects	8
Minimum Detect	0.03	Minimum Non-Detect	0.52
Maximum Detect	0.084	Maximum Non-Detect	0.69
Variance Detects	2.3360E-4	Percent Non-Detects	72.22%
Mean Detects	0.0464	SD Detects	0.0153
Median Detects	0.041	CV Detects	0.329
Skewness Detects	1.868	Kurtosis Detects	4.057
Mean of Logged Detects	-3.111	SD of Logged Detects	0.286

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.801	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.288	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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

Mean	0.0464	Standard Error of Mean	0.00483
SD	0.0145	95% KM (BCA) UCL	0.0545
95% KM (t) UCL	0.0546	95% KM (Percentile Bootstrap) UCL	0.0546
95% KM (z) UCL	0.0543	95% KM Bootstrap t UCL	0.0647
90% KM Chebyshev UCL	0.0609	95% KM Chebyshev UCL	0.0675
97.5% KM Chebyshev UCL	0.0766	99% KM Chebyshev UCL	0.0945

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.652	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.269	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.267	Detected Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	12.64	k star (bias corrected MLE)	8.912
Theta hat (MLE)	0.00367	Theta star (bias corrected MLE)	0.00521
nu hat (MLE)	252.7	nu star (bias corrected)	178.2
MLE Mean (bias corrected)	0.0464	MLE Sd (bias corrected)	0.0155

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	10.24	nu hat (KM)	737.3
Approximate Chi Square Value (737.32, α)	675.3	Adjusted Chi Square Value (737.32, β)	672.6
95% Gamma Approximate KM-UCL (use when n>=50)	0.0507	95% Gamma Adjusted KM-UCL (use when n<50)	0.0509

Gamma ROS Statistics using Imputed Non-Detects

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0295	Mean	0.0461
Maximum	0.084	Median	0.0442
SD	0.0116	CV	0.251
k hat (MLE)	17.68	k star (bias corrected MLE)	16.23
Theta hat (MLE)	0.00261	Theta star (bias corrected MLE)	0.00284
nu hat (MLE)	1273	nu star (bias corrected)	1168
MLE Mean (bias corrected)	0.0461	MLE Sd (bias corrected)	0.0114
		Adjusted Level of Significance (β)	0.0428
Approximate Chi Square Value (N/A, α)	1090	Adjusted Chi Square Value (N/A, β)	1087
95% Gamma Approximate UCL (use when n>=50)	0.0494	95% Gamma Adjusted UCL (use when n<50)	0.0496

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.25	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0457	Mean in Log Scale	-3.111
SD in Original Scale	0.0108	SD in Log Scale	0.22
95% t UCL (assumes normality of ROS data)	0.0487	95% Percentile Bootstrap UCL	0.0486
95% BCA Bootstrap UCL	0.0489	95% Bootstrap t UCL	0.0493
95% H-UCL (Log ROS)	0.0487		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.111	95% H-UCL (KM -Log)	0.0501
KM SD (logged)	0.271	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0903		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.213	Mean in Log Scale	-1.794
SD in Original Scale	0.106	SD in Log Scale	0.842
95% t UCL (Assumes normality)	0.242	95% H-Stat UCL	0.325

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0546	95% GROS Adjusted Gamma UCL	0.0496
95% Adjusted Gamma KM-UCL	0.0509		

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

General Statistics

Total Number of Observations	36	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	3.9	Mean	12.38
Maximum	146	Median	7.55
SD	23.28	Std. Error of Mean	3.88
Coefficient of Variation	1.881	Skewness	5.707

Normal GOF Test

Shapiro Wilk Test Statistic	0.307	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.379	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	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	18.93	95% Adjusted-CLT UCL (Chen-1995)	22.7
		95% Modified-t UCL (Johnson-1978)	19.55

Gamma GOF Test

A-D Test Statistic	3.673	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.218	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.15	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.418	k star (bias corrected MLE)	1.319
Theta hat (MLE)	8.727	Theta star (bias corrected MLE)	9.387
nu hat (MLE)	102.1	nu star (bias corrected)	94.94
MLE Mean (bias corrected)	12.38	MLE Sd (bias corrected)	10.78
		Approximate Chi Square Value (0.05)	73.47
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	72.61

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	16	95% Adjusted Gamma UCL (use when n<50)	16.18

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.814	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.126	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.148	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.361	Mean of logged Data	2.124
Maximum of Logged Data	4.984	SD of logged Data	0.666

Assuming Lognormal Distribution

95% H-UCL	13.14	90% Chebyshev (MVUE) UCL	14.08
95% Chebyshev (MVUE) UCL	15.77	97.5% Chebyshev (MVUE) UCL	18.11
99% Chebyshev (MVUE) UCL	22.71		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	18.76	95% Jackknife UCL	18.93
95% Standard Bootstrap UCL	18.58	95% Bootstrap-t UCL	42.33
95% Hall's Bootstrap UCL	43.9	95% Percentile Bootstrap UCL	20.19
95% BCA Bootstrap UCL	23.65		
90% Chebyshev(Mean, Sd) UCL	24.02	95% Chebyshev(Mean, Sd) UCL	29.29
97.5% Chebyshev(Mean, Sd) UCL	36.61	99% Chebyshev(Mean, Sd) UCL	50.98

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	29.29

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	36	Number of Distinct Observations	36
		Number of Missing Observations	0
Minimum	9.3	Mean	736.4
Maximum	13400	Median	40.9
SD	2617	Std. Error of Mean	436.2
Coefficient of Variation	3.554	Skewness	4.283

Normal GOF Test

Shapiro Wilk Test Statistic	0.31	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.424	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	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	1473	95% Adjusted-CLT UCL (Chen-1995)	1786
		95% Modified-t UCL (Johnson-1978)	1525

Gamma GOF Test

Appendix C-5
ProUCL Output - Future Surface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

A-D Test Statistic	6.089	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.865	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.359	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.16	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.284	k star (bias corrected MLE)	0.279
Theta hat (MLE)	2594	Theta star (bias corrected MLE)	2642
nu hat (MLE)	20.44	nu star (bias corrected)	20.07
MLE Mean (bias corrected)	736.4	MLE Sd (bias corrected)	1395
		Approximate Chi Square Value (0.05)	10.9
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	10.59

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1356	95% Adjusted Gamma UCL (use when n<50)	1395

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.832	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.21	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.148	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.23	Mean of logged Data	4.15
Maximum of Logged Data	9.503	SD of logged Data	1.75

Assuming Lognormal Distribution

95% H-UCL	790.5	90% Chebyshev (MVUE) UCL	578.6
95% Chebyshev (MVUE) UCL	720.2	97.5% Chebyshev (MVUE) UCL	916.7
99% Chebyshev (MVUE) UCL	1303		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	1454	95% Jackknife UCL	1473
95% Standard Bootstrap UCL	1471	95% Bootstrap-t UCL	8614
95% Hall's Bootstrap UCL	6570	95% Percentile Bootstrap UCL	1496
95% BCA Bootstrap UCL	1863		
90% Chebyshev(Mean, Sd) UCL	2045	95% Chebyshev(Mean, Sd) UCL	2638
97.5% Chebyshev(Mean, Sd) UCL	3460	99% Chebyshev(Mean, Sd) UCL	5076

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 2638

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/2/2015 11:21:13 AM
From File	ProUCL_Input_SB-Matteo.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Trichloroethene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	29
		Number of Missing Observations	1
Number of Detects	2	Number of Non-Detects	64
Number of Distinct Detects	2	Number of Distinct Non-Detects	27
Minimum Detect	2.4	Minimum Non-Detect	4
Maximum Detect	7	Maximum Non-Detect	8.2
Variance Detects	10.58	Percent Non-Detects	96.97%
Mean Detects	4.7	SD Detects	3.253
Median Detects	4.7	CV Detects	0.692
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	1.411	SD of Logged Detects	0.757

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	2.474	Standard Error of Mean	0.104
SD	0.579	95% KM (BCA) UCL	N/A
95% KM (t) UCL	2.648	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	2.645	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	2.786	95% KM Chebyshev UCL	2.928
97.5% KM Chebyshev UCL	3.124	99% KM Chebyshev UCL	3.51

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	3.812	k star (bias corrected MLE)	N/A
Theta hat (MLE)	1.233	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	15.25	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	18.23	nu hat (KM)	2406
		Adjusted Level of Significance (β)	0.0464

Approximate Chi Square Value (N/A, α)	2293	Adjusted Chi Square Value (N/A, β)	2291
95% Gamma Approximate KM-UCL (use when n>=50)	2.596	95% Gamma Adjusted KM-UCL (use when n<50)	2.599

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.53	Mean in Log Scale	0.891
SD in Original Scale	0.792	SD in Log Scale	0.264
95% t UCL (assumes normality of ROS data)	2.693	95% Percentile Bootstrap UCL	2.698
95% BCA Bootstrap UCL	2.733	95% Bootstrap t UCL	2.749
95% H-UCL (Log ROS)	2.672		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.713	Mean in Log Scale	0.977
SD in Original Scale	0.678	SD in Log Scale	0.19
95% t UCL (Assumes normality)	2.852	95% H-Stat UCL	2.816

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

95% KM (t) UCL	2.648	95% KM (% Bootstrap) UCL	N/A

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.

Benzo(a)anthracene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	30
Number of Detects	32	Number of Non-Detects	34
Number of Distinct Detects	28	Number of Distinct Non-Detects	4
Minimum Detect	19	Minimum Non-Detect	180
Maximum Detect	130000	Maximum Non-Detect	210
Variance Detects	5.257E+8	Percent Non-Detects	51.52%
Mean Detects	4374	SD Detects	22929
Median Detects	110	CV Detects	5.242
Skewness Detects	5.653	Kurtosis Detects	31.97
Mean of Logged Detects	5.127	SD of Logged Detects	1.767

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.193	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.508	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.157	Detected Data Not Normal at 5% Significance Level	

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2153	Standard Error of Mean	1984
SD	15861	95% KM (BCA) UCL	6114
95% KM (t) UCL	5463	95% KM (Percentile Bootstrap) UCL	6097
95% KM (z) UCL	5416	95% KM Bootstrap t UCL	137119
90% KM Chebyshev UCL	8104	95% KM Chebyshev UCL	10800
97.5% KM Chebyshev UCL	14541	99% KM Chebyshev UCL	21890

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.533	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.894	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.35	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.172	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)	0.222	k star (bias corrected MLE)	0.222
Theta hat (MLE)	19678	Theta star (bias corrected MLE)	19678
nu hat (MLE)	14.23	nu star (bias corrected)	14.23
MLE Mean (bias corrected)	4374	MLE Sd (bias corrected)	9278

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0184	nu hat (KM)	2.433
Approximate Chi Square Value (2.43, α)	0.226	Adjusted Chi Square Value (2.43, β)	0.216
95% Gamma Approximate KM-UCL (use when n>=50)	23146	95% Gamma Adjusted KM-UCL (use when n<50)	24281

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2121
Maximum	130000	Median	0.01
SD	15987	CV	7.539
k hat (MLE)	0.107	k star (bias corrected MLE)	0.112
Theta hat (MLE)	19870	Theta star (bias corrected MLE)	18938
nu hat (MLE)	14.09	nu star (bias corrected)	14.78
MLE Mean (bias corrected)	2121	MLE Sd (bias corrected)	6337
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (14.78, α)	7.11	Adjusted Chi Square Value (14.78, β)	6.991
95% Gamma Approximate UCL (use when n>=50)	4409	95% Gamma Adjusted UCL (use when n<50)	4484

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.157	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2163	Mean in Log Scale	4.559
SD in Original Scale	15982	SD in Log Scale	1.508
95% t UCL (assumes normality of ROS data)	5446	95% Percentile Bootstrap UCL	6075
95% BCA Bootstrap UCL	8091	95% Bootstrap t UCL	131133
95% H-UCL (Log ROS)	467.9		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.539	95% H-UCL (KM -Log)	370.4
KM SD (logged)	1.401	95% Critical H Value (KM-Log)	2.271
KM Standard Error of Mean (logged)	0.196		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2169	Mean in Log Scale	4.829
SD in Original Scale	15981	SD in Log Scale	1.255
95% t UCL (Assumes normality)	5452	95% H-Stat UCL	384.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 10800

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	26
Number of Detects	26	Number of Non-Detects	40
Number of Distinct Detects	24	Number of Distinct Non-Detects	4
Minimum Detect	29	Minimum Non-Detect	180
Maximum Detect	79000	Maximum Non-Detect	210
Variance Detects	2.385E+8	Percent Non-Detects	60.61%
Mean Detects	3300	SD Detects	15443
Median Detects	145	CV Detects	4.68
Skewness Detects	5.096	Kurtosis Detects	25.98
Mean of Logged Detects	5.249	SD of Logged Detects	1.646

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.215	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.518	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.174	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1347	Standard Error of Mean	1209
SD	9634	95% KM (BCA) UCL	3727
95% KM (t) UCL	3365	95% KM (Percentile Bootstrap) UCL	3733
95% KM (z) UCL	3336	95% KM Bootstrap t UCL	71418
90% KM Chebyshev UCL	4975	95% KM Chebyshev UCL	6619
97.5% KM Chebyshev UCL	8900	99% KM Chebyshev UCL	13380

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.409	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.877	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.378	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.188	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)	0.249	k star (bias corrected MLE)	0.246
Theta hat (MLE)	13244	Theta star (bias corrected MLE)	13411
nu hat (MLE)	12.96	nu star (bias corrected)	12.8
MLE Mean (bias corrected)	3300	MLE Sd (bias corrected)	6652

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0196	nu hat (KM)	2.581
Approximate Chi Square Value (2.58, α)	0.26	Adjusted Chi Square Value (2.58, β)	0.248
95% Gamma Approximate KM-UCL (use when n>=50)	13376	95% Gamma Adjusted KM-UCL (use when n<50)	14043

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1333
Maximum	79000	Median	0.01
SD	9712	CV	7.283
k hat (MLE)	0.106	k star (bias corrected MLE)	0.112
Theta hat (MLE)	12536	Theta star (bias corrected MLE)	11945
nu hat (MLE)	14.04	nu star (bias corrected)	14.74
MLE Mean (bias corrected)	1333	MLE Sd (bias corrected)	3991
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (14.74, α)	7.078	Adjusted Chi Square Value (14.74, β)	6.959
95% Gamma Approximate UCL (use when n>=50)	2776	95% Gamma Adjusted UCL (use when n<50)	2824

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.826	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.135	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.174	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1360	Mean in Log Scale	4.647
SD in Original Scale	9706	SD in Log Scale	1.328
95% t UCL (assumes normality of ROS data)	3354	95% Percentile Bootstrap UCL	3737
95% BCA Bootstrap UCL	4971	95% Bootstrap t UCL	75518
95% H-UCL (Log ROS)	362.2		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.626	95% H-UCL (KM -Log)	291
KM SD (logged)	1.199	95% Critical H Value (KM-Log)	2.208
KM Standard Error of Mean (logged)	0.176		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1358	Mean in Log Scale	4.828
SD in Original Scale	9706	SD in Log Scale	1.077
95% t UCL (Assumes normality)	3351	95% H-Stat UCL	302.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 6619

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	31
Number of Detects	31	Number of Non-Detects	35
Number of Distinct Detects	29	Number of Distinct Non-Detects	4
Minimum Detect	23	Minimum Non-Detect	180
Maximum Detect	110000	Maximum Non-Detect	210
Variance Detects	3.880E+8	Percent Non-Detects	53.03%
Mean Detects	3883	SD Detects	19698
Median Detects	170	CV Detects	5.073
Skewness Detects	5.564	Kurtosis Detects	30.97
Mean of Logged Detects	5.458	SD of Logged Detects	1.594

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.197	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.51	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.159	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

Mean	1872	Standard Error of Mean	1679
SD	13415	95% KM (BCA) UCL	5215
95% KM (t) UCL	4673	95% KM (Percentile Bootstrap) UCL	5210
95% KM (z) UCL	4633	95% KM Bootstrap t UCL	111753
90% KM Chebyshev UCL	6908	95% KM Chebyshev UCL	9189
97.5% KM Chebyshev UCL	12355	99% KM Chebyshev UCL	18573

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.381	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.878	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.389	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.173	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)	0.253	k star (bias corrected MLE)	0.25
Theta hat (MLE)	15368	Theta star (bias corrected MLE)	15549
nu hat (MLE)	15.66	nu star (bias corrected)	15.48
MLE Mean (bias corrected)	3883	MLE Sd (bias corrected)	7770

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0195	nu hat (KM)	2.57
Approximate Chi Square Value (2.57, α)	0.257	Adjusted Chi Square Value (2.57, β)	0.245
95% Gamma Approximate KM-UCL (use when n>=50)	18695	95% Gamma Adjusted KM-UCL (use when n<50)	19626

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1824
Maximum	110000	Median	0.01
SD	13524	CV	7.416
k hat (MLE)	0.109	k star (bias corrected MLE)	0.114
Theta hat (MLE)	16768	Theta star (bias corrected MLE)	16009
nu hat (MLE)	14.36	nu star (bias corrected)	15.04
MLE Mean (bias corrected)	1824	MLE Sd (bias corrected)	5403
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (15.04, α)	7.287	Adjusted Chi Square Value (15.04, β)	7.167
95% Gamma Approximate UCL (use when n>=50)	3763	95% Gamma Adjusted UCL (use when n<50)	3827

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.929	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.117	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.159	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1881	Mean in Log Scale	4.875
SD in Original Scale	13517	SD in Log Scale	1.368
95% t UCL (assumes normality of ROS data)	4657	95% Percentile Bootstrap UCL	5200
95% BCA Bootstrap UCL	6894	95% Bootstrap t UCL	110421
95% H-UCL (Log ROS)	487.9		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.882	95% H-UCL (KM -Log)	415
KM SD (logged)	1.269	95% Critical H Value (KM-Log)	2.166
KM Standard Error of Mean (logged)	0.182		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1874	Mean in Log Scale	4.976
SD in Original Scale	13517	SD in Log Scale	1.176
95% t UCL (Assumes normality)	4650	95% H-Stat UCL	400.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 9189

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.

Benzo(k)fluoranthene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	22
Number of Detects	23	Number of Non-Detects	43
Number of Distinct Detects	20	Number of Distinct Non-Detects	4
Minimum Detect	37	Minimum Non-Detect	180
Maximum Detect	63000	Maximum Non-Detect	210
Variance Detects	1.710E+8	Percent Non-Detects	65.15%
Mean Detects	3024	SD Detects	13078
Median Detects	180	CV Detects	4.325
Skewness Detects	4.791	Kurtosis Detects	22.97
Mean of Logged Detects	5.364	SD of Logged Detects	1.671

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.233	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.515	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	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

Mean	1098	Standard Error of Mean	966.7
SD	7681	95% KM (BCA) UCL	3019
95% KM (t) UCL	2711	95% KM (Percentile Bootstrap) UCL	3004
95% KM (z) UCL	2688	95% KM Bootstrap t UCL	46222
90% KM Chebyshev UCL	3999	95% KM Chebyshev UCL	5312
97.5% KM Chebyshev UCL	7136	99% KM Chebyshev UCL	10717

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.413	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.866	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.373	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.198	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)	0.265	k star (bias corrected MLE)	0.26
Theta hat (MLE)	11394	Theta star (bias corrected MLE)	11641
nu hat (MLE)	12.21	nu star (bias corrected)	11.95
MLE Mean (bias corrected)	3024	MLE Sd (bias corrected)	5933

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0205	nu hat (KM)	2.699
Approximate Chi Square Value (2.70, α)	0.289	Adjusted Chi Square Value (2.70, β)	0.275
95% Gamma Approximate KM-UCL (use when n>=50)	10251	95% Gamma Adjusted KM-UCL (use when n<50)	10763

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1066
Maximum	63000	Median	0.01
SD	7745	CV	7.267
k hat (MLE)	0.102	k star (bias corrected MLE)	0.108
Theta hat (MLE)	10437	Theta star (bias corrected MLE)	9907
nu hat (MLE)	13.48	nu star (bias corrected)	14.2
MLE Mean (bias corrected)	1066	MLE Sd (bias corrected)	3249
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (14.20, α)	6.709	Adjusted Chi Square Value (14.20, β)	6.593
95% Gamma Approximate UCL (use when n>=50)	2256	95% Gamma Adjusted UCL (use when n<50)	2295

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.83	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1114	Mean in Log Scale	4.578

SD in Original Scale	7738	SD in Log Scale	1.354
95% t UCL (assumes normality of ROS data)	2703	95% Percentile Bootstrap UCL	3016
95% BCA Bootstrap UCL	4058	95% Bootstrap t UCL	46697
95% H-UCL (Log ROS)	353.2		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.562	95% H-UCL (KM -Log)	264.8
KM SD (logged)	1.177	95% Critical H Value (KM-Log)	2.224
KM Standard Error of Mean (logged)	0.171		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1116	Mean in Log Scale	4.836
SD in Original Scale	7737	SD in Log Scale	1.048
95% t UCL (Assumes normality)	2705	95% H-Stat UCL	292.6

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 5312

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.

Chrysene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	31
Number of Detects	32	Number of Non-Detects	34
Number of Distinct Detects	29	Number of Distinct Non-Detects	4
Minimum Detect	26	Minimum Non-Detect	180
Maximum Detect	110000	Maximum Non-Detect	210
Variance Detects	3.760E+8	Percent Non-Detects	51.52%
Mean Detects	3759	SD Detects	19391
Median Detects	170	CV Detects	5.158
Skewness Detects	5.653	Kurtosis Detects	31.97
Mean of Logged Detects	5.338	SD of Logged Detects	1.648

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.194	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.515	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.157	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

Mean	1863	Standard Error of Mean	1678

SD	13416	95% KM (BCA) UCL	5207
95% KM (t) UCL	4663	95% KM (Percentile Bootstrap) UCL	5164
95% KM (z) UCL	4623	95% KM Bootstrap t UCL	96246
90% KM Chebyshev UCL	6897	95% KM Chebyshev UCL	9177
97.5% KM Chebyshev UCL	12341	99% KM Chebyshev UCL	18558

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.374	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.882	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.358	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.171	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)	0.246	k star (bias corrected MLE)	0.244
Theta hat (MLE)	15279	Theta star (bias corrected MLE)	15419
nu hat (MLE)	15.75	nu star (bias corrected)	15.6
MLE Mean (bias corrected)	3759	MLE Sd (bias corrected)	7613

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0193	nu hat (KM)	2.546
Approximate Chi Square Value (2.55, α)	0.252	Adjusted Chi Square Value (2.55, β)	0.24
95% Gamma Approximate KM-UCL (use when n>=50)	18846	95% Gamma Adjusted KM-UCL (use when n<50)	19783

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1823
Maximum	110000	Median	0.01
SD	13524	CV	7.42
k hat (MLE)	0.11	k star (bias corrected MLE)	0.115
Theta hat (MLE)	16568	Theta star (bias corrected MLE)	15834
nu hat (MLE)	14.52	nu star (bias corrected)	15.19
MLE Mean (bias corrected)	1823	MLE Sd (bias corrected)	5372
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (15.19, α)	7.397	Adjusted Chi Square Value (15.19, β)	7.275
95% Gamma Approximate UCL (use when n>=50)	3744	95% Gamma Adjusted UCL (use when n<50)	3807

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.157	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1870	Mean in Log Scale	4.743
SD in Original Scale	13518	SD in Log Scale	1.429

95% t UCL (assumes normality of ROS data)	4647	95% Percentile Bootstrap UCL	5189
95% BCA Bootstrap UCL	6917	95% Bootstrap t UCL	100951
95% H-UCL (Log ROS)	479.8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.75	95% H-UCL (KM -Log)	405.4
KM SD (logged)	1.334	95% Critical H Value (KM-Log)	2.205
KM Standard Error of Mean (logged)	0.19		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1871	Mean in Log Scale	4.931
SD in Original Scale	13518	SD in Log Scale	1.206
95% t UCL (Assumes normality)	4648	95% H-Stat UCL	398.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 9177

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	15
Number of Detects	15	Number of Non-Detects	51
Number of Distinct Detects	12	Number of Distinct Non-Detects	4
Minimum Detect	31	Minimum Non-Detect	180
Maximum Detect	23000	Maximum Non-Detect	210
Variance Detects	34902338	Percent Non-Detects	77.27%
Mean Detects	1647	SD Detects	5908
Median Detects	91	CV Detects	3.587
Skewness Detects	3.872	Kurtosis Detects	14.99
Mean of Logged Detects	4.912	SD of Logged Detects	1.591

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.296	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.522	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.229	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

Mean	429.4	Standard Error of Mean	356.9
SD	2800	95% KM (BCA) UCL	1134

95% KM (t) UCL	1025	95% KM (Percentile Bootstrap) UCL	1120
95% KM (z) UCL	1016	95% KM Bootstrap t UCL	15470
90% KM Chebyshev UCL	1500	95% KM Chebyshev UCL	1985
97.5% KM Chebyshev UCL	2658	99% KM Chebyshev UCL	3980

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.555	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.845	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.443	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.241	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)	0.28	k star (bias corrected MLE)	0.268
Theta hat (MLE)	5890	Theta star (bias corrected MLE)	6142
nu hat (MLE)	8.388	nu star (bias corrected)	8.044
MLE Mean (bias corrected)	1647	MLE Sd (bias corrected)	3180

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0235	nu hat (KM)	3.104
Approximate Chi Square Value (3.10, α)	0.404	Adjusted Chi Square Value (3.10, β)	0.385
95% Gamma Approximate KM-UCL (use when n>=50)	3300	95% Gamma Adjusted KM-UCL (use when n<50)	3459

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	510
Maximum	23000	Median	0.01
SD	2843	CV	5.574
k hat (MLE)	0.112	k star (bias corrected MLE)	0.117
Theta hat (MLE)	4558	Theta star (bias corrected MLE)	4362
nu hat (MLE)	14.77	nu star (bias corrected)	15.43
MLE Mean (bias corrected)	510	MLE Sd (bias corrected)	1491
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (15.43, α)	7.563	Adjusted Chi Square Value (15.43, β)	7.44
95% Gamma Approximate UCL (use when n>=50)	1041	95% Gamma Adjusted UCL (use when n<50)	1058

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.716	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	443.8	Mean in Log Scale	4.359
SD in Original Scale	2820	SD in Log Scale	1.076
95% t UCL (assumes normality of ROS data)	1023	95% Percentile Bootstrap UCL	1136

95% BCA Bootstrap UCL	1509	95% Bootstrap t UCL	15646
95% H-UCL (Log ROS)	188.7		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	447.6	Mean in Log Scale	4.634
SD in Original Scale	2819	SD in Log Scale	0.755
95% t UCL (Assumes normality)	1027	95% H-Stat UCL	165.9

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

95% KM (Chebyshev) UCL 1985

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	28
Number of Detects	24	Number of Non-Detects	42
Number of Distinct Detects	24	Number of Distinct Non-Detects	4
Minimum Detect	33	Minimum Non-Detect	180
Maximum Detect	35000	Maximum Non-Detect	210
Variance Detects	50506915	Percent Non-Detects	63.64%
Mean Detects	1648	SD Detects	7107
Median Detects	105	CV Detects	4.313
Skewness Detects	4.893	Kurtosis Detects	23.96
Mean of Logged Detects	5.067	SD of Logged Detects	1.483

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.23	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.504	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.181	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

Mean	647.7	Standard Error of Mean	536.1
SD	4263	95% KM (BCA) UCL	1711
95% KM (t) UCL	1542	95% KM (Percentile Bootstrap) UCL	1703
95% KM (z) UCL	1529	95% KM Bootstrap t UCL	21631
90% KM Chebyshev UCL	2256	95% KM Chebyshev UCL	2984
97.5% KM Chebyshev UCL	3995	99% KM Chebyshev UCL	5982

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.915	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.853	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.37	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.193	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)	0.295	k star (bias corrected MLE)	0.286
Theta hat (MLE)	5578	Theta star (bias corrected MLE)	5756
nu hat (MLE)	14.18	nu star (bias corrected)	13.74
MLE Mean (bias corrected)	1648	MLE Sd (bias corrected)	3080

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0231	nu hat (KM)	3.047
Approximate Chi Square Value (3.05, α)	0.386	Adjusted Chi Square Value (3.05, β)	0.369
95% Gamma Approximate KM-UCL (use when n>=50)	5107	95% Gamma Adjusted KM-UCL (use when n<50)	5355

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	656.9
Maximum	35000	Median	0.01
SD	4301	CV	6.548
k hat (MLE)	0.12	k star (bias corrected MLE)	0.125
Theta hat (MLE)	5480	Theta star (bias corrected MLE)	5275
nu hat (MLE)	15.82	nu star (bias corrected)	16.44
MLE Mean (bias corrected)	656.9	MLE Sd (bias corrected)	1862
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (16.44, α)	8.271	Adjusted Chi Square Value (16.44, β)	8.141
95% Gamma Approximate UCL (use when n>=50)	1305	95% Gamma Adjusted UCL (use when n<50)	1326

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.797	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.152	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.181	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	660.9	Mean in Log Scale	4.57
SD in Original Scale	4294	SD in Log Scale	1.157
95% t UCL (assumes normality of ROS data)	1543	95% Percentile Bootstrap UCL	1722
95% BCA Bootstrap UCL	2735	95% Bootstrap t UCL	22625
95% H-UCL (Log ROS)	259.8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.532	95% H-UCL (KM -Log)	210.7
KM SD (logged)	1.029	95% Critical H Value (KM-Log)	2.26

KM Standard Error of Mean (logged) 0.157

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	659.6	Mean in Log Scale	4.738
SD in Original Scale	4294	SD in Log Scale	0.918
95% t UCL (Assumes normality)	1542	95% H-Stat UCL	223.7

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL 1711

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.

Pyrene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	30
Number of Detects	32	Number of Non-Detects	34
Number of Distinct Detects	28	Number of Distinct Non-Detects	4
Minimum Detect	27	Minimum Non-Detect	180
Maximum Detect	180000	Maximum Non-Detect	210
Variance Detects	1.008E+9	Percent Non-Detects	51.52%
Mean Detects	6032	SD Detects	31750
Median Detects	185	CV Detects	5.264
Skewness Detects	5.654	Kurtosis Detects	31.98
Mean of Logged Detects	5.515	SD of Logged Detects	1.705

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.192	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.517	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.157	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

Mean	2969	Standard Error of Mean	2747
SD	21962	95% KM (BCA) UCL	8403
95% KM (t) UCL	7552	95% KM (Percentile Bootstrap) UCL	8407
95% KM (z) UCL	7487	95% KM Bootstrap t UCL	194068
90% KM Chebyshev UCL	11209	95% KM Chebyshev UCL	14941
97.5% KM Chebyshev UCL	20121	99% KM Chebyshev UCL	30297

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.775	**Anderson-Darling GOF Test**	

5% A-D Critical Value	0.892	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.367	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.172	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)	0.226	k star (bias corrected MLE)	0.226
Theta hat (MLE)	26659	Theta star (bias corrected MLE)	26704
nu hat (MLE)	14.48	nu star (bias corrected)	14.46
MLE Mean (bias corrected)	6032	MLE Sd (bias corrected)	12691

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0183	nu hat (KM)	2.412
Approximate Chi Square Value (2.41, α)	0.222	Adjusted Chi Square Value (2.41, β)	0.212
95% Gamma Approximate KM-UCL (use when n>=50)	32265	95% Gamma Adjusted KM-UCL (use when n<50)	33841

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2924
Maximum	180000	Median	0.01
SD	22136	CV	7.569
k hat (MLE)	0.105	k star (bias corrected MLE)	0.11
Theta hat (MLE)	27829	Theta star (bias corrected MLE)	26487
nu hat (MLE)	13.87	nu star (bias corrected)	14.57
MLE Mean (bias corrected)	2924	MLE Sd (bias corrected)	8801
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (14.57, α)	6.966	Adjusted Chi Square Value (14.57, β)	6.849
95% Gamma Approximate UCL (use when n>=50)	6118	95% Gamma Adjusted UCL (use when n<50)	6223

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.133	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.157	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2977	Mean in Log Scale	4.876
SD in Original Scale	22129	SD in Log Scale	1.483
95% t UCL (assumes normality of ROS data)	7522	95% Percentile Bootstrap UCL	8423
95% BCA Bootstrap UCL	11188	95% Bootstrap t UCL	189846
95% H-UCL (Log ROS)	609.9		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.897	95% H-UCL (KM -Log)	499.8
KM SD (logged)	1.369	95% Critical H Value (KM-Log)	2.236
KM Standard Error of Mean (logged)	0.191		

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	2973	Mean in Log Scale	5.019
SD in Original Scale	22130	SD in Log Scale	1.274
95% t UCL (Assumes normality)	7519	95% H-Stat UCL	479.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 14941

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.

Dioxin

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	0.735	Mean	12.35
Maximum	48.37	Median	3.618
SD	15.62	Std. Error of Mean	4.174
Coefficient of Variation	1.265	Skewness	1.367

Normal GOF Test

Shapiro Wilk Test Statistic	0.763	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	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	19.74	95% Adjusted-CLT UCL (Chen-1995)	20.84
		95% Modified-t UCL (Johnson-1978)	19.99

Gamma GOF Test

A-D Test Statistic	0.658	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.776	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.228	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.239	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.687	k star (bias corrected MLE)	0.588

Theta hat (MLE)	17.96	Theta star (bias corrected MLE)	21.01
nu hat (MLE)	19.25	nu star (bias corrected)	16.46
MLE Mean (bias corrected)	12.35	MLE Sd (bias corrected)	16.1
		Approximate Chi Square Value (0.05)	8.285
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	7.526

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	24.52	95% Adjusted Gamma UCL (use when n<50)	26.99

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.184	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.237	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.307	Mean of logged Data	1.632
Maximum of Logged Data	3.879	SD of logged Data	1.449

Assuming Lognormal Distribution

95% H-UCL	61.89	90% Chebyshev (MVUE) UCL	29.57
95% Chebyshev (MVUE) UCL	37.16	97.5% Chebyshev (MVUE) UCL	47.69
99% Chebyshev (MVUE) UCL	68.38		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	19.21	95% Jackknife UCL	19.74
95% Standard Bootstrap UCL	18.97	95% Bootstrap-t UCL	24.06
95% Hall's Bootstrap UCL	19.23	95% Percentile Bootstrap UCL	19.09
95% BCA Bootstrap UCL	20.31		
90% Chebyshev(Mean, Sd) UCL	24.87	95% Chebyshev(Mean, Sd) UCL	30.54
97.5% Chebyshev(Mean, Sd) UCL	38.41	99% Chebyshev(Mean, Sd) UCL	53.88

Suggested UCL to Use

95% Adjusted Gamma UCL	26.99

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

4,4'-DDT

General Statistics

Total Number of Observations	58	Number of Distinct Observations	24
Number of Detects	22	Number of Non-Detects	36
Number of Distinct Detects	18	Number of Distinct Non-Detects	6
Minimum Detect	4.6	Minimum Non-Detect	3.5

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Maximum Detect	32000	Maximum Non-Detect	4
Variance Detects	46859713	Percent Non-Detects	62.07%
Mean Detects	1734	SD Detects	6845
Median Detects	16.5	CV Detects	3.949
Skewness Detects	4.518	Kurtosis Detects	20.76
Mean of Logged Detects	3.669	SD of Logged Detects	2.261

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.275	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.495	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	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

Mean	659.7	Standard Error of Mean	565
SD	4204	95% KM (BCA) UCL	1770
95% KM (t) UCL	1604	95% KM (Percentile Bootstrap) UCL	1759
95% KM (z) UCL	1589	95% KM Bootstrap t UCL	59737
90% KM Chebyshev UCL	2355	95% KM Chebyshev UCL	3122
97.5% KM Chebyshev UCL	4188	99% KM Chebyshev UCL	6281

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.196	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.901	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.37	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.206	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)	0.195	k star (bias corrected MLE)	0.199
Theta hat (MLE)	8890	Theta star (bias corrected MLE)	8724
nu hat (MLE)	8.58	nu star (bias corrected)	8.743
MLE Mean (bias corrected)	1734	MLE Sd (bias corrected)	3889

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0246	nu hat (KM)	2.857
Approximate Chi Square Value (2.86, α)	0.331	Adjusted Chi Square Value (2.86, β)	0.314
95% Gamma Approximate KM-UCL (use when n>=50)	5688	95% Gamma Adjusted KM-UCL (use when n<50)	6011

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	657.6
Maximum	32000	Median	0.01
SD	4241	CV	6.449
k hat (MLE)	0.102	k star (bias corrected MLE)	0.108
Theta hat (MLE)	6456	Theta star (bias corrected MLE)	6084

nu hat (MLE)	11.81	nu star (bias corrected)	12.54
MLE Mean (bias corrected)	657.6	MLE Sd (bias corrected)	2000
		Adjusted Level of Significance (β)	0.0459
Approximate Chi Square Value (12.54, α)	5.583	Adjusted Chi Square Value (12.54, β)	5.464
95% Gamma Approximate UCL (use when n>=50)	1477	95% Gamma Adjusted UCL (use when n<50)	1509

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.811	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.183	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	657.7	Mean in Log Scale	-0.552
SD in Original Scale	4241	SD in Log Scale	3.999
95% t UCL (assumes normality of ROS data)	1589	95% Percentile Bootstrap UCL	1759
95% BCA Bootstrap UCL	2323	95% Bootstrap t UCL	59645
95% H-UCL (Log ROS)	71189		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.169	95% H-UCL (KM -Log)	101.5
KM SD (logged)	1.796	95% Critical H Value (KM-Log)	3.524
KM Standard Error of Mean (logged)	0.241		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	658.7	Mean in Log Scale	1.769
SD in Original Scale	4241	SD in Log Scale	2.032
95% t UCL (Assumes normality)	1590	95% H-Stat UCL	130.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 6281

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.

Delta-BHC

General Statistics

Total Number of Observations	56	Number of Distinct Observations	11
		Number of Missing Observations	2
Number of Detects	5	Number of Non-Detects	51
Number of Distinct Detects	5	Number of Distinct Non-Detects	6
Minimum Detect	7.6	Minimum Non-Detect	1.7

Maximum Detect	690	Maximum Non-Detect	2.3
Variance Detects	82725	Percent Non-Detects	91.07%
Mean Detects	187.7	SD Detects	287.6
Median Detects	72	CV Detects	1.533
Skewness Detects	1.99	Kurtosis Detects	4.041
Mean of Logged Detects	4.018	SD of Logged Detects	1.929

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.726	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.338	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	18.31	Standard Error of Mean	13.95
SD	93.39	95% KM (BCA) UCL	44.35
95% KM (t) UCL	41.65	95% KM (Percentile Bootstrap) UCL	42.01
95% KM (z) UCL	41.26	95% KM Bootstrap t UCL	114
90% KM Chebyshev UCL	60.16	95% KM Chebyshev UCL	79.12
97.5% KM Chebyshev UCL	105.4	99% KM Chebyshev UCL	157.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.327	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.238	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.371	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)	0.519	k star (bias corrected MLE)	0.341
Theta hat (MLE)	361.5	Theta star (bias corrected MLE)	550.4
nu hat (MLE)	5.191	nu star (bias corrected)	3.41
MLE Mean (bias corrected)	187.7	MLE Sd (bias corrected)	321.4

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0384	nu hat (KM)	4.303
Approximate Chi Square Value (4.30, α)	0.845	Adjusted Chi Square Value (4.30, β)	0.807
95% Gamma Approximate KM-UCL (use when n>=50)	93.22	95% Gamma Adjusted KM-UCL (use when n<50)	97.63

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	16.77
Maximum	690	Median	0.01
SD	94.51	CV	5.637
k hat (MLE)	0.119	k star (bias corrected MLE)	0.125
Theta hat (MLE)	140.6	Theta star (bias corrected MLE)	134.4

nu hat (MLE)	13.36	nu star (bias corrected)	13.98
MLE Mean (bias corrected)	16.77	MLE Sd (bias corrected)	47.46
		Adjusted Level of Significance (β)	0.0457
Approximate Chi Square Value (13.98, α)	6.555	Adjusted Chi Square Value (13.98, β)	6.42
95% Gamma Approximate UCL (use when n>=50)	35.75	95% Gamma Adjusted UCL (use when n<50)	36.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	16.8	Mean in Log Scale	-7.309
SD in Original Scale	94.5	SD in Log Scale	5.8
95% t UCL (assumes normality of ROS data)	37.93	95% Percentile Bootstrap UCL	40.18
95% BCA Bootstrap UCL	53.78	95% Bootstrap t UCL	168.9
95% H-UCL (Log ROS)	32002641		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.842	95% H-UCL (KM -Log)	6.345
KM SD (logged)	1.12	95% Critical H Value (KM-Log)	2.504
KM Standard Error of Mean (logged)	0.167		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	17.62	Mean in Log Scale	0.312
SD in Original Scale	94.36	SD in Log Scale	1.282
95% t UCL (Assumes normality)	38.72	95% H-Stat UCL	5.025

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	41.65	95% KM (Percentile Bootstrap) UCL	42.01

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.

Dieldrin

General Statistics

Total Number of Observations	57	Number of Distinct Observations	18
		Number of Missing Observations	1
Number of Detects	13	Number of Non-Detects	44
Number of Distinct Detects	11	Number of Distinct Non-Detects	8
Minimum Detect	3.6	Minimum Non-Detect	3.5

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Maximum Detect	2400	Maximum Non-Detect	4.5
Variance Detects	510758	Percent Non-Detects	77.19%
Mean Detects	287.4	SD Detects	714.7
Median Detects	12	CV Detects	2.487
Skewness Detects	2.687	Kurtosis Detects	7.001
Mean of Logged Detects	3.065	SD of Logged Detects	2.052

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.468	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.486	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.246	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

Mean	68.24	Standard Error of Mean	48.1
SD	348.9	95% KM (BCA) UCL	152.6
95% KM (t) UCL	148.7	95% KM (Percentile Bootstrap) UCL	152.4
95% KM (z) UCL	147.4	95% KM Bootstrap t UCL	4352
90% KM Chebyshev UCL	212.5	95% KM Chebyshev UCL	277.9
97.5% KM Chebyshev UCL	368.6	99% KM Chebyshev UCL	546.8

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.453	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.843	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.419	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.258	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)	0.27	k star (bias corrected MLE)	0.259
Theta hat (MLE)	1063	Theta star (bias corrected MLE)	1109
nu hat (MLE)	7.025	nu star (bias corrected)	6.738
MLE Mean (bias corrected)	287.4	MLE Sd (bias corrected)	564.5

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0383	nu hat (KM)	4.362
Approximate Chi Square Value (4.36, α)	0.87	Adjusted Chi Square Value (4.36, β)	0.831
95% Gamma Approximate KM-UCL (use when n>=50)	342.3	95% Gamma Adjusted KM-UCL (use when n<50)	358

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	65.55
Maximum	2400	Median	0.01
SD	352.5	CV	5.378
k hat (MLE)	0.114	k star (bias corrected MLE)	0.119
Theta hat (MLE)	577.5	Theta star (bias corrected MLE)	549.7

nu hat (MLE)	12.94	nu star (bias corrected)	13.59
MLE Mean (bias corrected)	65.55	MLE Sd (bias corrected)	189.8
		Adjusted Level of Significance (β)	0.0458
Approximate Chi Square Value (13.59, α)	6.293	Adjusted Chi Square Value (13.59, β)	6.164
95% Gamma Approximate UCL (use when n>=50)	141.6	95% Gamma Adjusted UCL (use when n<50)	144.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.743	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	65.62	Mean in Log Scale	-2.758
SD in Original Scale	352.5	SD in Log Scale	4.076
95% t UCL (assumes normality of ROS data)	143.7	95% Percentile Bootstrap UCL	149.3
95% BCA Bootstrap UCL	193.5	95% Bootstrap t UCL	4156
95% H-UCL (Log ROS)	12061		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	66.97	Mean in Log Scale	1.173
SD in Original Scale	352.2	SD in Log Scale	1.408
95% t UCL (Assumes normality)	145	95% H-Stat UCL	15.23

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

99% KM (Chebyshev) UCL 546.8

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.

Heptachlor Epoxide

General Statistics

Total Number of Observations	57	Number of Distinct Observations	17
		Number of Missing Observations	1
Number of Detects	15	Number of Non-Detects	42
Number of Distinct Detects	14	Number of Distinct Non-Detects	4
Minimum Detect	2	Minimum Non-Detect	1.8
Maximum Detect	1600	Maximum Non-Detect	2.1
Variance Detects	195021	Percent Non-Detects	73.68%
Mean Detects	177.4	SD Detects	441.6
Median Detects	13	CV Detects	2.489
Skewness Detects	2.923	Kurtosis Detects	8.498

Mean of Logged Detects	2.968	SD of Logged Detects	1.965

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.462	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.418	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	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

Mean	48.01	Standard Error of Mean	31.82
SD	232.1	95% KM (BCA) UCL	105
95% KM (t) UCL	101.2	95% KM (Percentile Bootstrap) UCL	102.7
95% KM (z) UCL	100.4	95% KM Bootstrap t UCL	627.9
90% KM Chebyshev UCL	143.5	95% KM Chebyshev UCL	186.7
97.5% KM Chebyshev UCL	246.8	99% KM Chebyshev UCL	364.7

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.005	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.833	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.361	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.24	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)	0.31	k star (bias corrected MLE)	0.293
Theta hat (MLE)	571.8	Theta star (bias corrected MLE)	606.2
nu hat (MLE)	9.308	nu star (bias corrected)	8.78
MLE Mean (bias corrected)	177.4	MLE Sd (bias corrected)	327.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0428	nu hat (KM)	4.877
Approximate Chi Square Value (4.88, α)	1.096	Adjusted Chi Square Value (4.88, β)	1.051
95% Gamma Approximate KM-UCL (use when n>=50)	213.7	95% Gamma Adjusted KM-UCL (use when n<50)	222.7

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	46.69
Maximum	1600	Median	0.01
SD	234.4	CV	5.021
k hat (MLE)	0.122	k star (bias corrected MLE)	0.128
Theta hat (MLE)	381.2	Theta star (bias corrected MLE)	365.5
nu hat (MLE)	13.96	nu star (bias corrected)	14.56
MLE Mean (bias corrected)	46.69	MLE Sd (bias corrected)	130.6
		Adjusted Level of Significance (β)	0.0458
Approximate Chi Square Value (14.56, α)	6.959	Adjusted Chi Square Value (14.56, β)	6.822
95% Gamma Approximate UCL (use when n>=50)	97.72	95% Gamma Adjusted UCL (use when n<50)	99.68

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.261	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	46.78	Mean in Log Scale	-2.356
SD in Original Scale	234.4	SD in Log Scale	4.097
95% t UCL (assumes normality of ROS data)	98.71	95% Percentile Bootstrap UCL	103.5
95% BCA Bootstrap UCL	146.4	95% Bootstrap t UCL	665.4
95% H-UCL (Log ROS)	20434		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	47.38	Mean in Log Scale	0.741
SD in Original Scale	234.3	SD in Log Scale	1.664
95% t UCL (Assumes normality)	99.29	95% H-Stat UCL	17.48

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

95% KM (Chebyshev) UCL 186.7

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.

Aroclor 1254

General Statistics

Total Number of Observations	89	Number of Distinct Observations	30
Number of Detects	26	Number of Non-Detects	63
Number of Distinct Detects	25	Number of Distinct Non-Detects	9
Minimum Detect	35	Minimum Non-Detect	35
Maximum Detect	270000	Maximum Non-Detect	49
Variance Detects	3.741E+9	Percent Non-Detects	70.79%
Mean Detects	18232	SD Detects	61160
Median Detects	265	CV Detects	3.355
Skewness Detects	3.661	Kurtosis Detects	13.15
Mean of Logged Detects	6.116	SD of Logged Detects	2.397

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.337	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.446	**Lilliefors GOF Test**

5% Lilliefors Critical Value	0.174	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

Mean	5351	Standard Error of Mean	3616
SD	33454	95% KM (BCA) UCL	12277
95% KM (t) UCL	11363	95% KM (Percentile Bootstrap) UCL	12085
95% KM (z) UCL	11299	95% KM Bootstrap t UCL	105523
90% KM Chebyshev UCL	16200	95% KM Chebyshev UCL	21114
97.5% KM Chebyshev UCL	27935	99% KM Chebyshev UCL	41333

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.4	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.902	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.35	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.19	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)	0.199	k star (bias corrected MLE)	0.202
Theta hat (MLE)	91490	Theta star (bias corrected MLE)	90290
nu hat (MLE)	10.36	nu star (bias corrected)	10.5
MLE Mean (bias corrected)	18232	MLE Sd (bias corrected)	40573

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0256	nu hat (KM)	4.554
Approximate Chi Square Value (4.55, α)	0.952	Adjusted Chi Square Value (4.55, β)	0.926
95% Gamma Approximate KM-UCL (use when n>=50)	25598	95% Gamma Adjusted KM-UCL (use when n<50)	26313

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5326
Maximum	270000	Median	0.01
SD	33648	CV	6.318
k hat (MLE)	0.0827	k star (bias corrected MLE)	0.0874
Theta hat (MLE)	64433	Theta star (bias corrected MLE)	60964
nu hat (MLE)	14.71	nu star (bias corrected)	15.55
MLE Mean (bias corrected)	5326	MLE Sd (bias corrected)	18019
		Adjusted Level of Significance (β)	0.0473
Approximate Chi Square Value (15.55, α)	7.646	Adjusted Chi Square Value (15.55, β)	7.555
95% Gamma Approximate UCL (use when n>=50)	10832	95% Gamma Adjusted UCL (use when n<50)	10963

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.222	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.174	Detected Data Not Lognormal at 5% Significance Level

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5327	Mean in Log Scale	0.536
SD in Original Scale	33647	SD in Log Scale	4.502
95% t UCL (assumes normality of ROS data)	11256	95% Percentile Bootstrap UCL	11895
95% BCA Bootstrap UCL	14878	95% Bootstrap t UCL	121345
95% H-UCL (Log ROS)	1134424		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5339	Mean in Log Scale	3.856
SD in Original Scale	33646	SD in Log Scale	1.941
95% t UCL (Assumes normality)	11268	95% H-Stat UCL	616.5

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

97.5% KM (Chebyshev) UCL 27935

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.

Aroclor 1260

General Statistics

Total Number of Observations	87	Number of Distinct Observations	45
		Number of Missing Observations	2
Number of Detects	48	Number of Non-Detects	39
Number of Distinct Detects	42	Number of Distinct Non-Detects	5
Minimum Detect	20	Minimum Non-Detect	35
Maximum Detect	540000	Maximum Non-Detect	39
Variance Detects	9.741E+9	Percent Non-Detects	44.83%
Mean Detects	28030	SD Detects	98698
Median Detects	175	CV Detects	3.521
Skewness Detects	4.001	Kurtosis Detects	16.88
Mean of Logged Detects	5.808	SD of Logged Detects	2.526

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.333	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.481	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	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

Mean	15476	Standard Error of Mean	8003

SD	73869	95% KM (BCA) UCL	29088
95% KM (t) UCL	28784	95% KM (Percentile Bootstrap) UCL	29572
95% KM (z) UCL	28640	95% KM Bootstrap t UCL	41690
90% KM Chebyshev UCL	39486	95% KM Chebyshev UCL	50362
97.5% KM Chebyshev UCL	65457	99% KM Chebyshev UCL	95108

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	9.407	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.94	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.38	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.143	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)	0.17	k star (bias corrected MLE)	0.173
Theta hat (MLE)	164705	Theta star (bias corrected MLE)	161617
nu hat (MLE)	16.34	nu star (bias corrected)	16.65
MLE Mean (bias corrected)	28030	MLE Sd (bias corrected)	67307

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0439	nu hat (KM)	7.637
Approximate Chi Square Value (7.64, α)	2.527	Adjusted Chi Square Value (7.64, β)	2.478
95% Gamma Approximate KM-UCL (use when n>=50)	46775	95% Gamma Adjusted KM-UCL (use when n<50)	47703

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	15465
Maximum	540000	Median	35
SD	74299	CV	4.804
k hat (MLE)	0.096	k star (bias corrected MLE)	0.1
Theta hat (MLE)	161150	Theta star (bias corrected MLE)	154156
nu hat (MLE)	16.7	nu star (bias corrected)	17.46
MLE Mean (bias corrected)	15465	MLE Sd (bias corrected)	48826
		Adjusted Level of Significance (β)	0.0472
Approximate Chi Square Value (17.46, α)	8.999	Adjusted Chi Square Value (17.46, β)	8.896
95% Gamma Approximate UCL (use when n>=50)	29999	95% Gamma Adjusted UCL (use when n<50)	30345

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.803	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.128	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	15469	Mean in Log Scale	3.835
SD in Original Scale	74298	SD in Log Scale	3.052

95% t UCL (assumes normality of ROS data)	28714	95% Percentile Bootstrap UCL	30017
95% BCA Bootstrap UCL	38134	95% Bootstrap t UCL	47175
95% H-UCL (Log ROS)	23489		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	15473	Mean in Log Scale	4.508
SD in Original Scale	74297	SD in Log Scale	2.365
95% t UCL (Assumes normality)	28718	95% H-Stat UCL	3969

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

97.5% KM (Chebyshev) UCL 65457

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.

Aluminum

General Statistics

Total Number of Observations	78	Number of Distinct Observations	74
		Number of Missing Observations	0
Minimum	1020	Mean	2804
Maximum	11900	Median	2290
SD	1815	Std. Error of Mean	205.5
Coefficient of Variation	0.647	Skewness	3.327

Normal GOF Test

Shapiro Wilk Test Statistic	0.682	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1	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	3146	95% Adjusted-CLT UCL (Chen-1995)	3224
		95% Modified-t UCL (Johnson-1978)	3159

Gamma GOF Test

A-D Test Statistic	1.73	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.756	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.128	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.102	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.045	k star (bias corrected MLE)	3.898
Theta hat (MLE)	693	Theta star (bias corrected MLE)	719.2
nu hat (MLE)	631.1	nu star (bias corrected)	608.1
MLE Mean (bias corrected)	2804	MLE Sd (bias corrected)	1420
		Approximate Chi Square Value (0.05)	551.9
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	550.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3089	95% Adjusted Gamma UCL (use when n<50)	3095

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00416	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0949	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.1	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	6.928	Mean of logged Data	7.81
Maximum of Logged Data	9.384	SD of logged Data	0.473

Assuming Lognormal Distribution

95% H-UCL	3045	90% Chebyshev (MVUE) UCL	3217
95% Chebyshev (MVUE) UCL	3428	97.5% Chebyshev (MVUE) UCL	3719
99% Chebyshev (MVUE) UCL	4293		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3142	95% Jackknife UCL	3146
95% Standard Bootstrap UCL	3135	95% Bootstrap-t UCL	3300
95% Hall's Bootstrap UCL	3595	95% Percentile Bootstrap UCL	3174
95% BCA Bootstrap UCL	3221		
90% Chebyshev(Mean, Sd) UCL	3420	95% Chebyshev(Mean, Sd) UCL	3699
97.5% Chebyshev(Mean, Sd) UCL	4087	99% Chebyshev(Mean, Sd) UCL	4849

Suggested UCL to Use

95% Student's-t UCL	3146	or 95% Modified-t UCL	3159

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	78	Number of Distinct Observations	42
Number of Detects	37	Number of Non-Detects	41

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Number of Distinct Detects	35	Number of Distinct Non-Detects	9
Minimum Detect	0.21	Minimum Non-Detect	0.73
Maximum Detect	465	Maximum Non-Detect	1.2
Variance Detects	5778	Percent Non-Detects	52.56%
Mean Detects	16.26	SD Detects	76.02
Median Detects	1.4	CV Detects	4.675
Skewness Detects	6.035	Kurtosis Detects	36.59
Mean of Logged Detects	0.605	SD of Logged Detects	1.65

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.211	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.441	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.146	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

Mean	7.966	Standard Error of Mean	5.997
SD	52.24	95% KM (BCA) UCL	19.69
95% KM (t) UCL	17.95	95% KM (Percentile Bootstrap) UCL	19.82
95% KM (z) UCL	17.83	95% KM Bootstrap t UCL	123.4
90% KM Chebyshev UCL	25.96	95% KM Chebyshev UCL	34.11
97.5% KM Chebyshev UCL	45.42	99% KM Chebyshev UCL	67.63

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.697	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.854	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.253	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.157	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)	0.314	k star (bias corrected MLE)	0.306
Theta hat (MLE)	51.86	Theta star (bias corrected MLE)	53.11
nu hat (MLE)	23.2	nu star (bias corrected)	22.65
MLE Mean (bias corrected)	16.26	MLE Sd (bias corrected)	29.39

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0233	nu hat (KM)	3.628
Approximate Chi Square Value (3.63, α)	0.58	Adjusted Chi Square Value (3.63, β)	0.559
95% Gamma Approximate KM-UCL (use when n>=50)	49.8	95% Gamma Adjusted KM-UCL (use when n<50)	51.65

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	7.718
Maximum	465	Median	0.01
SD	52.61	CV	6.817

k hat (MLE)	0.179	k star (bias corrected MLE)	0.181
Theta hat (MLE)	43.07	Theta star (bias corrected MLE)	42.68
nu hat (MLE)	27.95	nu star (bias corrected)	28.21
MLE Mean (bias corrected)	7.718	MLE Sd (bias corrected)	18.15
		Adjusted Level of Significance (β)	0.0469
Approximate Chi Square Value (28.21, α)	17.09	Adjusted Chi Square Value (28.21, β)	16.93
95% Gamma Approximate UCL (use when n>=50)	12.74	95% Gamma Adjusted UCL (use when n<50)	12.86

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.109	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.146	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	8.033	Mean in Log Scale	-0.159
SD in Original Scale	52.57	SD in Log Scale	1.497
95% t UCL (assumes normality of ROS data)	17.94	95% Percentile Bootstrap UCL	19.82
95% BCA Bootstrap UCL	26.5	95% Bootstrap t UCL	127
95% H-UCL (Log ROS)	4.226		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.159	95% H-UCL (KM -Log)	3.381
KM SD (logged)	1.383	95% Critical H Value (KM-Log)	2.673
KM Standard Error of Mean (logged)	0.175		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	7.989	Mean in Log Scale	-0.0546
SD in Original Scale	52.57	SD in Log Scale	1.296
95% t UCL (Assumes normality)	17.9	95% H-Stat UCL	3.206

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 34.11

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.

Arsenic

General Statistics

Total Number of Observations	78	Number of Distinct Observations	47
		Number of Missing Observations	0

Minimum	0.32	Mean	4.574
Maximum	75.4	Median	1.9
SD	10.4	Std. Error of Mean	1.178
Coefficient of Variation	2.274	Skewness	5.424

Normal GOF Test

Shapiro Wilk Test Statistic	0.364	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.341	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1	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	6.535	95% Adjusted-CLT UCL (Chen-1995)	7.285
		95% Modified-t UCL (Johnson-1978)	6.656

Gamma GOF Test

A-D Test Statistic	6.361	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.788	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.207	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.105	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.849	k star (bias corrected MLE)	0.825
Theta hat (MLE)	5.385	Theta star (bias corrected MLE)	5.543
nu hat (MLE)	132.5	nu star (bias corrected)	128.7
MLE Mean (bias corrected)	4.574	MLE Sd (bias corrected)	5.035
		Approximate Chi Square Value (0.05)	103.5
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	103.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	5.688	95% Adjusted Gamma UCL (use when n<50)	5.711

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	2.2592E-4	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.114	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.139	Mean of logged Data	0.827
Maximum of Logged Data	4.323	SD of logged Data	0.963

Assuming Lognormal Distribution

95% H-UCL	4.64	90% Chebyshev (MVUE) UCL	4.994
95% Chebyshev (MVUE) UCL	5.624	97.5% Chebyshev (MVUE) UCL	6.498
99% Chebyshev (MVUE) UCL	8.215		

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	6.512	95% Jackknife UCL	6.535
95% Standard Bootstrap UCL	6.446	95% Bootstrap-t UCL	9.39
95% Hall's Bootstrap UCL	12.04	95% Percentile Bootstrap UCL	6.525
95% BCA Bootstrap UCL	7.694		
90% Chebyshev(Mean, Sd) UCL	8.108	95% Chebyshev(Mean, Sd) UCL	9.709
97.5% Chebyshev(Mean, Sd) UCL	11.93	99% Chebyshev(Mean, Sd) UCL	16.29

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	9.709

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cadmium

General Statistics

Total Number of Observations	78	Number of Distinct Observations	36
Number of Detects	34	Number of Non-Detects	44
Number of Distinct Detects	29	Number of Distinct Non-Detects	10
Minimum Detect	0.11	Minimum Non-Detect	0.51
Maximum Detect	11.3	Maximum Non-Detect	0.61
Variance Detects	8.083	Percent Non-Detects	56.41%
Mean Detects	1.621	SD Detects	2.843
Median Detects	0.29	CV Detects	1.754
Skewness Detects	2.313	Kurtosis Detects	4.683
Mean of Logged Detects	-0.649	SD of Logged Detects	1.415

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.589	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.36	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	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

Mean	0.839	Standard Error of Mean	0.228
SD	1.975	95% KM (BCA) UCL	1.259
95% KM (t) UCL	1.218	95% KM (Percentile Bootstrap) UCL	1.223
95% KM (z) UCL	1.214	95% KM Bootstrap t UCL	1.448
90% KM Chebyshev UCL	1.522	95% KM Chebyshev UCL	1.831
97.5% KM Chebyshev UCL	2.26	99% KM Chebyshev UCL	3.104

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.185	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.807	Detected Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.26	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.159	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)	0.553	k star (bias corrected MLE)	0.523
Theta hat (MLE)	2.934	Theta star (bias corrected MLE)	3.097
nu hat (MLE)	37.57	nu star (bias corrected)	35.59
MLE Mean (bias corrected)	1.621	MLE Sd (bias corrected)	2.24

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.181	nu hat (KM)	28.18
Approximate Chi Square Value (28.18, α)	17.07	Adjusted Chi Square Value (28.18, β)	16.91
95% Gamma Approximate KM-UCL (use when n>=50)	1.386	95% Gamma Adjusted KM-UCL (use when n<50)	1.399

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.836
Maximum	11.3	Median	0.165
SD	2.008	CV	2.402
k hat (MLE)	0.349	k star (bias corrected MLE)	0.344
Theta hat (MLE)	2.396	Theta star (bias corrected MLE)	2.43
nu hat (MLE)	54.43	nu star (bias corrected)	53.67
MLE Mean (bias corrected)	0.836	MLE Sd (bias corrected)	1.425
		Adjusted Level of Significance (β)	0.0469
Approximate Chi Square Value (53.67, α)	37.84	Adjusted Chi Square Value (53.67, β)	37.59
95% Gamma Approximate UCL (use when n>=50)	1.186	95% Gamma Adjusted UCL (use when n<50)	1.194

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.852	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.182	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data Not Lognormal at 5% Significance Level	

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.881	Mean in Log Scale	-1.069
SD in Original Scale	1.979	SD in Log Scale	1.127
95% t UCL (assumes normality of ROS data)	1.254	95% Percentile Bootstrap UCL	1.264
95% BCA Bootstrap UCL	1.375	95% Bootstrap t UCL	1.485
95% H-UCL (Log ROS)	0.881		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.863	Mean in Log Scale	-1.008
SD in Original Scale	1.979	SD in Log Scale	0.98
95% t UCL (Assumes normality)	1.236	95% H-Stat UCL	0.757

DL/2 is not a recommended method, provided for comparisons and historical reasons

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL 1.259

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

General Statistics

Total Number of Observations	78	Number of Distinct Observations	59
		Number of Missing Observations	0
Minimum	2.5	Mean	11.31
Maximum	153	Median	6.5
SD	19.16	Std. Error of Mean	2.169
Coefficient of Variation	1.694	Skewness	5.755

Normal GOF Test

Shapiro Wilk Test Statistic	0.427	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.329	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1	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	14.92	95% Adjusted-CLT UCL (Chen-1995)	16.39
		95% Modified-t UCL (Johnson-1978)	15.16

Gamma GOF Test

A-D Test Statistic	5.733	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.776	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.224	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.103	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.257	k star (bias corrected MLE)	1.217
Theta hat (MLE)	9.002	Theta star (bias corrected MLE)	9.296
nu hat (MLE)	196	nu star (bias corrected)	189.8
MLE Mean (bias corrected)	11.31	MLE Sd (bias corrected)	10.25
		Approximate Chi Square Value (0.05)	158.9
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	158.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	13.51	95% Adjusted Gamma UCL (use when n<50)	13.55

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.2280E-7	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.131	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.916	Mean of logged Data	1.978
Maximum of Logged Data	5.03	SD of logged Data	0.786

Assuming Lognormal Distribution

95% H-UCL	11.84	90% Chebyshev (MVUE) UCL	12.73
95% Chebyshev (MVUE) UCL	14.06	97.5% Chebyshev (MVUE) UCL	15.91
99% Chebyshev (MVUE) UCL	19.54		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	14.88	95% Jackknife UCL	14.92
95% Standard Bootstrap UCL	14.9	95% Bootstrap-t UCL	18.9
95% Hall's Bootstrap UCL	28.76	95% Percentile Bootstrap UCL	14.97
95% BCA Bootstrap UCL	17.5		
90% Chebyshev(Mean, Sd) UCL	17.82	95% Chebyshev(Mean, Sd) UCL	20.77
97.5% Chebyshev(Mean, Sd) UCL	24.86	99% Chebyshev(Mean, Sd) UCL	32.9

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	20.77

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	78	Number of Distinct Observations	45
		Number of Missing Observations	0
Minimum	0.37	Mean	1.67
Maximum	11.3	Median	1.3
SD	1.494	Std. Error of Mean	0.169
Coefficient of Variation	0.895	Skewness	3.923

Normal GOF Test

Shapiro Wilk Test Statistic	0.666	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1	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	1.952	95% Adjusted-CLT UCL (Chen-1995)	2.029
		95% Modified-t UCL (Johnson-1978)	1.964

Gamma GOF Test

A-D Test Statistic	1.78	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.762	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.16	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.102	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.332	k star (bias corrected MLE)	2.251
Theta hat (MLE)	0.716	Theta star (bias corrected MLE)	0.742
nu hat (MLE)	363.9	nu star (bias corrected)	351.2
MLE Mean (bias corrected)	1.67	MLE Sd (bias corrected)	1.113
		Approximate Chi Square Value (0.05)	308.8
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	308

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.9	95% Adjusted Gamma UCL (use when n<50)	1.904

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.207	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.116	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level	

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.994	Mean of logged Data	0.284
Maximum of Logged Data	2.425	SD of logged Data	0.637

Assuming Lognormal Distribution

95% H-UCL	1.872	90% Chebyshev (MVUE) UCL	2.001
95% Chebyshev (MVUE) UCL	2.174	97.5% Chebyshev (MVUE) UCL	2.413
99% Chebyshev (MVUE) UCL	2.882		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.949	95% Jackknife UCL	1.952
95% Standard Bootstrap UCL	1.935	95% Bootstrap-t UCL	2.091
95% Hall's Bootstrap UCL	2.457	95% Percentile Bootstrap UCL	1.936
95% BCA Bootstrap UCL	2.017		

90% Chebyshev(Mean, Sd) UCL	2.178	95% Chebyshev(Mean, Sd) UCL	2.408
97.5% Chebyshev(Mean, Sd) UCL	2.727	99% Chebyshev(Mean, Sd) UCL	3.354

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 2.408

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Copper

General Statistics

Total Number of Observations	78	Number of Distinct Observations	63
		Number of Missing Observations	0
Minimum	1.3	Mean	94.07
Maximum	4070	Median	5.6
SD	471.7	Std. Error of Mean	53.4
Coefficient of Variation	5.014	Skewness	8.047

Normal GOF Test

Shapiro Wilk Test Statistic	0.21	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.422	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1	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	183	95% Adjusted-CLT UCL (Chen-1995)	233.9
		95% Modified-t UCL (Johnson-1978)	191.1

Gamma GOF Test

A-D Test Statistic	11.29	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.863	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.294	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.11	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.307	k star (bias corrected MLE)	0.303
Theta hat (MLE)	306.7	Theta star (bias corrected MLE)	310
nu hat (MLE)	47.85	nu star (bias corrected)	47.34
MLE Mean (bias corrected)	94.07	MLE Sd (bias corrected)	170.8
		Approximate Chi Square Value (0.05)	32.55
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	32.32

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	136.8	95% Adjusted Gamma UCL (use when n<50)	137.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.6205E-9	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.174	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.262	Mean of logged Data	2.304
Maximum of Logged Data	8.311	SD of logged Data	1.632

Assuming Lognormal Distribution

95% H-UCL	65.92	90% Chebyshev (MVUE) UCL	65.2
95% Chebyshev (MVUE) UCL	78.19	97.5% Chebyshev (MVUE) UCL	96.22
99% Chebyshev (MVUE) UCL	131.6		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	181.9	95% Jackknife UCL	183
95% Standard Bootstrap UCL	179.9	95% Bootstrap-t UCL	560.4
95% Hall's Bootstrap UCL	479.4	95% Percentile Bootstrap UCL	194.1
95% BCA Bootstrap UCL	254.5		
90% Chebyshev(Mean, Sd) UCL	254.3	95% Chebyshev(Mean, Sd) UCL	326.8
97.5% Chebyshev(Mean, Sd) UCL	427.6	99% Chebyshev(Mean, Sd) UCL	625.4

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	326.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	78	Number of Distinct Observations	74
		Number of Missing Observations	0
Minimum	1630	Mean	10199
Maximum	89300	Median	5980
SD	15465	Std. Error of Mean	1751
Coefficient of Variation	1.516	Skewness	4.08

Normal GOF Test

Shapiro Wilk Test Statistic	0.478	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**

5% Lilliefors Critical Value	0.1	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	13115	95% Adjusted-CLT UCL (Chen-1995)	13944
		95% Modified-t UCL (Johnson-1978)	13249

Gamma GOF Test

A-D Test Statistic	4.794	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.776	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.195	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.243	k star (bias corrected MLE)	1.204
Theta hat (MLE)	8205	Theta star (bias corrected MLE)	8472
nu hat (MLE)	193.9	nu star (bias corrected)	187.8
MLE Mean (bias corrected)	10199	MLE Sd (bias corrected)	9296
		Approximate Chi Square Value (0.05)	157.1
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	156.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	12192	95% Adjusted Gamma UCL (use when n<50)	12233

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.6466E-5	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.107	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.396	Mean of logged Data	8.777
Maximum of Logged Data	11.4	SD of logged Data	0.818

Assuming Lognormal Distribution

95% H-UCL	11011	90% Chebyshev (MVUE) UCL	11846
95% Chebyshev (MVUE) UCL	13132	97.5% Chebyshev (MVUE) UCL	14918
99% Chebyshev (MVUE) UCL	18426		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	13080	95% Jackknife UCL	13115
95% Standard Bootstrap UCL	12989	95% Bootstrap-t UCL	15150
95% Hall's Bootstrap UCL	13933	95% Percentile Bootstrap UCL	13308
95% BCA Bootstrap UCL	14184		
90% Chebyshev(Mean, Sd) UCL	15453	95% Chebyshev(Mean, Sd) UCL	17832

97.5% Chebyshev(Mean, Sd) UCL	21135	99% Chebyshev(Mean, Sd) UCL	27623

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 17832

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	78	Number of Distinct Observations	70
		Number of Missing Observations	0
Minimum	1.3	Mean	1707
Maximum	94100	Median	25.1
SD	10723	Std. Error of Mean	1214
Coefficient of Variation	6.283	Skewness	8.533

Normal GOF Test

Shapiro Wilk Test Statistic	0.168	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.437	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1	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	3728	95% Adjusted-CLT UCL (Chen-1995)	4957
		95% Modified-t UCL (Johnson-1978)	3924

Gamma GOF Test

A-D Test Statistic	9.824	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.921	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.261	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.113	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.193	k star (bias corrected MLE)	0.194
Theta hat (MLE)	8830	Theta star (bias corrected MLE)	8779
nu hat (MLE)	30.15	nu star (bias corrected)	30.33
MLE Mean (bias corrected)	1707	MLE Sd (bias corrected)	3871
		Approximate Chi Square Value (0.05)	18.75
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	18.58

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2760	95% Adjusted Gamma UCL (use when n<50)	2786

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.8951E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.104	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.262	Mean of logged Data	3.615
Maximum of Logged Data	11.45	SD of logged Data	2.468

Assuming Lognormal Distribution

95% H-UCL	2446	90% Chebyshev (MVUE) UCL	1626
95% Chebyshev (MVUE) UCL	2055	97.5% Chebyshev (MVUE) UCL	2652
99% Chebyshev (MVUE) UCL	3823		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	3704	95% Jackknife UCL	3728
95% Standard Bootstrap UCL	3764	95% Bootstrap-t UCL	15736
95% Hall's Bootstrap UCL	14017	95% Percentile Bootstrap UCL	4089
95% BCA Bootstrap UCL	5441		
90% Chebyshev(Mean, Sd) UCL	5349	95% Chebyshev(Mean, Sd) UCL	6999
97.5% Chebyshev(Mean, Sd) UCL	9289	99% Chebyshev(Mean, Sd) UCL	13787

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 6999

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	78	Number of Distinct Observations	76
		Number of Missing Observations	0
Minimum	9.2	Mean	82.51
Maximum	722	Median	41.8
SD	130.7	Std. Error of Mean	14.8
Coefficient of Variation	1.584	Skewness	3.551

Normal GOF Test

Shapiro Wilk Test Statistic	0.516	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.307	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1	Data Not Normal at 5% Significance Level	

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	107.2	95% Adjusted-CLT UCL (Chen-1995)	113.2
		95% Modified-t UCL (Johnson-1978)	108.1

Gamma GOF Test

A-D Test Statistic	4.155	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.782	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.187	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.002	k star (bias corrected MLE)	0.972
Theta hat (MLE)	82.36	Theta star (bias corrected MLE)	84.9
nu hat (MLE)	156.3	nu star (bias corrected)	151.6
MLE Mean (bias corrected)	82.51	MLE Sd (bias corrected)	83.7
		Approximate Chi Square Value (0.05)	124.2
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	123.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	100.8	95% Adjusted Gamma UCL (use when n<50)	101.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	9.4780E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0941	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1	Data appear Lognormal at 5% Significance Level	

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.219	Mean of logged Data	3.837
Maximum of Logged Data	6.582	SD of logged Data	0.962

Assuming Lognormal Distribution

95% H-UCL	94.04	90% Chebyshev (MVUE) UCL	101.2
95% Chebyshev (MVUE) UCL	114	97.5% Chebyshev (MVUE) UCL	131.7
99% Chebyshev (MVUE) UCL	166.5		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	106.9	95% Jackknife UCL	107.2
95% Standard Bootstrap UCL	106.2	95% Bootstrap-t UCL	117.5
95% Hall's Bootstrap UCL	116.4	95% Percentile Bootstrap UCL	108.7
95% BCA Bootstrap UCL	114.2		
90% Chebyshev(Mean, Sd) UCL	126.9	95% Chebyshev(Mean, Sd) UCL	147
97.5% Chebyshev(Mean, Sd) UCL	175	99% Chebyshev(Mean, Sd) UCL	229.8

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 147

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	78	Number of Distinct Observations	28
Number of Detects	27	Number of Non-Detects	51
Number of Distinct Detects	24	Number of Distinct Non-Detects	4
Minimum Detect	0.023	Minimum Non-Detect	0.097
Maximum Detect	2.9	Maximum Non-Detect	0.12
Variance Detects	0.4	Percent Non-Detects	65.38%
Mean Detects	0.349	SD Detects	0.632
Median Detects	0.13	CV Detects	1.814
Skewness Detects	3.291	Kurtosis Detects	11.25
Mean of Logged Detects	-1.898	SD of Logged Detects	1.205

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.519	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.327	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	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

Mean	0.16	Standard Error of Mean	0.0452
SD	0.39	95% KM (BCA) UCL	0.252
95% KM (t) UCL	0.236	95% KM (Percentile Bootstrap) UCL	0.239
95% KM (z) UCL	0.235	95% KM Bootstrap t UCL	0.379
90% KM Chebyshev UCL	0.296	95% KM Chebyshev UCL	0.358
97.5% KM Chebyshev UCL	0.443	99% KM Chebyshev UCL	0.611

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.703	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.787	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.209	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.175	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)	0.714	k star (bias corrected MLE)	0.659
Theta hat (MLE)	0.488	Theta star (bias corrected MLE)	0.529
nu hat (MLE)	38.55	nu star (bias corrected)	35.6
MLE Mean (bias corrected)	0.349	MLE Sd (bias corrected)	0.429

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.169	nu hat (KM)	26.36
Approximate Chi Square Value (26.36, α)	15.66	Adjusted Chi Square Value (26.36, β)	15.5
95% Gamma Approximate KM-UCL (use when n>=50)	0.27	95% Gamma Adjusted KM-UCL (use when n<50)	0.273

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.149
Maximum	2.9	Median	0.0266
SD	0.4	CV	2.674
k hat (MLE)	0.473	k star (bias corrected MLE)	0.463
Theta hat (MLE)	0.316	Theta star (bias corrected MLE)	0.323
nu hat (MLE)	73.78	nu star (bias corrected)	72.28
MLE Mean (bias corrected)	0.149	MLE Sd (bias corrected)	0.22
		Adjusted Level of Significance (β)	0.0469
Approximate Chi Square Value (72.28, α)	53.7	Adjusted Chi Square Value (72.28, β)	53.4
95% Gamma Approximate UCL (use when n>=50)	0.201	95% Gamma Adjusted UCL (use when n<50)	0.202

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.152	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.168	Mean in Log Scale	-2.535
SD in Original Scale	0.392	SD in Log Scale	1.037
95% t UCL (assumes normality of ROS data)	0.242	95% Percentile Bootstrap UCL	0.25
95% BCA Bootstrap UCL	0.283	95% Bootstrap t UCL	0.389
95% H-UCL (Log ROS)	0.178		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.536	95% H-UCL (KM -Log)	0.148
KM SD (logged)	0.9	95% Critical H Value (KM-Log)	2.168
KM Standard Error of Mean (logged)	0.134		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.157	Mean in Log Scale	-2.555
SD in Original Scale	0.393	SD in Log Scale	0.85
95% t UCL (Assumes normality)	0.231	95% H-Stat UCL	0.137

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL 0.252

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.

Nickel

General Statistics

Total Number of Observations	78	Number of Distinct Observations	51
		Number of Missing Observations	0
Minimum	1.1	Mean	9.421
Maximum	218	Median	3.55
SD	26.4	Std. Error of Mean	2.989
Coefficient of Variation	2.802	Skewness	6.815

Normal GOF Test

Shapiro Wilk Test Statistic	0.311	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.376	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1	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	14.4	95% Adjusted-CLT UCL (Chen-1995)	16.8
		95% Modified-t UCL (Johnson-1978)	14.78

Gamma GOF Test

A-D Test Statistic	8.924	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.795	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.27	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.105	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.726	k star (bias corrected MLE)	0.706
Theta hat (MLE)	12.98	Theta star (bias corrected MLE)	13.34
nu hat (MLE)	113.2	nu star (bias corrected)	110.2
MLE Mean (bias corrected)	9.421	MLE Sd (bias corrected)	11.21
		Approximate Chi Square Value (0.05)	86.96
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	86.57

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	11.94	95% Adjusted Gamma UCL (use when n<50)	11.99

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	8.325E-10	Data Not Lognormal at 5% Significance Level

Lilliefors Test Statistic	0.16	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.0953	Mean of logged Data	1.414
Maximum of Logged Data	5.384	SD of logged Data	0.981

Assuming Lognormal Distribution

95% H-UCL	8.557	90% Chebyshev (MVUE) UCL	9.206
95% Chebyshev (MVUE) UCL	10.39	97.5% Chebyshev (MVUE) UCL	12.03
99% Chebyshev (MVUE) UCL	15.25		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	14.34	95% Jackknife UCL	14.4
95% Standard Bootstrap UCL	14.42	95% Bootstrap-t UCL	23.62
95% Hall's Bootstrap UCL	30.24	95% Percentile Bootstrap UCL	14.77
95% BCA Bootstrap UCL	19.18		
90% Chebyshev(Mean, Sd) UCL	18.39	95% Chebyshev(Mean, Sd) UCL	22.45
97.5% Chebyshev(Mean, Sd) UCL	28.09	99% Chebyshev(Mean, Sd) UCL	39.16

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 22.45

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Thallium

General Statistics

Total Number of Observations	78	Number of Distinct Observations	24
Number of Detects	11	Number of Non-Detects	67
Number of Distinct Detects	10	Number of Distinct Non-Detects	14
Minimum Detect	0.03	Minimum Non-Detect	0.51
Maximum Detect	0.33	Maximum Non-Detect	0.69
Variance Detects	0.00752	Percent Non-Detects	85.9%
Mean Detects	0.0722	SD Detects	0.0867
Median Detects	0.041	CV Detects	1.202
Skewness Detects	3.157	Kurtosis Detects	10.18
Mean of Logged Detects	-2.929	SD of Logged Detects	0.662

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.479	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.392	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.267	Detected Data Not Normal at 5% Significance Level	

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0722	Standard Error of Mean	0.0261
SD	0.0827	95% KM (BCA) UCL	0.127
95% KM (t) UCL	0.116	95% KM (Percentile Bootstrap) UCL	0.123
95% KM (z) UCL	0.115	95% KM Bootstrap t UCL	0.411
90% KM Chebyshev UCL	0.151	95% KM Chebyshev UCL	0.186
97.5% KM Chebyshev UCL	0.235	99% KM Chebyshev UCL	0.332

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.863	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.74	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.348	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.259	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)	1.816	k star (bias corrected MLE)	1.381
Theta hat (MLE)	0.0398	Theta star (bias corrected MLE)	0.0523
nu hat (MLE)	39.94	nu star (bias corrected)	30.38
MLE Mean (bias corrected)	0.0722	MLE Sd (bias corrected)	0.0614

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.762	nu hat (KM)	118.9
Approximate Chi Square Value (118.86, α)	94.69	Adjusted Chi Square Value (118.86, β)	94.28
95% Gamma Approximate KM-UCL (use when n>=50)	0.0906	95% Gamma Adjusted KM-UCL (use when n<50)	0.091

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0716
Maximum	0.33	Median	0.0591
SD	0.0601	CV	0.839
k hat (MLE)	1.534	k star (bias corrected MLE)	1.483
Theta hat (MLE)	0.0467	Theta star (bias corrected MLE)	0.0483
nu hat (MLE)	239.3	nu star (bias corrected)	231.4
MLE Mean (bias corrected)	0.0716	MLE Sd (bias corrected)	0.0588
		Adjusted Level of Significance (β)	0.0469
Approximate Chi Square Value (231.41, α)	197.2	Adjusted Chi Square Value (231.41, β)	196.6
95% Gamma Approximate UCL (use when n>=50)	0.0841	95% Gamma Adjusted UCL (use when n<50)	0.0843

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.699	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.29	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0612	Mean in Log Scale	-2.929
SD in Original Scale	0.0408	SD in Log Scale	0.492
95% t UCL (assumes normality of ROS data)	0.0689	95% Percentile Bootstrap UCL	0.0694
95% BCA Bootstrap UCL	0.0711	95% Bootstrap t UCL	0.072
95% H-UCL (Log ROS)	0.067		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.25	Mean in Log Scale	-1.51
SD in Original Scale	0.0802	SD in Log Scale	0.628
95% t UCL (Assumes normality)	0.265	95% H-Stat UCL	0.309

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

95% KM (t) UCL	0.116	95% KM (% Bootstrap) UCL	0.123

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

General Statistics

Total Number of Observations	78	Number of Distinct Observations	58
		Number of Missing Observations	0
Minimum	3.6	Mean	11.63
Maximum	146	Median	7.6
SD	17.33	Std. Error of Mean	1.963
Coefficient of Variation	1.491	Skewness	6.496

Normal GOF Test

Shapiro Wilk Test Statistic	0.388	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.322	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.1	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	14.89	95% Adjusted-CLT UCL (Chen-1995)	16.4
		95% Modified-t UCL (Johnson-1978)	15.13

Gamma GOF Test

A-D Test Statistic	5.213	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.766	Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.2	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.103	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.791	k star (bias corrected MLE)	1.731
Theta hat (MLE)	6.491	Theta star (bias corrected MLE)	6.718
nu hat (MLE)	279.4	nu star (bias corrected)	270
MLE Mean (bias corrected)	11.63	MLE Sd (bias corrected)	8.837
		Approximate Chi Square Value (0.05)	232.9
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	232.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	13.47	95% Adjusted Gamma UCL (use when n<50)	13.51

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.884	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	5.4188E-8	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.128	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.281	Mean of logged Data	2.149
Maximum of Logged Data	4.984	SD of logged Data	0.632

Assuming Lognormal Distribution

95% H-UCL	12.05	90% Chebyshev (MVUE) UCL	12.87
95% Chebyshev (MVUE) UCL	13.97	97.5% Chebyshev (MVUE) UCL	15.5
99% Chebyshev (MVUE) UCL	18.5		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	14.85	95% Jackknife UCL	14.89
95% Standard Bootstrap UCL	14.98	95% Bootstrap-t UCL	20.02
95% Hall's Bootstrap UCL	27.12	95% Percentile Bootstrap UCL	15.05
95% BCA Bootstrap UCL	17.87		
90% Chebyshev(Mean, Sd) UCL	17.51	95% Chebyshev(Mean, Sd) UCL	20.18
97.5% Chebyshev(Mean, Sd) UCL	23.88	99% Chebyshev(Mean, Sd) UCL	31.15

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	20.18

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	78	Number of Distinct Observations	73
		Number of Missing Observations	0
Minimum	4.1	Mean	452.4
Maximum	13400	Median	25.95
SD	1916	Std. Error of Mean	216.9
Coefficient of Variation	4.235	Skewness	5.554

Normal GOF Test

Shapiro Wilk Test Statistic	0.26	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.437	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1	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	813.6	95% Adjusted-CLT UCL (Chen-1995)	955
		95% Modified-t UCL (Johnson-1978)	836.3

Gamma GOF Test

A-D Test Statistic	13.08	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.872	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.337	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.11	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.287	k star (bias corrected MLE)	0.284
Theta hat (MLE)	1579	Theta star (bias corrected MLE)	1593
nu hat (MLE)	44.7	nu star (bias corrected)	44.31
MLE Mean (bias corrected)	452.4	MLE Sd (bias corrected)	848.9
		Approximate Chi Square Value (0.05)	30.04
Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	29.82

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	667.3	95% Adjusted Gamma UCL (use when n<50)	672.2

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	8.551E-11	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.149	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.1	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.411	Mean of logged Data	3.69
Maximum of Logged Data	9.503	SD of logged Data	1.654

Appendix C-6
ProUCL Output - Current/Future Surface and Subsurface Soil - Matteo Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Assuming Lognormal Distribution

95% H-UCL	276.6	90% Chebyshev (MVUE) UCL	272
95% Chebyshev (MVUE) UCL	326.7	97.5% Chebyshev (MVUE) UCL	402.7
99% Chebyshev (MVUE) UCL	552		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	809.3	95% Jackknife UCL	813.6
95% Standard Bootstrap UCL	818.3	95% Bootstrap-t UCL	1310
95% Hall's Bootstrap UCL	864.2	95% Percentile Bootstrap UCL	830.6
95% BCA Bootstrap UCL	998.9		
90% Chebyshev(Mean, Sd) UCL	1103	95% Chebyshev(Mean, Sd) UCL	1398
97.5% Chebyshev(Mean, Sd) UCL	1807	99% Chebyshev(Mean, Sd) UCL	2611

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 1398

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 10:37:45 PM
From File	ProUCL_Input_SB-WW.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Total Number of Observations	17	Number of Distinct Observations	10
Number of Detects	8	Number of Non-Detects	9
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	71	Minimum Non-Detect	180
Maximum Detect	620	Maximum Non-Detect	190
Variance Detects	34021	Percent Non-Detects	52.94%
Mean Detects	341.4	SD Detects	184.4
Median Detects	355	CV Detects	0.54
Skewness Detects	-0.0265	Kurtosis Detects	-0.711
Mean of Logged Detects	5.649	SD of Logged Detects	0.724

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	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

Mean	216.5	Standard Error of Mean	46.36
SD	168.8	95% KM (BCA) UCL	310
95% KM (t) UCL	297.4	95% KM (Percentile Bootstrap) UCL	298.2
95% KM (z) UCL	292.8	95% KM Bootstrap t UCL	304.1
90% KM Chebyshev UCL	355.6	95% KM Chebyshev UCL	418.6
97.5% KM Chebyshev UCL	506	99% KM Chebyshev UCL	677.7

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.296	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.22	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.296	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)	2.876	k star (bias corrected MLE)	1.881
Theta hat (MLE)	118.7	Theta star (bias corrected MLE)	181.5
nu hat (MLE)	46.02	nu star (bias corrected)	30.1
MLE Mean (bias corrected)	341.4	MLE Sd (bias corrected)	248.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.645	nu hat (KM)	55.92
Approximate Chi Square Value (55.92, α)	39.73	Adjusted Chi Square Value (55.92, β)	38.3
95% Gamma Approximate KM-UCL (use when n>=50)	304.7	95% Gamma Adjusted KM-UCL (use when n<50)	316.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	213.2
Maximum	620	Median	161.1
SD	181.6	CV	0.851
k hat (MLE)	0.705	k star (bias corrected MLE)	0.62
Theta hat (MLE)	302.3	Theta star (bias corrected MLE)	343.9
nu hat (MLE)	23.98	nu star (bias corrected)	21.08
MLE Mean (bias corrected)	213.2	MLE Sd (bias corrected)	270.8
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (21.08, α)	11.65	Adjusted Chi Square Value (21.08, β)	10.92
95% Gamma Approximate UCL (use when n>=50)	385.8	95% Gamma Adjusted UCL (use when n<50)	411.6

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	218.5	Mean in Log Scale	5.099
SD in Original Scale	173.7	SD in Log Scale	0.784
95% t UCL (assumes normality of ROS data)	292.1	95% Percentile Bootstrap UCL	284.3
95% BCA Bootstrap UCL	305.3	95% Bootstrap t UCL	313.6
95% H-UCL (Log ROS)	352.5		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.095	95% H-UCL (KM -Log)	329.1
KM SD (logged)	0.742	95% Critical H Value (KM-Log)	2.301
KM Standard Error of Mean (logged)	0.244		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	210.1	Mean in Log Scale	5.06
SD in Original Scale	176.6	SD in Log Scale	0.747
95% t UCL (Assumes normality)	284.8	95% H-Stat UCL	320.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	297.4	95% KM (Percentile Bootstrap) UCL	298.2

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	17	Number of Distinct Observations	10
Number of Detects	8	Number of Non-Detects	9
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	100	Minimum Non-Detect	180
Maximum Detect	670	Maximum Non-Detect	190
Variance Detects	47336	Percent Non-Detects	52.94%
Mean Detects	407.5	SD Detects	217.6
Median Detects	445	CV Detects	0.534
Skewness Detects	-0.255	Kurtosis Detects	-1.503
Mean of Logged Detects	5.832	SD of Logged Detects	0.704

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.313	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

Mean	257.9	Standard Error of Mean	52.84
SD	199.3	95% KM (BCA) UCL	359.4
95% KM (t) UCL	350.2	95% KM (Percentile Bootstrap) UCL	351.2
95% KM (z) UCL	344.8	95% KM Bootstrap t UCL	364.8
90% KM Chebyshev UCL	416.4	95% KM Chebyshev UCL	488.2
97.5% KM Chebyshev UCL	587.9	99% KM Chebyshev UCL	783.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.397	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.211	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.296	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)	2.957	k star (bias corrected MLE)	1.931
Theta hat (MLE)	137.8	Theta star (bias corrected MLE)	211
nu hat (MLE)	47.31	nu star (bias corrected)	30.9
MLE Mean (bias corrected)	407.5	MLE Sd (bias corrected)	293.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.676	nu hat (KM)	56.97

Approximate Chi Square Value (56.97, α)	40.62	Adjusted Chi Square Value (56.97, β)	39.18
95% Gamma Approximate KM-UCL (use when n>=50)	361.8	95% Gamma Adjusted KM-UCL (use when n<50)	375.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	258.8
Maximum	670	Median	199.8
SD	212.7	CV	0.822
k hat (MLE)	0.728	k star (bias corrected MLE)	0.639
Theta hat (MLE)	355.5	Theta star (bias corrected MLE)	405.2
nu hat (MLE)	24.75	nu star (bias corrected)	21.72
MLE Mean (bias corrected)	258.8	MLE Sd (bias corrected)	323.9
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (21.72, α)	12.13	Adjusted Chi Square Value (21.72, β)	11.38
95% Gamma Approximate UCL (use when n>=50)	463.5	95% Gamma Adjusted UCL (use when n<50)	494

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	263.7	Mean in Log Scale	5.303
SD in Original Scale	204.2	SD in Log Scale	0.756
95% t UCL (assumes normality of ROS data)	350.1	95% Percentile Bootstrap UCL	348.2
95% BCA Bootstrap UCL	354	95% Bootstrap t UCL	368.5
95% H-UCL (Log ROS)	414.4		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.29	95% H-UCL (KM -Log)	374.7
KM SD (logged)	0.698	95% Critical H Value (KM-Log)	2.255
KM Standard Error of Mean (logged)	0.202		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	241.2	Mean in Log Scale	5.146
SD in Original Scale	216.4	SD in Log Scale	0.813
95% t UCL (Assumes normality)	332.8	95% H-Stat UCL	387.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	350.2	95% KM (Percentile Bootstrap) UCL	351.2

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	17	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	8
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	47	Minimum Non-Detect	180
Maximum Detect	1100	Maximum Non-Detect	190
Variance Detects	165619	Percent Non-Detects	47.06%
Mean Detects	606.3	SD Detects	407
Median Detects	590	CV Detects	0.671
Skewness Detects	-0.0119	Kurtosis Detects	-1.672
Mean of Logged Detects	6.054	SD of Logged Detects	1.066

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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

Mean	367.4	Standard Error of Mean	99.52
SD	378.7	95% KM (BCA) UCL	547.1
95% KM (t) UCL	541.1	95% KM (Percentile Bootstrap) UCL	536.5
95% KM (z) UCL	531.1	95% KM Bootstrap t UCL	566
90% KM Chebyshev UCL	665.9	95% KM Chebyshev UCL	801.2
97.5% KM Chebyshev UCL	988.9	99% KM Chebyshev UCL	1358

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.366	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.16	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.284	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)	1.561	k star (bias corrected MLE)	1.115
Theta hat (MLE)	388.5	Theta star (bias corrected MLE)	544
nu hat (MLE)	28.09	nu star (bias corrected)	20.06
MLE Mean (bias corrected)	606.3	MLE Sd (bias corrected)	574.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.941	nu hat (KM)	31.99
Approximate Chi Square Value (31.99, α)	20.06	Adjusted Chi Square Value (31.99, β)	19.08
95% Gamma Approximate KM-UCL (use when n>=50)	585.7	95% Gamma Adjusted KM-UCL (use when n<50)	616

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	371.1
Maximum	1100	Median	198.8
SD	392.1	CV	1.057
k hat (MLE)	0.404	k star (bias corrected MLE)	0.372
Theta hat (MLE)	917.8	Theta star (bias corrected MLE)	997
nu hat (MLE)	13.75	nu star (bias corrected)	12.65
MLE Mean (bias corrected)	371.1	MLE Sd (bias corrected)	608.2
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (12.65, α)	5.661	Adjusted Chi Square Value (12.65, β)	5.178
95% Gamma Approximate UCL (use when n>=50)	829.5	95% Gamma Adjusted UCL (use when n<50)	906.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	369.4	Mean in Log Scale	5.313
SD in Original Scale	389	SD in Log Scale	1.181
95% t UCL (assumes normality of ROS data)	534.1	95% Percentile Bootstrap UCL	522.1
95% BCA Bootstrap UCL	543.7	95% Bootstrap t UCL	569.4
95% H-UCL (Log ROS)	973.1		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.29	95% H-UCL (KM -Log)	909.6
KM SD (logged)	1.162	95% Critical H Value (KM-Log)	2.919
KM Standard Error of Mean (logged)	0.377		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	365.1	Mean in Log Scale	5.342
SD in Original Scale	390.3	SD in Log Scale	1.084
95% t UCL (Assumes normality)	530.4	95% H-Stat UCL	802.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	541.1	95% KM (Percentile Bootstrap) UCL	536.5

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.

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	17	Number of Distinct Observations	9
Number of Detects	7	Number of Non-Detects	10
Number of Distinct Detects	6	Number of Distinct Non-Detects	3
Minimum Detect	38	Minimum Non-Detect	180
Maximum Detect	160	Maximum Non-Detect	260
Variance Detects	2345	Percent Non-Detects	58.82%
Mean Detects	106.7	SD Detects	48.42
Median Detects	120	CV Detects	0.454
Skewness Detects	-0.267	Kurtosis Detects	-1.658
Mean of Logged Detects	4.558	SD of Logged Detects	0.545

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	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

Mean	106.7	Standard Error of Mean	18.3
SD	44.83	95% KM (BCA) UCL	137.3
95% KM (t) UCL	138.7	95% KM (Percentile Bootstrap) UCL	134.1
95% KM (z) UCL	136.8	95% KM Bootstrap t UCL	141
90% KM Chebyshev UCL	161.6	95% KM Chebyshev UCL	186.5
97.5% KM Chebyshev UCL	221	99% KM Chebyshev UCL	288.8

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.364	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.231	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.313	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)	4.623	k star (bias corrected MLE)	2.737
Theta hat (MLE)	23.09	Theta star (bias corrected MLE)	38.99
nu hat (MLE)	64.72	nu star (bias corrected)	38.31
MLE Mean (bias corrected)	106.7	MLE Sd (bias corrected)	64.51

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	5.666	nu hat (KM)	192.6
Approximate Chi Square Value (192.64, α)	161.5	Adjusted Chi Square Value (192.64, β)	158.5
95% Gamma Approximate KM-UCL (use when n>=50)	127.3	95% Gamma Adjusted KM-UCL (use when n<50)	129.7

Gamma ROS Statistics using Imputed Non-Detects

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	38	Mean	105.9
Maximum	174.3	Median	101.7
SD	41.32	CV	0.39
k hat (MLE)	6.175	k star (bias corrected MLE)	5.124
Theta hat (MLE)	17.15	Theta star (bias corrected MLE)	20.67
nu hat (MLE)	209.9	nu star (bias corrected)	174.2
MLE Mean (bias corrected)	105.9	MLE Sd (bias corrected)	46.79
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (174.23, α)	144.7	Adjusted Chi Square Value (174.23, β)	141.9
95% Gamma Approximate UCL (use when n>=50)	127.5	95% Gamma Adjusted UCL (use when n<50)	130.1

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	104.9	Mean in Log Scale	4.558
SD in Original Scale	44.85	SD in Log Scale	0.466
95% t UCL (assumes normality of ROS data)	123.9	95% Percentile Bootstrap UCL	123.4
95% BCA Bootstrap UCL	123.7	95% Bootstrap t UCL	123.8
95% H-UCL (Log ROS)	134.2		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.558	95% H-UCL (KM -Log)	140.1
KM SD (logged)	0.504	95% Critical H Value (KM-Log)	2.039
KM Standard Error of Mean (logged)	0.206		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	101	Mean in Log Scale	4.565
SD in Original Scale	31.34	SD in Log Scale	0.343
95% t UCL (Assumes normality)	114.3	95% H-Stat UCL	119.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	138.7	95% KM (Percentile Bootstrap) UCL	134.1

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	17	Number of Distinct Observations	9
Number of Detects	8	Number of Non-Detects	9
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	89	Minimum Non-Detect	180
Maximum Detect	480	Maximum Non-Detect	190
Variance Detects	26702	Percent Non-Detects	52.94%
Mean Detects	301.1	SD Detects	163.4
Median Detects	310	CV Detects	0.543
Skewness Detects	-0.193	Kurtosis Detects	-1.873
Mean of Logged Detects	5.532	SD of Logged Detects	0.686

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	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

Mean	191.7	Standard Error of Mean	38.23
SD	147.1	95% KM (BCA) UCL	288.1
95% KM (t) UCL	258.5	95% KM (Percentile Bootstrap) UCL	268.8
95% KM (z) UCL	254.6	95% KM Bootstrap t UCL	268.3
90% KM Chebyshev UCL	306.4	95% KM Chebyshev UCL	358.4
97.5% KM Chebyshev UCL	430.5	99% KM Chebyshev UCL	572.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.494	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.211	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.296	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)	3.003	k star (bias corrected MLE)	1.96
Theta hat (MLE)	100.3	Theta star (bias corrected MLE)	153.6
nu hat (MLE)	48.04	nu star (bias corrected)	31.36
MLE Mean (bias corrected)	301.1	MLE Sd (bias corrected)	215.1

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.698	nu hat (KM)	57.74
Approximate Chi Square Value (57.74, α)	41.27	Adjusted Chi Square Value (57.74, β)	39.81
95% Gamma Approximate KM-UCL (use when n>=50)	268.2	95% Gamma Adjusted KM-UCL (use when n<50)	278.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.306	Mean	192.3
Maximum	480	Median	149.4
SD	157.7	CV	0.82
k hat (MLE)	0.972	k star (bias corrected MLE)	0.84
Theta hat (MLE)	197.8	Theta star (bias corrected MLE)	229
nu hat (MLE)	33.05	nu star (bias corrected)	28.55
MLE Mean (bias corrected)	192.3	MLE Sd (bias corrected)	209.8
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (28.55, α)	17.35	Adjusted Chi Square Value (28.55, β)	16.44
95% Gamma Approximate UCL (use when n>=50)	316.2	95% Gamma Adjusted UCL (use when n<50)	333.8

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	197.1	Mean in Log Scale	5.028
SD in Original Scale	150.7	SD in Log Scale	0.728
95% t UCL (assumes normality of ROS data)	260.9	95% Percentile Bootstrap UCL	259
95% BCA Bootstrap UCL	264.9	95% Bootstrap t UCL	276.5
95% H-UCL (Log ROS)	301.4		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.01	95% H-UCL (KM -Log)	269
KM SD (logged)	0.661	95% Critical H Value (KM-Log)	2.211
KM Standard Error of Mean (logged)	0.173		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	191.1	Mean in Log Scale	5.005
SD in Original Scale	152	SD in Log Scale	0.685
95% t UCL (Assumes normality)	255.5	95% H-Stat UCL	276.6

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	258.5	95% KM (Percentile Bootstrap) UCL	268.8

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.

Arsenic

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

General Statistics

Total Number of Observations	17	Number of Distinct Observations	16
Number of Detects	16	Number of Non-Detects	1
Number of Distinct Detects	15	Number of Distinct Non-Detects	1
Minimum Detect	0.26	Minimum Non-Detect	0.53
Maximum Detect	14.8	Maximum Non-Detect	0.53
Variance Detects	13.32	Percent Non-Detects	5.882%
Mean Detects	3.358	SD Detects	3.65
Median Detects	2.75	CV Detects	1.087
Skewness Detects	2.36	Kurtosis Detects	6.391
Mean of Logged Detects	0.74	SD of Logged Detects	1.048

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.735	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	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

Mean	3.176	Standard Error of Mean	0.878
SD	3.505	95% KM (BCA) UCL	4.734
95% KM (t) UCL	4.709	95% KM (Percentile Bootstrap) UCL	4.639
95% KM (z) UCL	4.62	95% KM Bootstrap t UCL	6.157
90% KM Chebyshev UCL	5.81	95% KM Chebyshev UCL	7.003
97.5% KM Chebyshev UCL	8.659	99% KM Chebyshev UCL	11.91

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.272	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.76	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.121	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.22	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)	1.2	k star (bias corrected MLE)	1.016
Theta hat (MLE)	2.799	Theta star (bias corrected MLE)	3.304
nu hat (MLE)	38.39	nu star (bias corrected)	32.52
MLE Mean (bias corrected)	3.358	MLE Sd (bias corrected)	3.331

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.821	nu hat (KM)	27.92
Approximate Chi Square Value (27.92, α)	16.86	Adjusted Chi Square Value (27.92, β)	15.97
95% Gamma Approximate KM-UCL (use when n>=50)	5.258	95% Gamma Adjusted KM-UCL (use when n<50)	5.553

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3.161
Maximum	14.8	Median	2.7
SD	3.626	CV	1.147
k hat (MLE)	0.816	k star (bias corrected MLE)	0.711
Theta hat (MLE)	3.874	Theta star (bias corrected MLE)	4.445
nu hat (MLE)	27.74	nu star (bias corrected)	24.18
MLE Mean (bias corrected)	3.161	MLE Sd (bias corrected)	3.749
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (24.18, α)	13.99	Adjusted Chi Square Value (24.18, β)	13.18
95% Gamma Approximate UCL (use when n>=50)	5.465	95% Gamma Adjusted UCL (use when n<50)	5.801

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.981	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.177	Mean in Log Scale	0.62
SD in Original Scale	3.612	SD in Log Scale	1.128
95% t UCL (assumes normality of ROS data)	4.706	95% Percentile Bootstrap UCL	4.725
95% BCA Bootstrap UCL	5.215	95% Bootstrap t UCL	6.217
95% H-UCL (Log ROS)	7.882		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.617	95% H-UCL (KM -Log)	7.373
KM SD (logged)	1.1	95% Critical H Value (KM-Log)	2.821
KM Standard Error of Mean (logged)	0.276		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.176	Mean in Log Scale	0.618
SD in Original Scale	3.612	SD in Log Scale	1.132
95% t UCL (Assumes normality)	4.706	95% H-Stat UCL	7.932

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	7.003	95% GROS Adjusted Gamma UCL	5.801
95% Adjusted Gamma KM-UCL	5.553		

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

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	16	Number of Non-Detects	1
Number of Distinct Detects	16	Number of Distinct Non-Detects	1
Minimum Detect	2.1	Minimum Non-Detect	1.1
Maximum Detect	20.5	Maximum Non-Detect	1.1
Variance Detects	21.74	Percent Non-Detects	5.882%
Mean Detects	6.181	SD Detects	4.662
Median Detects	4.5	CV Detects	0.754
Skewness Detects	2.327	Kurtosis Detects	5.839
Mean of Logged Detects	1.639	SD of Logged Detects	0.582

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.722	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	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

Mean	5.882	Standard Error of Mean	1.137
SD	4.54	95% KM (BCA) UCL	7.924
95% KM (t) UCL	7.868	95% KM (Percentile Bootstrap) UCL	7.912
95% KM (z) UCL	7.753	95% KM Bootstrap t UCL	9.923
90% KM Chebyshev UCL	9.294	95% KM Chebyshev UCL	10.84
97.5% KM Chebyshev UCL	12.98	99% KM Chebyshev UCL	17.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.712	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.18	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.217	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)	2.89	k star (bias corrected MLE)	2.39
Theta hat (MLE)	2.139	Theta star (bias corrected MLE)	2.586
nu hat (MLE)	92.49	nu star (bias corrected)	76.48
MLE Mean (bias corrected)	6.181	MLE Sd (bias corrected)	3.998

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.679	nu hat (KM)	57.09
Approximate Chi Square Value (57.09, α)	40.72	Adjusted Chi Square Value (57.09, β)	39.27
95% Gamma Approximate KM-UCL (use when n>=50)	8.247	95% Gamma Adjusted KM-UCL (use when n<50)	8.551

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5.818

Maximum	20.5	Median	4.4
SD	4.756	CV	0.817
k hat (MLE)	1.159	k star (bias corrected MLE)	0.994
Theta hat (MLE)	5.018	Theta star (bias corrected MLE)	5.853
nu hat (MLE)	39.42	nu star (bias corrected)	33.8
MLE Mean (bias corrected)	5.818	MLE Sd (bias corrected)	5.836
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (33.80, α)	21.5	Adjusted Chi Square Value (33.80, β)	20.48
95% Gamma Approximate UCL (use when n>=50)	9.145	95% Gamma Adjusted UCL (use when n<50)	9.603

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5.892	Mean in Log Scale	1.556
SD in Original Scale	4.669	SD in Log Scale	0.659
95% t UCL (assumes normality of ROS data)	7.869	95% Percentile Bootstrap UCL	7.847
95% BCA Bootstrap UCL	8.347	95% Bootstrap t UCL	9.895
95% H-UCL (Log ROS)	8.468		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.548	95% H-UCL (KM -Log)	8.37
KM SD (logged)	0.656	95% Critical H Value (KM-Log)	2.205
KM Standard Error of Mean (logged)	0.164		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.85	Mean in Log Scale	1.507
SD in Original Scale	4.716	SD in Log Scale	0.782
95% t UCL (Assumes normality)	7.847	95% H-Stat UCL	9.68

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	7.924	95% GROS Adjusted Gamma UCL	9.603
95% Adjusted Gamma KM-UCL	8.551		

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

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

General Statistics

Total Number of Observations	17	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	4420	Mean	7847
Maximum	16500	Median	6020
SD	3790	Std. Error of Mean	919.3
Coefficient of Variation	0.483	Skewness	1.447

Normal GOF Test

Shapiro Wilk Test Statistic	0.779	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	9452	95% Adjusted-CLT UCL (Chen-1995)	9704
		95% Modified-t UCL (Johnson-1978)	9506

Gamma GOF Test

A-D Test Statistic	1.121	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.216	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.21	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.793	k star (bias corrected MLE)	4.81
Theta hat (MLE)	1355	Theta star (bias corrected MLE)	1631
nu hat (MLE)	197	nu star (bias corrected)	163.5
MLE Mean (bias corrected)	7847	MLE Sd (bias corrected)	3578
		Approximate Chi Square Value (0.05)	135
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	132.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	9508	95% Adjusted Gamma UCL (use when n<50)	9703

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.871	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.195	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.394	Mean of logged Data	8.879
Maximum of Logged Data	9.711	SD of logged Data	0.413

Assuming Lognormal Distribution

95% H-UCL	9562	90% Chebyshev (MVUE) UCL	10164

95% Chebyshev (MVUE) UCL	11246	97.5% Chebyshev (MVUE) UCL	12747
99% Chebyshev (MVUE) UCL	15696		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	9359	95% Jackknife UCL	9452
95% Standard Bootstrap UCL	9310	95% Bootstrap-t UCL	9970
95% Hall's Bootstrap UCL	9455	95% Percentile Bootstrap UCL	9375
95% BCA Bootstrap UCL	9611		
90% Chebyshev(Mean, Sd) UCL	10605	95% Chebyshev(Mean, Sd) UCL	11854
97.5% Chebyshev(Mean, Sd) UCL	13588	99% Chebyshev(Mean, Sd) UCL	16994

Suggested UCL to Use

95% Student's-t UCL	9452	or 95% Modified-t UCL	9506

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	16	Number of Non-Detects	1
Number of Distinct Detects	16	Number of Distinct Non-Detects	1
Minimum Detect	1.9	Minimum Non-Detect	0.53
Maximum Detect	75.5	Maximum Non-Detect	0.53
Variance Detects	373.2	Percent Non-Detects	5.882%
Mean Detects	18.12	SD Detects	19.32
Median Detects	12.75	CV Detects	1.066
Skewness Detects	1.974	Kurtosis Detects	4.461
Mean of Logged Detects	2.413	SD of Logged Detects	1.038

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.773	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	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

Mean	17.08	Standard Error of Mean	4.662
SD	18.61	95% KM (BCA) UCL	25.14
95% KM (t) UCL	25.22	95% KM (Percentile Bootstrap) UCL	24.95
95% KM (z) UCL	24.75	95% KM Bootstrap t UCL	29.17
90% KM Chebyshev UCL	31.07	95% KM Chebyshev UCL	37.41
97.5% KM Chebyshev UCL	46.2	99% KM Chebyshev UCL	63.47

Appendix C-7
ProUCL Output - Current/Future Surface and Subsurface Soil - Willow Woods Property
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.397	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.76	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.16	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.22	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)	1.171	k star (bias corrected MLE)	0.993
Theta hat (MLE)	15.47	Theta star (bias corrected MLE)	18.25
nu hat (MLE)	37.47	nu star (bias corrected)	31.78
MLE Mean (bias corrected)	18.12	MLE Sd (bias corrected)	18.18

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.843	nu hat (KM)	28.65
Approximate Chi Square Value (28.65, α)	17.43	Adjusted Chi Square Value (28.65, β)	16.52
95% Gamma Approximate KM-UCL (use when n>=50)	28.07	95% Gamma Adjusted KM-UCL (use when n<50)	29.63

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	17.05
Maximum	75.5	Median	10.3
SD	19.21	CV	1.127
k hat (MLE)	0.72	k star (bias corrected MLE)	0.632
Theta hat (MLE)	23.7	Theta star (bias corrected MLE)	26.99
nu hat (MLE)	24.47	nu star (bias corrected)	21.48
MLE Mean (bias corrected)	17.05	MLE Sd (bias corrected)	21.45
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (21.48, α)	11.95	Adjusted Chi Square Value (21.48, β)	11.21
95% Gamma Approximate UCL (use when n>=50)	30.65	95% Gamma Adjusted UCL (use when n<50)	32.68

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	17.1	Mean in Log Scale	2.262
SD in Original Scale	19.17	SD in Log Scale	1.181
95% t UCL (assumes normality of ROS data)	25.22	95% Percentile Bootstrap UCL	25.27
95% BCA Bootstrap UCL	27.02	95% Bootstrap t UCL	29.99
95% H-UCL (Log ROS)	46.12		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.233	95% H-UCL (KM -Log)	48.04
KM SD (logged)	1.21	95% Critical H Value (KM-Log)	2.997

KM Standard Error of Mean (logged) 0.303

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	17.07	Mean in Log Scale	2.193
SD in Original Scale	19.2	SD in Log Scale	1.354
95% t UCL (Assumes normality)	25.2	95% H-Stat UCL	66.92

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	37.41	95% GROS Adjusted Gamma UCL	32.68
95% Adjusted Gamma KM-UCL	29.63		

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.

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 10:39:20 PM
From File	ProUCL_Input_GW.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

1,4-Dioxane

General Statistics

Total Number of Observations	34	Number of Distinct Observations	23
Number of Detects	24	Number of Non-Detects	10
Number of Distinct Detects	22	Number of Distinct Non-Detects	2
Minimum Detect	0.21	Minimum Non-Detect	2
Maximum Detect	4.1	Maximum Non-Detect	20
Variance Detects	0.858	Percent Non-Detects	29.41%
Mean Detects	0.895	SD Detects	0.926
Median Detects	0.5	CV Detects	1.035
Skewness Detects	2.232	Kurtosis Detects	5.568
Mean of Logged Detects	-0.482	SD of Logged Detects	0.83

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.72	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.275	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.181	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

Mean	0.816	Standard Error of Mean	0.152
SD	0.813	95% KM (BCA) UCL	1.098
95% KM (t) UCL	1.073	95% KM (Percentile Bootstrap) UCL	1.068
95% KM (z) UCL	1.066	95% KM Bootstrap t UCL	1.171
90% KM Chebyshev UCL	1.271	95% KM Chebyshev UCL	1.478
97.5% KM Chebyshev UCL	1.764	99% KM Chebyshev UCL	2.326

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.115	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.762	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.209	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.181	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)	1.492	k star (bias corrected MLE)	1.334
Theta hat (MLE)	0.599	Theta star (bias corrected MLE)	0.671
nu hat (MLE)	71.64	nu star (bias corrected)	64.02
MLE Mean (bias corrected)	0.895	MLE Sd (bias corrected)	0.775

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.009	nu hat (KM)	68.6
Approximate Chi Square Value (68.60, α)	50.53	Adjusted Chi Square Value (68.60, β)	49.77
95% Gamma Approximate KM-UCL (use when n>=50)	1.108	95% Gamma Adjusted KM-UCL (use when n<50)	1.125

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.814
Maximum	4.1	Median	0.538
SD	0.822	CV	1.01
k hat (MLE)	1.288	k star (bias corrected MLE)	1.194
Theta hat (MLE)	0.632	Theta star (bias corrected MLE)	0.682
nu hat (MLE)	87.57	nu star (bias corrected)	81.18
MLE Mean (bias corrected)	0.814	MLE Sd (bias corrected)	0.745
		Adjusted Level of Significance (β)	0.0422
Approximate Chi Square Value (81.18, α)	61.42	Adjusted Chi Square Value (81.18, β)	60.57
95% Gamma Approximate UCL (use when n>=50)	1.076	95% Gamma Adjusted UCL (use when n<50)	1.091

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.181	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.807	Mean in Log Scale	-0.534
SD in Original Scale	0.803	SD in Log Scale	0.759
95% t UCL (assumes normality of ROS data)	1.04	95% Percentile Bootstrap UCL	1.054
95% BCA Bootstrap UCL	1.102	95% Bootstrap t UCL	1.176
95% H-UCL (Log ROS)	1.043		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.541	95% H-UCL (KM -Log)	1.049
KM SD (logged)	0.769	95% Critical H Value (KM-Log)	2.188
KM Standard Error of Mean (logged)	0.153		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.19	Mean in Log Scale	-0.273
SD in Original Scale	1.739	SD in Log Scale	0.857
95% t UCL (Assumes normality)	1.695	95% H-Stat UCL	1.544

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL 1.098

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.

cis-1,2-Dichloroethene

General Statistics

Total Number of Observations	34	Number of Distinct Observations	10
Number of Detects	11	Number of Non-Detects	23
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	0.1	Minimum Non-Detect	0.5
Maximum Detect	21	Maximum Non-Detect	0.5
Variance Detects	34.88	Percent Non-Detects	67.65%
Mean Detects	3.691	SD Detects	5.906
Median Detects	1.7	CV Detects	1.6
Skewness Detects	2.992	Kurtosis Detects	9.427
Mean of Logged Detects	0.488	SD of Logged Detects	1.424

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.563	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.375	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	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

Mean	1.326	Standard Error of Mean	0.649
SD	3.597	95% KM (BCA) UCL	2.577
95% KM (t) UCL	2.424	95% KM (Percentile Bootstrap) UCL	2.519
95% KM (z) UCL	2.393	95% KM Bootstrap t UCL	4.477
90% KM Chebyshev UCL	3.273	95% KM Chebyshev UCL	4.155
97.5% KM Chebyshev UCL	5.379	99% KM Chebyshev UCL	7.783

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.498	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.764	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.216	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.265	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)	0.734	k star (bias corrected MLE)	0.595
Theta hat (MLE)	5.025	Theta star (bias corrected MLE)	6.206
nu hat (MLE)	16.16	nu star (bias corrected)	13.08
MLE Mean (bias corrected)	3.691	MLE Sd (bias corrected)	4.786

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.136	nu hat (KM)	9.24

Approximate Chi Square Value (9.24, α)	3.473	Adjusted Chi Square Value (9.24, β)	3.299
95% Gamma Approximate KM-UCL (use when n>=50)	3.528	95% Gamma Adjusted KM-UCL (use when n<50)	3.714

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.21
Maximum	21	Median	0.01
SD	3.689	CV	3.049
k hat (MLE)	0.235	k star (bias corrected MLE)	0.234
Theta hat (MLE)	5.139	Theta star (bias corrected MLE)	5.165
nu hat (MLE)	16.01	nu star (bias corrected)	15.93
MLE Mean (bias corrected)	1.21	MLE Sd (bias corrected)	2.5
		Adjusted Level of Significance (β)	0.0422
Approximate Chi Square Value (15.93, α)	7.913	Adjusted Chi Square Value (15.93, β)	7.634
95% Gamma Approximate UCL (use when n>=50)	2.436	95% Gamma Adjusted UCL (use when n<50)	2.525

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.354	Mean in Log Scale	-1.211
SD in Original Scale	3.646	SD in Log Scale	1.754
95% t UCL (assumes normality of ROS data)	2.412	95% Percentile Bootstrap UCL	2.531
95% BCA Bootstrap UCL	3.122	95% Bootstrap t UCL	4.743
95% H-UCL (Log ROS)	4.033		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.039	95% H-UCL (KM -Log)	1.861
KM SD (logged)	1.38	95% Critical H Value (KM-Log)	2.948
KM Standard Error of Mean (logged)	0.373		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.363	Mean in Log Scale	-0.78
SD in Original Scale	3.639	SD in Log Scale	1.186
95% t UCL (Assumes normality)	2.419	95% H-Stat UCL	1.613

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	2.424	95% GROS Adjusted Gamma UCL	2.525
95% Adjusted Gamma KM-UCL	3.714		

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Trichloroethene

General Statistics

Total Number of Observations	34	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	28
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.074	Minimum Non-Detect	0.5
Maximum Detect	0.32	Maximum Non-Detect	0.5
Variance Detects	0.00884	Percent Non-Detects	82.35%
Mean Detects	0.133	SD Detects	0.094
Median Detects	0.097	CV Detects	0.707
Skewness Detects	2.186	Kurtosis Detects	4.938
Mean of Logged Detects	-2.166	SD of Logged Detects	0.546

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.689	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.346	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.133	Standard Error of Mean	0.0384
SD	0.0858	95% KM (BCA) UCL	0.215
95% KM (t) UCL	0.198	95% KM (Percentile Bootstrap) UCL	0.198
95% KM (z) UCL	0.196	95% KM Bootstrap t UCL	0.422
90% KM Chebyshev UCL	0.248	95% KM Chebyshev UCL	0.3
97.5% KM Chebyshev UCL	0.373	99% KM Chebyshev UCL	0.515

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.712	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.701	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.279	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.334	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.533	k star (bias corrected MLE)	1.878
Theta hat (MLE)	0.0376	Theta star (bias corrected MLE)	0.0708
nu hat (MLE)	42.4	nu star (bias corrected)	22.53
MLE Mean (bias corrected)	0.133	MLE Sd (bias corrected)	0.0971

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.401	nu hat (KM)	163.3
Approximate Chi Square Value (163.29, α)	134.7	Adjusted Chi Square Value (163.29, β)	133.5

95% Gamma Approximate KM-UCL (use when n>=50)	0.161	95% Gamma Adjusted KM-UCL (use when n<50)	0.163

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.138
Maximum	0.382	Median	0.114
SD	0.0956	CV	0.691
k hat (MLE)	1.816	k star (bias corrected MLE)	1.675
Theta hat (MLE)	0.0762	Theta star (bias corrected MLE)	0.0826
nu hat (MLE)	123.5	nu star (bias corrected)	113.9
MLE Mean (bias corrected)	0.138	MLE Sd (bias corrected)	0.107
		Adjusted Level of Significance (β)	0.0422
Approximate Chi Square Value (113.93, α)	90.29	Adjusted Chi Square Value (113.93, β)	89.25
95% Gamma Approximate UCL (use when n>=50)	0.175	95% Gamma Adjusted UCL (use when n<50)	0.177

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.815	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.134	Mean in Log Scale	-2.166
SD in Original Scale	0.0803	SD in Log Scale	0.564
95% t UCL (assumes normality of ROS data)	0.157	95% Percentile Bootstrap UCL	0.158
95% BCA Bootstrap UCL	0.159	95% Bootstrap t UCL	0.161
95% H-UCL (Log ROS)	0.163		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.166	95% H-UCL (KM -Log)	0.154
KM SD (logged)	0.498	95% Critical H Value (KM-Log)	1.937
KM Standard Error of Mean (logged)	0.223		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.229	Mean in Log Scale	-1.524
SD in Original Scale	0.0582	SD in Log Scale	0.369
95% t UCL (Assumes normality)	0.246	95% H-Stat UCL	0.263

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.198	95% KM (Percentile Bootstrap) UCL	0.198

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Vinyl Chloride

General Statistics

Total Number of Observations	34	Number of Distinct Observations	11
Number of Detects	10	Number of Non-Detects	24
Number of Distinct Detects	10	Number of Distinct Non-Detects	1
Minimum Detect	0.15	Minimum Non-Detect	0.5
Maximum Detect	36	Maximum Non-Detect	0.5
Variance Detects	125.3	Percent Non-Detects	70.59%
Mean Detects	6.521	SD Detects	11.19
Median Detects	1.6	CV Detects	1.717
Skewness Detects	2.465	Kurtosis Detects	6.292
Mean of Logged Detects	0.676	SD of Logged Detects	1.692

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.629	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.317	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	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

Mean	2.084	Standard Error of Mean	1.164
SD	6.433	95% KM (BCA) UCL	4.465
95% KM (t) UCL	4.053	95% KM (Percentile Bootstrap) UCL	4.102
95% KM (z) UCL	3.998	95% KM Bootstrap t UCL	11.26
90% KM Chebyshev UCL	5.575	95% KM Chebyshev UCL	7.157
97.5% KM Chebyshev UCL	9.352	99% KM Chebyshev UCL	13.66

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.436	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.775	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogrov-Smirnoff GOF**
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 on Detected Data Only

k hat (MLE)	0.526	k star (bias corrected MLE)	0.435
Theta hat (MLE)	12.4	Theta star (bias corrected MLE)	15
nu hat (MLE)	10.51	nu star (bias corrected)	8.693
MLE Mean (bias corrected)	6.521	MLE Sd (bias corrected)	9.891

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.105	nu hat (KM)	7.136
Approximate Chi Square Value (7.14, α)	2.246	Adjusted Chi Square Value (7.14, β)	2.112
95% Gamma Approximate KM-UCL (use when n>=50)	6.622	95% Gamma Adjusted KM-UCL (use when n<50)	7.04

Appendix C-8
ProUCL Output - Current/Future Groundwater
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Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.925
Maximum	36	Median	0.01
SD	6.576	CV	3.416
k hat (MLE)	0.199	k star (bias corrected MLE)	0.201
Theta hat (MLE)	9.686	Theta star (bias corrected MLE)	9.587
nu hat (MLE)	13.51	nu star (bias corrected)	13.65
MLE Mean (bias corrected)	1.925	MLE Sd (bias corrected)	4.296
		Adjusted Level of Significance (β)	0.0422
Approximate Chi Square Value (13.65, α)	6.336	Adjusted Chi Square Value (13.65, β)	6.089
95% Gamma Approximate UCL (use when n>=50)	4.149	95% Gamma Adjusted UCL (use when n<50)	4.317

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.986	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.115	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.102	Mean in Log Scale	-1.265
SD in Original Scale	6.528	SD in Log Scale	1.948
95% t UCL (assumes normality of ROS data)	3.996	95% Percentile Bootstrap UCL	4.165
95% BCA Bootstrap UCL	5.673	95% Bootstrap t UCL	10.78
95% H-UCL (Log ROS)	6.807		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.873	95% H-UCL (KM -Log)	2.119
KM SD (logged)	1.363	95% Critical H Value (KM-Log)	2.925
KM Standard Error of Mean (logged)	0.322		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.094	Mean in Log Scale	-0.78
SD in Original Scale	6.526	SD in Log Scale	1.3
95% t UCL (Assumes normality)	3.988	95% H-Stat UCL	2.03

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	4.053	95% GROS Adjusted Gamma UCL	4.317
95% Adjusted Gamma KM-UCL	7.04		

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.

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

Dieldrin

General Statistics

Total Number of Observations	34	Number of Distinct Observations	4
Number of Detects	2	Number of Non-Detects	32
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	9.0000E-4	Minimum Non-Detect	0.091
Maximum Detect	0.0073	Maximum Non-Detect	0.1
Variance Detects	2.0480E-5	Percent Non-Detects	94.12%
Mean Detects	0.0041	SD Detects	0.00453
Median Detects	0.0041	CV Detects	1.104
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-5.966	SD of Logged Detects	1.48

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	0.0041	Standard Error of Mean	0.0032
SD	0.0032	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.00952	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.00936	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0137	95% KM Chebyshev UCL	0.018
97.5% KM Chebyshev UCL	0.0241	99% KM Chebyshev UCL	0.0359

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.204	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00341	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	4.815	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.642	nu hat (KM)	111.6
		Adjusted Level of Significance (β)	0.0422
Approximate Chi Square Value (111.63, α)	88.24	Adjusted Chi Square Value (111.63, β)	87.21
95% Gamma Approximate KM-UCL (use when n>=50)	0.00519	95% Gamma Adjusted KM-UCL (use when n<50)	0.00525

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0165	Mean in Log Scale	-5.966
SD in Original Scale	0.0412	SD in Log Scale	2.104
95% t UCL (assumes normality of ROS data)	0.0284	95% Percentile Bootstrap UCL	0.0294
95% BCA Bootstrap UCL	0.0354	95% Bootstrap t UCL	0.055
95% H-UCL (Log ROS)	0.103		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0469	Mean in Log Scale	-3.179
SD in Original Scale	0.011	SD in Log Scale	0.753
95% t UCL (Assumes normality)	0.0501	95% H-Stat UCL	0.0735

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

95% KM (BCA) UCL N/A

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.

Antimony

General Statistics

Total Number of Observations	35	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	29
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	2.4	Minimum Non-Detect	2
Maximum Detect	400	Maximum Non-Detect	2
Variance Detects	26193	Percent Non-Detects	82.86%
Mean Detects	69.65	SD Detects	161.8
Median Detects	3.55	CV Detects	2.324
Skewness Detects	2.449	Kurtosis Detects	5.999
Mean of Logged Detects	2.028	SD of Logged Detects	1.961

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.502	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.487	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	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

Mean	13.6	Standard Error of Mean	12.27
SD	66.27	95% KM (BCA) UCL	36.28
95% KM (t) UCL	34.35	95% KM (Percentile Bootstrap) UCL	36.33
95% KM (z) UCL	33.78	95% KM Bootstrap t UCL	1682

90% KM Chebyshev UCL	50.41	95% KM Chebyshev UCL	67.09
97.5% KM Chebyshev UCL	90.23	99% KM Chebyshev UCL	135.7

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.447	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.765	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.482	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.356	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)	0.31	k star (bias corrected MLE)	0.266
Theta hat (MLE)	224.9	Theta star (bias corrected MLE)	261.9
nu hat (MLE)	3.716	nu star (bias corrected)	3.191
MLE Mean (bias corrected)	69.65	MLE Sd (bias corrected)	135.1

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0421	nu hat (KM)	2.947
Approximate Chi Square Value (2.95, α)	0.357	Adjusted Chi Square Value (2.95, β)	0.322
95% Gamma Approximate KM-UCL (use when n>=50)	112.3	95% Gamma Adjusted KM-UCL (use when n<50)	124.4

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	11.95
Maximum	400	Median	0.01
SD	67.53	CV	5.652
k hat (MLE)	0.132	k star (bias corrected MLE)	0.139
Theta hat (MLE)	90.77	Theta star (bias corrected MLE)	85.71
nu hat (MLE)	9.214	nu star (bias corrected)	9.758
MLE Mean (bias corrected)	11.95	MLE Sd (bias corrected)	32
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (9.76, α)	3.791	Adjusted Chi Square Value (9.76, β)	3.616
95% Gamma Approximate UCL (use when n>=50)	30.75	95% Gamma Adjusted UCL (use when n<50)	32.25

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.627	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.399	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	11.97	Mean in Log Scale	-5.016
SD in Original Scale	67.53	SD in Log Scale	4.681
95% t UCL (assumes normality of ROS data)	31.28	95% Percentile Bootstrap UCL	34.74
95% BCA Bootstrap UCL	46.42	95% Bootstrap t UCL	811.7
95% H-UCL (Log ROS)	310462		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	12.77	Mean in Log Scale	0.348
SD in Original Scale	67.39	SD in Log Scale	1.08
95% t UCL (Assumes normality)	32.03	95% H-Stat UCL	4.073

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

97.5% KM (Chebyshev) UCL	90.23

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.

Arsenic

General Statistics

Total Number of Observations	35	Number of Distinct Observations	33
Number of Detects	34	Number of Non-Detects	1
Number of Distinct Detects	32	Number of Distinct Non-Detects	1
Minimum Detect	0.39	Minimum Non-Detect	0.2
Maximum Detect	76	Maximum Non-Detect	0.2
Variance Detects	358.1	Percent Non-Detects	2.857%
Mean Detects	13.22	SD Detects	18.92
Median Detects	5.15	CV Detects	1.431
Skewness Detects	2.048	Kurtosis Detects	3.727
Mean of Logged Detects	1.628	SD of Logged Detects	1.478

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.694	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.263	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.152	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

Mean	12.85	Standard Error of Mean	3.174
SD	18.5	95% KM (BCA) UCL	18.97
95% KM (t) UCL	18.22	95% KM (Percentile Bootstrap) UCL	18.14
95% KM (z) UCL	18.07	95% KM Bootstrap t UCL	19.93
90% KM Chebyshev UCL	22.38	95% KM Chebyshev UCL	26.69
97.5% KM Chebyshev UCL	32.68	99% KM Chebyshev UCL	44.44

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.836	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.798	Detected Data Not Gamma Distributed at 5% Significance Level

K-S Test Statistic	0.137	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.641	k star (bias corrected MLE)	0.604
Theta hat (MLE)	20.62	Theta star (bias corrected MLE)	21.88
nu hat (MLE)	43.61	nu star (bias corrected)	41.1
MLE Mean (bias corrected)	13.22	MLE Sd (bias corrected)	17.01

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.483	nu hat (KM)	33.78
Approximate Chi Square Value (33.78, α)	21.49	Adjusted Chi Square Value (33.78, β)	21.02
95% Gamma Approximate KM-UCL (use when n>=50)	20.2	95% Gamma Adjusted KM-UCL (use when n<50)	20.65

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	12.85
Maximum	76	Median	4.9
SD	18.78	CV	1.462
k hat (MLE)	0.565	k star (bias corrected MLE)	0.536
Theta hat (MLE)	22.73	Theta star (bias corrected MLE)	23.98
nu hat (MLE)	39.56	nu star (bias corrected)	37.5
MLE Mean (bias corrected)	12.85	MLE Sd (bias corrected)	17.55
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (37.50, α)	24.48	Adjusted Chi Square Value (37.50, β)	23.98
95% Gamma Approximate UCL (use when n>=50)	19.68	95% Gamma Adjusted UCL (use when n<50)	20.09

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.933	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0894	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.152	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	12.85	Mean in Log Scale	1.52
SD in Original Scale	18.77	SD in Log Scale	1.59
95% t UCL (assumes normality of ROS data)	18.22	95% Percentile Bootstrap UCL	18.17
95% BCA Bootstrap UCL	18.79	95% Bootstrap t UCL	21.09
95% H-UCL (Log ROS)	39.43		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.535	95% H-UCL (KM -Log)	34.73
KM SD (logged)	1.533	95% Critical H Value (KM-Log)	3.181
KM Standard Error of Mean (logged)	0.263		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	12.85	Mean in Log Scale	1.516
SD in Original Scale	18.77	SD in Log Scale	1.601
95% t UCL (Assumes normality)	18.21	95% H-Stat UCL	40.33

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	26.69	95% GROS Adjusted Gamma UCL	20.09
95% Adjusted Gamma KM-UCL	20.65		

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.

Cadmium

General Statistics

Total Number of Observations	35	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	31
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	0.6	Minimum Non-Detect	0.25
Maximum Detect	1.5	Maximum Non-Detect	0.25
Variance Detects	0.171	Percent Non-Detects	88.57%
Mean Detects	0.973	SD Detects	0.414
Median Detects	0.895	CV Detects	0.425
Skewness Detects	0.703	Kurtosis Detects	-1.726
Mean of Logged Detects	-0.0953	SD of Logged Detects	0.423

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	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

Mean	0.333	Standard Error of Mean	0.0507
SD	0.26	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.418	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.416	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.485	95% KM Chebyshev UCL	0.554
97.5% KM Chebyshev UCL	0.649	99% KM Chebyshev UCL	0.837

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.312	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.658	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.279	**Kolmogrov-Smirnoff 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)	7.582	k star (bias corrected MLE)	2.062
Theta hat (MLE)	0.128	Theta star (bias corrected MLE)	0.472
nu hat (MLE)	60.66	nu star (bias corrected)	16.5
MLE Mean (bias corrected)	0.973	MLE Sd (bias corrected)	0.677

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.639	nu hat (KM)	114.7
Approximate Chi Square Value (114.70, α)	90.98	Adjusted Chi Square Value (114.70, β)	89.97
95% Gamma Approximate KM-UCL (use when n>=50)	0.419	95% Gamma Adjusted KM-UCL (use when n<50)	0.424

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.128
Maximum	1.5	Median	0.01
SD	0.333	CV	2.603
k hat (MLE)	0.356	k star (bias corrected MLE)	0.344
Theta hat (MLE)	0.36	Theta star (bias corrected MLE)	0.372
nu hat (MLE)	24.89	nu star (bias corrected)	24.09
MLE Mean (bias corrected)	0.128	MLE Sd (bias corrected)	0.218
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (24.09, α)	13.91	Adjusted Chi Square Value (24.09, β)	13.55
95% Gamma Approximate UCL (use when n>=50)	0.222	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.207	Mean in Log Scale	-2.436
SD in Original Scale	0.32	SD in Log Scale	1.365
95% t UCL (assumes normality of ROS data)	0.299	95% Percentile Bootstrap UCL	0.299
95% BCA Bootstrap UCL	0.325	95% Bootstrap t UCL	0.363
95% H-UCL (Log ROS)	0.442		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.239	95% H-UCL (KM -Log)	0.365
KM SD (logged)	0.429	95% Critical H Value (KM-Log)	1.889
KM Standard Error of Mean (logged)	0.0837		

DL/2 Statistics

DL/2 Normal **DL/2 Log-Transformed**

Mean in Original Scale	0.222	Mean in Log Scale	-1.853
SD in Original Scale	0.3	SD in Log Scale	0.653
95% t UCL (Assumes normality)	0.308	95% H-Stat UCL	0.245

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.418	95% KM (Percentile Bootstrap) UCL	N/A

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

General Statistics

Total Number of Observations	35	Number of Distinct Observations	20
Number of Detects	28	Number of Non-Detects	7
Number of Distinct Detects	19	Number of Distinct Non-Detects	1
Minimum Detect	0.6	Minimum Non-Detect	2
Maximum Detect	5.8	Maximum Non-Detect	2
Variance Detects	1.587	Percent Non-Detects	20%
Mean Detects	2.246	SD Detects	1.26
Median Detects	2	CV Detects	0.561
Skewness Detects	1.071	Kurtosis Detects	0.94
Mean of Logged Detects	0.662	SD of Logged Detects	0.557

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.907	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.167	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2.048	Standard Error of Mean	0.206
SD	1.184	95% KM (BCA) UCL	2.382
95% KM (t) UCL	2.397	95% KM (Percentile Bootstrap) UCL	2.4
95% KM (z) UCL	2.387	95% KM Bootstrap t UCL	2.456
90% KM Chebyshev UCL	2.666	95% KM Chebyshev UCL	2.946
97.5% KM Chebyshev UCL	3.335	99% KM Chebyshev UCL	4.099

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.425	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.17	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.166	Detected Data Not Gamma Distributed at 5% Significance Level

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.56	k star (bias corrected MLE)	3.202
Theta hat (MLE)	0.631	Theta star (bias corrected MLE)	0.701
nu hat (MLE)	199.3	nu star (bias corrected)	179.3
MLE Mean (bias corrected)	2.246	MLE Sd (bias corrected)	1.255

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.992	nu hat (KM)	209.4
Approximate Chi Square Value (209.45, α)	177	Adjusted Chi Square Value (209.45, β)	175.5
95% Gamma Approximate KM-UCL (use when n>=50)	2.424	95% Gamma Adjusted KM-UCL (use when n<50)	2.444

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.511	Mean	2.046
Maximum	5.8	Median	1.694
SD	1.212	CV	0.593
k hat (MLE)	3.306	k star (bias corrected MLE)	3.042
Theta hat (MLE)	0.619	Theta star (bias corrected MLE)	0.673
nu hat (MLE)	231.4	nu star (bias corrected)	212.9
MLE Mean (bias corrected)	2.046	MLE Sd (bias corrected)	1.173
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (212.91, α)	180.1	Adjusted Chi Square Value (212.91, β)	178.7
95% Gamma Approximate UCL (use when n>=50)	2.418	95% Gamma Adjusted UCL (use when n<50)	2.437

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.924	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.167	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.056	Mean in Log Scale	0.574
SD in Original Scale	1.198	SD in Log Scale	0.544
95% t UCL (assumes normality of ROS data)	2.399	95% Percentile Bootstrap UCL	2.398
95% BCA Bootstrap UCL	2.463	95% Bootstrap t UCL	2.469
95% H-UCL (Log ROS)	2.475		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.568	95% H-UCL (KM -Log)	2.45
KM SD (logged)	0.539	95% Critical H Value (KM-Log)	1.974
KM Standard Error of Mean (logged)	0.0965		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.997	Mean in Log Scale	0.53

SD in Original Scale	1.231	SD in Log Scale	0.565
95% t UCL (Assumes normality)	2.349	95% H-Stat UCL	2.417

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	2.397	95% KM (Percentile Bootstrap) UCL	2.4

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.

Cobalt

General Statistics

Total Number of Observations	35	Number of Distinct Observations	23
Number of Detects	27	Number of Non-Detects	8
Number of Distinct Detects	22	Number of Distinct Non-Detects	1
Minimum Detect	0.29	Minimum Non-Detect	1
Maximum Detect	7.9	Maximum Non-Detect	1
Variance Detects	2.255	Percent Non-Detects	22.86%
Mean Detects	1.246	SD Detects	1.502
Median Detects	0.7	CV Detects	1.206
Skewness Detects	3.623	Kurtosis Detects	15.46
Mean of Logged Detects	-0.152	SD of Logged Detects	0.803

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.585	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.262	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.171	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

Mean	1.084	Standard Error of Mean	0.23
SD	1.331	95% KM (BCA) UCL	1.487
95% KM (t) UCL	1.473	95% KM (Percentile Bootstrap) UCL	1.483
95% KM (z) UCL	1.463	95% KM Bootstrap t UCL	1.857
90% KM Chebyshev UCL	1.774	95% KM Chebyshev UCL	2.087
97.5% KM Chebyshev UCL	2.521	99% KM Chebyshev UCL	3.373

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.969	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.763	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.158	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.491	k star (bias corrected MLE)	1.35
Theta hat (MLE)	0.835	Theta star (bias corrected MLE)	0.923
nu hat (MLE)	80.52	nu star (bias corrected)	72.91
MLE Mean (bias corrected)	1.246	MLE Sd (bias corrected)	1.072

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.664	nu hat (KM)	46.45
Approximate Chi Square Value (46.45, α)	31.81	Adjusted Chi Square Value (46.45, β)	31.23
95% Gamma Approximate KM-UCL (use when n>=50)	1.583	95% Gamma Adjusted KM-UCL (use when n<50)	1.612

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.057
Maximum	7.9	Median	0.69
SD	1.372	CV	1.297
k hat (MLE)	0.992	k star (bias corrected MLE)	0.926
Theta hat (MLE)	1.066	Theta star (bias corrected MLE)	1.142
nu hat (MLE)	69.41	nu star (bias corrected)	64.79
MLE Mean (bias corrected)	1.057	MLE Sd (bias corrected)	1.099
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (64.79, α)	47.27	Adjusted Chi Square Value (64.79, β)	46.56
95% Gamma Approximate UCL (use when n>=50)	1.449	95% Gamma Adjusted UCL (use when n<50)	1.471

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.119	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.09	Mean in Log Scale	-0.268
SD in Original Scale	1.349	SD in Log Scale	0.765
95% t UCL (assumes normality of ROS data)	1.476	95% Percentile Bootstrap UCL	1.489
95% BCA Bootstrap UCL	1.7	95% Bootstrap t UCL	1.836
95% H-UCL (Log ROS)	1.366		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.273	95% H-UCL (KM -Log)	1.331
KM SD (logged)	0.749	95% Critical H Value (KM-Log)	2.173
KM Standard Error of Mean (logged)	0.134		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.075	Mean in Log Scale	-0.276
SD in Original Scale	1.351	SD in Log Scale	0.739
95% t UCL (Assumes normality)	1.461	95% H-Stat UCL	1.313

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	1.487	95% GROS Adjusted Gamma UCL	1.471
95% Adjusted Gamma KM-UCL	1.612		

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.

Cyanide

General Statistics

Total Number of Observations	35	Number of Distinct Observations	4
Number of Detects	4	Number of Non-Detects	31
Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	2.2	Minimum Non-Detect	10
Maximum Detect	3.6	Maximum Non-Detect	10
Variance Detects	0.443	Percent Non-Detects	88.57%
Mean Detects	2.625	SD Detects	0.665
Median Detects	2.35	CV Detects	0.253
Skewness Detects	1.747	Kurtosis Detects	2.999
Mean of Logged Detects	0.944	SD of Logged Detects	0.233

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.772	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.325	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.443	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

Mean	2.625	Standard Error of Mean	0.333
SD	0.576	95% KM (BCA) UCL	N/A
95% KM (t) UCL	3.187	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	3.172	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	3.623	95% KM Chebyshev UCL	4.075
97.5% KM Chebyshev UCL	4.702	99% KM Chebyshev UCL	5.934

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.576	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.315	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.394	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)	23.37	k star (bias corrected MLE)	6.01
Theta hat (MLE)	0.112	Theta star (bias corrected MLE)	0.437
nu hat (MLE)	187	nu star (bias corrected)	48.08
MLE Mean (bias corrected)	2.625	MLE Sd (bias corrected)	1.071

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	20.76	nu hat (KM)	1453
Approximate Chi Square Value (N/A, α)	1366	Adjusted Chi Square Value (N/A, β)	1362
95% Gamma Approximate KM-UCL (use when n>=50)	2.793	95% Gamma Adjusted KM-UCL (use when n<50)	2.801

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	1.256	Mean	2.647
Maximum	4.347	Median	2.538
SD	0.744	CV	0.281
k hat (MLE)	12.71	k star (bias corrected MLE)	11.64
Theta hat (MLE)	0.208	Theta star (bias corrected MLE)	0.227
nu hat (MLE)	889.6	nu star (bias corrected)	814.7
MLE Mean (bias corrected)	2.647	MLE Sd (bias corrected)	0.776
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (814.70, α)	749.5	Adjusted Chi Square Value (814.70, β)	746.5
95% Gamma Approximate UCL (use when n>=50)	2.877	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.796	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.654	Mean in Log Scale	0.944
SD in Original Scale	0.696	SD in Log Scale	0.259
95% t UCL (assumes normality of ROS data)	2.853	95% Percentile Bootstrap UCL	2.852
95% BCA Bootstrap UCL	2.865	95% Bootstrap t UCL	2.878
95% H-UCL (Log ROS)	2.875		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.944	95% H-UCL (KM -Log)	2.785
KM SD (logged)	0.202	95% Critical H Value (KM-Log)	1.749
KM Standard Error of Mean (logged)	0.116		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.729	Mean in Log Scale	1.533
SD in Original Scale	0.792	SD in Log Scale	0.226
95% t UCL (Assumes normality)	4.955	95% H-Stat UCL	5.089

DL/2 is not a recommended method, provided for comparisons and historical reasons

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	3.187	95% KM (Percentile Bootstrap) UCL	N/A

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.

Iron

General Statistics

Total Number of Observations	35	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	38.3	Mean	11797
Maximum	62300	Median	4410
SD	17245	Std. Error of Mean	2915
Coefficient of Variation	1.462	Skewness	1.846

Normal GOF Test

Shapiro Wilk Test Statistic	0.698	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.251	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	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	16725	95% Adjusted-CLT UCL (Chen-1995)	17563
		95% Modified-t UCL (Johnson-1978)	16877

Gamma GOF Test

A-D Test Statistic	0.548	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.822	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.14	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.455	k star (bias corrected MLE)	0.435
Theta hat (MLE)	25916	Theta star (bias corrected MLE)	27105
nu hat (MLE)	31.86	nu star (bias corrected)	30.47
MLE Mean (bias corrected)	11797	MLE Sd (bias corrected)	17882
		Approximate Chi Square Value (0.05)	18.86
Adjusted Level of Significance	0.0425	Adjusted Chi Square Value	18.43

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	19057	95% Adjusted Gamma UCL (use when n<50)	19505

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.136	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.645	Mean of logged Data	7.959
Maximum of Logged Data	11.04	SD of logged Data	2.066

Assuming Lognormal Distribution

95% H-UCL	99452	90% Chebyshev (MVUE) UCL	50321
95% Chebyshev (MVUE) UCL	63837	97.5% Chebyshev (MVUE) UCL	82597
99% Chebyshev (MVUE) UCL	119448		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	16591	95% Jackknife UCL	16725
95% Standard Bootstrap UCL	16436	95% Bootstrap-t UCL	18406
95% Hall's Bootstrap UCL	17256	95% Percentile Bootstrap UCL	16685
95% BCA Bootstrap UCL	17603		
90% Chebyshev(Mean, Sd) UCL	20541	95% Chebyshev(Mean, Sd) UCL	24502
97.5% Chebyshev(Mean, Sd) UCL	30000	99% Chebyshev(Mean, Sd) UCL	40799

Suggested UCL to Use

95% Adjusted Gamma UCL 19505

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	35	Number of Distinct Observations	26
		Number of Missing Observations	0
Minimum	0.31	Mean	18.49
Maximum	573	Median	1.4
SD	96.52	Std. Error of Mean	16.31
Coefficient of Variation	5.221	Skewness	5.91

Normal GOF Test

Shapiro Wilk Test Statistic	0.187	**Shapiro Wilk GOF Test**	

5% Shapiro Wilk Critical Value	0.934	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.497	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.15	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	46.07	95% Adjusted-CLT UCL (Chen-1995)	62.74
		95% Modified-t UCL (Johnson-1978)	48.79

Gamma GOF Test

A-D Test Statistic	8.11	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.86	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.408	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.162	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.293	k star (bias corrected MLE)	0.287
Theta hat (MLE)	63.03	Theta star (bias corrected MLE)	64.37
nu hat (MLE)	20.53	nu star (bias corrected)	20.1
MLE Mean (bias corrected)	18.49	MLE Sd (bias corrected)	34.5
		Approximate Chi Square Value (0.05)	10.93
Adjusted Level of Significance	0.0425	Adjusted Chi Square Value	10.61

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	34.01	95% Adjusted Gamma UCL (use when n<50)	35.04

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.792	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.934	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.17	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.15	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.171	Mean of logged Data	0.557
Maximum of Logged Data	6.351	SD of logged Data	1.319

Assuming Lognormal Distribution

95% H-UCL	7.981	90% Chebyshev (MVUE) UCL	7.294
95% Chebyshev (MVUE) UCL	8.791	97.5% Chebyshev (MVUE) UCL	10.87
99% Chebyshev (MVUE) UCL	14.95		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	45.32	95% Jackknife UCL	46.07
95% Standard Bootstrap UCL	44.76	95% Bootstrap-t UCL	1109
95% Hall's Bootstrap UCL	535	95% Percentile Bootstrap UCL	50.92

95% BCA Bootstrap UCL	83.41		
90% Chebyshev(Mean, Sd) UCL	67.43	95% Chebyshev(Mean, Sd) UCL	89.6
97.5% Chebyshev(Mean, Sd) UCL	120.4	99% Chebyshev(Mean, Sd) UCL	180.8

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	89.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	35	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	0.69	Mean	155.5
Maximum	816	Median	73.1
SD	209.1	Std. Error of Mean	35.35
Coefficient of Variation	1.345	Skewness	1.833

Normal GOF Test

Shapiro Wilk Test Statistic	0.738	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	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	215.2	95% Adjusted-CLT UCL (Chen-1995)	225.3
		95% Modified-t UCL (Johnson-1978)	217.1

Gamma GOF Test

A-D Test Statistic	0.282	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.805	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0968	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.156	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.57	k star (bias corrected MLE)	0.54
Theta hat (MLE)	272.7	Theta star (bias corrected MLE)	287.7
nu hat (MLE)	39.91	nu star (bias corrected)	37.82
MLE Mean (bias corrected)	155.5	MLE Sd (bias corrected)	211.5
		Approximate Chi Square Value (0.05)	24.74
Adjusted Level of Significance	0.0425	Adjusted Chi Square Value	24.24

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	237.7	95% Adjusted Gamma UCL (use when n<50)	242.6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0897	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.15	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.371	Mean of logged Data	3.954
Maximum of Logged Data	6.704	SD of logged Data	1.775

Assuming Lognormal Distribution

95% H-UCL	740.4	90% Chebyshev (MVUE) UCL	501.6
95% Chebyshev (MVUE) UCL	626	97.5% Chebyshev (MVUE) UCL	798.5
99% Chebyshev (MVUE) UCL	1138		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	213.6	95% Jackknife UCL	215.2
95% Standard Bootstrap UCL	213.4	95% Bootstrap-t UCL	231.7
95% Hall's Bootstrap UCL	224.2	95% Percentile Bootstrap UCL	212.3
95% BCA Bootstrap UCL	226.6		
90% Chebyshev(Mean, Sd) UCL	261.5	95% Chebyshev(Mean, Sd) UCL	309.5
97.5% Chebyshev(Mean, Sd) UCL	376.2	99% Chebyshev(Mean, Sd) UCL	507.2

Suggested UCL to Use

95% Adjusted Gamma UCL 242.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Vanadium

General Statistics

Total Number of Observations	35	Number of Distinct Observations	18
Number of Detects	21	Number of Non-Detects	14
Number of Distinct Detects	17	Number of Distinct Non-Detects	1
Minimum Detect	1.1	Minimum Non-Detect	5
Maximum Detect	10.5	Maximum Non-Detect	5
Variance Detects	9.627	Percent Non-Detects	40%
Mean Detects	3.705	SD Detects	3.103
Median Detects	2.2	CV Detects	0.838
Skewness Detects	1.426	Kurtosis Detects	0.73
Mean of Logged Detects	1.034	SD of Logged Detects	0.729

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.757	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.257	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	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

Mean	3.088	Standard Error of Mean	0.457
SD	2.525	95% KM (BCA) UCL	3.847
95% KM (t) UCL	3.86	95% KM (Percentile Bootstrap) UCL	3.84
95% KM (z) UCL	3.839	95% KM Bootstrap t UCL	4.086
90% KM Chebyshev UCL	4.458	95% KM Chebyshev UCL	5.078
97.5% KM Chebyshev UCL	5.939	99% KM Chebyshev UCL	7.631

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.095	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.754	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.216	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.192	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)	1.963	k star (bias corrected MLE)	1.715
Theta hat (MLE)	1.887	Theta star (bias corrected MLE)	2.161
nu hat (MLE)	82.46	nu star (bias corrected)	72.02
MLE Mean (bias corrected)	3.705	MLE Sd (bias corrected)	2.829

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.495	nu hat (KM)	104.7
Approximate Chi Square Value (104.66, α)	82.05	Adjusted Chi Square Value (104.66, β)	81.1
95% Gamma Approximate KM-UCL (use when n>=50)	3.939	95% Gamma Adjusted KM-UCL (use when n<50)	3.985

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0308	Mean	3.15
Maximum	10.5	Median	2.2
SD	2.662	CV	0.845
k hat (MLE)	1.507	k star (bias corrected MLE)	1.397
Theta hat (MLE)	2.09	Theta star (bias corrected MLE)	2.255
nu hat (MLE)	105.5	nu star (bias corrected)	97.78
MLE Mean (bias corrected)	3.15	MLE Sd (bias corrected)	2.665
		Adjusted Level of Significance (β)	0.0425
Approximate Chi Square Value (97.78, α)	75.97	Adjusted Chi Square Value (97.78, β)	75.05
95% Gamma Approximate UCL (use when n>=50)	4.054	95% Gamma Adjusted UCL (use when n<50)	4.103

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.91	**Shapiro Wilk GOF Test**

5% Shapiro Wilk Critical Value	0.908	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.16	Mean in Log Scale	0.916
SD in Original Scale	2.567	SD in Log Scale	0.658
95% t UCL (assumes normality of ROS data)	3.894	95% Percentile Bootstrap UCL	3.889
95% BCA Bootstrap UCL	4.129	95% Bootstrap t UCL	4.173
95% H-UCL (Log ROS)	3.926		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.898	95% H-UCL (KM -Log)	3.727
KM SD (logged)	0.628	95% Critical H Value (KM-Log)	2.053
KM Standard Error of Mean (logged)	0.124		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.223	Mean in Log Scale	0.987
SD in Original Scale	2.454	SD in Log Scale	0.562
95% t UCL (Assumes normality)	3.924	95% H-Stat UCL	3.809

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	3.86	95% KM (% Bootstrap) UCL	3.84

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.

Zinc

General Statistics

Total Number of Observations	35	Number of Distinct Observations	34
		Number of Missing Observations	0
Minimum	2	Mean	139.7
Maximum	3880	Median	8.3
SD	652.6	Std. Error of Mean	110.3
Coefficient of Variation	4.672	Skewness	5.866

Normal GOF Test

Shapiro Wilk Test Statistic	0.214	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.934	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.445	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.15	Data Not Normal at 5% Significance Level

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	326.2	95% Adjusted-CLT UCL (Chen-1995)	438
		95% Modified-t UCL (Johnson-1978)	344.4

Gamma GOF Test

A-D Test Statistic	5.872	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.855	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.296	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.161	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.305	k star (bias corrected MLE)	0.298
Theta hat (MLE)	457.5	Theta star (bias corrected MLE)	468.4
nu hat (MLE)	21.37	nu star (bias corrected)	20.87
MLE Mean (bias corrected)	139.7	MLE Sd (bias corrected)	255.8
		Approximate Chi Square Value (0.05)	11.5
Adjusted Level of Significance	0.0425	Adjusted Chi Square Value	11.17

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	253.6	95% Adjusted Gamma UCL (use when n<50)	261.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.853	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.934	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.206	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.15	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.693	Mean of logged Data	2.687
Maximum of Logged Data	8.264	SD of logged Data	1.551

Assuming Lognormal Distribution

95% H-UCL	114.8	90% Chebyshev (MVUE) UCL	92.13
95% Chebyshev (MVUE) UCL	113.2	97.5% Chebyshev (MVUE) UCL	142.4
99% Chebyshev (MVUE) UCL	199.8		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	321.1	95% Jackknife UCL	326.2
95% Standard Bootstrap UCL	318.4	95% Bootstrap-t UCL	2438
95% Hall's Bootstrap UCL	1469	95% Percentile Bootstrap UCL	358.8
95% BCA Bootstrap UCL	478.6		
90% Chebyshev(Mean, Sd) UCL	470.6	95% Chebyshev(Mean, Sd) UCL	620.5
97.5% Chebyshev(Mean, Sd) UCL	828.6	99% Chebyshev(Mean, Sd) UCL	1237

Appendix C-8
ProUCL Output - Current/Future Groundwater
Matteo Sons, Inc. Site
Thorofare, New Jersey

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 620.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 10:42:00 PM
From File	ProUCL_Input_SW.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Total Number of Observations	27	Number of Distinct Observations	3
Number of Detects	2	Number of Non-Detects	25
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	0.1	Minimum Non-Detect	0.05
Maximum Detect	0.18	Maximum Non-Detect	0.05
Variance Detects	0.0032	Percent Non-Detects	92.59%
Mean Detects	0.14	SD Detects	0.0566
Median Detects	0.14	CV Detects	0.404
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-2.009	SD of Logged Detects	0.416

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	0.0567	Standard Error of Mean	0.00707
SD	0.026	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0687	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0683	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0779	95% KM Chebyshev UCL	0.0875
97.5% KM Chebyshev UCL	0.101	99% KM Chebyshev UCL	0.127

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	11.91	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0118	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	47.63	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	4.764	nu hat (KM)	257.2
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (257.24, α)	221.1	Adjusted Chi Square Value (257.24, β)	219

95% Gamma Approximate KM-UCL (use when n>=50)	0.0659	95% Gamma Adjusted KM-UCL (use when n<50)	0.0666

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0184	Mean in Log Scale	-5.372
SD in Original Scale	0.0384	SD in Log Scale	1.747
95% t UCL (assumes normality of ROS data)	0.031	95% Percentile Bootstrap UCL	0.0309
95% BCA Bootstrap UCL	0.0385	95% Bootstrap t UCL	0.0559
95% H-UCL (Log ROS)	0.0739		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0335	Mean in Log Scale	-3.564
SD in Original Scale	0.0326	SD in Log Scale	0.456
95% t UCL (Assumes normality)	0.0442	95% H-Stat UCL	0.0373

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

95% KM (t) UCL	0.0687	95% KM (% Bootstrap) UCL	N/A

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	27	Number of Distinct Observations	3
Number of Detects	2	Number of Non-Detects	25
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	0.2	Minimum Non-Detect	0.05
Maximum Detect	0.32	Maximum Non-Detect	0.05
Variance Detects	0.0072	Percent Non-Detects	92.59%
Mean Detects	0.26	SD Detects	0.0849
Median Detects	0.26	CV Detects	0.326
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.374	SD of Logged Detects	0.332

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0656	Standard Error of Mean	0.0156
SD	0.0574	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0922	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0912	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.112	95% KM Chebyshev UCL	0.134
97.5% KM Chebyshev UCL	0.163	99% KM Chebyshev UCL	0.221

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	18.44	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0141	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	73.75	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.306	nu hat (KM)	70.51
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (70.51, α)	52.18	Adjusted Chi Square Value (70.51, β)	51.17
95% Gamma Approximate KM-UCL (use when n>=50)	0.0886	95% Gamma Adjusted KM-UCL (use when n<50)	0.0903

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0426	Mean in Log Scale	-4.064
SD in Original Scale	0.0699	SD in Log Scale	1.397
95% t UCL (assumes normality of ROS data)	0.0655	95% Percentile Bootstrap UCL	0.0661
95% BCA Bootstrap UCL	0.0768	95% Bootstrap t UCL	0.098
95% H-UCL (Log ROS)	0.106		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0424	Mean in Log Scale	-3.517
SD in Original Scale	0.0649	SD in Log Scale	0.621
95% t UCL (Assumes normality)	0.0637	95% H-Stat UCL	0.0464

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

95% KM (t) UCL	0.0922	95% KM (% Bootstrap) UCL	N/A

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	27	Number of Distinct Observations	3
Number of Detects	2	Number of Non-Detects	25
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	0.23	Minimum Non-Detect	0.05
Maximum Detect	0.38	Maximum Non-Detect	0.05
Variance Detects	0.0113	Percent Non-Detects	92.59%
Mean Detects	0.305	SD Detects	0.106
Median Detects	0.305	CV Detects	0.348
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.219	SD of Logged Detects	0.355

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	0.0689	Standard Error of Mean	0.019
SD	0.0698	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.101	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.1	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.126	95% KM Chebyshev UCL	0.152
97.5% KM Chebyshev UCL	0.188	99% KM Chebyshev UCL	0.258

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	16.2	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0188	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	64.79	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.973	nu hat (KM)	52.55
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (52.55, α)	36.9	Adjusted Chi Square Value (52.55, β)	36.06
95% Gamma Approximate KM-UCL (use when n>=50)	0.0981	95% Gamma Adjusted KM-UCL (use when n<50)	0.1

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0467	Mean in Log Scale	-4.092

SD in Original Scale	0.0825	SD in Log Scale	1.492
95% t UCL (assumes normality of ROS data)	0.0738	95% Percentile Bootstrap UCL	0.0766
95% BCA Bootstrap UCL	0.0846	95% Bootstrap t UCL	0.113
95% H-UCL (Log ROS)	0.131		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0457	Mean in Log Scale	-3.506
SD in Original Scale	0.0776	SD in Log Scale	0.663
95% t UCL (Assumes normality)	0.0712	95% H-Stat UCL	0.0493

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

95% KM (t) UCL	0.101	95% KM (% Bootstrap) UCL	N/A

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	27	Number of Distinct Observations	3
Number of Detects	2	Number of Non-Detects	25
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	0.097	Minimum Non-Detect	0.05
Maximum Detect	0.15	Maximum Non-Detect	0.05
Variance Detects	0.0014	Percent Non-Detects	92.59%
Mean Detects	0.124	SD Detects	0.0375
Median Detects	0.124	CV Detects	0.303
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-2.115	SD of Logged Detects	0.308

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	0.0554	Standard Error of Mean	0.00559
SD	0.0206	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.065	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0646	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0722	95% KM Chebyshev UCL	0.0798

97.5% KM Chebyshev UCL	0.0904	99% KM Chebyshev UCL	0.111

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	21.38	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00578	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	85.52	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	7.275	nu hat (KM)	392.9
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (392.86, α)	347.9	Adjusted Chi Square Value (392.86, β)	345.2
95% Gamma Approximate KM-UCL (use when n>=50)	0.0626	95% Gamma Adjusted KM-UCL (use when n<50)	0.0631

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0219	Mean in Log Scale	-4.61
SD in Original Scale	0.033	SD in Log Scale	1.295
95% t UCL (assumes normality of ROS data)	0.0327	95% Percentile Bootstrap UCL	0.0328
95% BCA Bootstrap UCL	0.0365	95% Bootstrap t UCL	0.0453
95% H-UCL (Log ROS)	0.0485		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0323	Mean in Log Scale	-3.572
SD in Original Scale	0.0273	SD in Log Scale	0.424
95% t UCL (Assumes normality)	0.0413	95% H-Stat UCL	0.036

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

95% KM (t) UCL	0.065	95% KM (% Bootstrap) UCL	N/A

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.

Pentachlorophenol

General Statistics

Total Number of Observations	27	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	23

Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	0.82	Minimum Non-Detect	0.2
Maximum Detect	3.8	Maximum Non-Detect	0.2
Variance Detects	1.627	Percent Non-Detects	85.19%
Mean Detects	2.055	SD Detects	1.275
Median Detects	1.8	CV Detects	0.621
Skewness Detects	1.047	Kurtosis Detects	1.229
Mean of Logged Detects	0.571	SD of Logged Detects	0.641

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	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

Mean	0.475	Standard Error of Mean	0.174
SD	0.784	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.772	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.761	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.998	95% KM Chebyshev UCL	1.234
97.5% KM Chebyshev UCL	1.563	99% KM Chebyshev UCL	2.209

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.203	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.177	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.396	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)	3.507	k star (bias corrected MLE)	1.043
Theta hat (MLE)	0.586	Theta star (bias corrected MLE)	1.969
nu hat (MLE)	28.06	nu star (bias corrected)	8.348
MLE Mean (bias corrected)	2.055	MLE Sd (bias corrected)	2.012

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.367	nu hat (KM)	19.8
Approximate Chi Square Value (19.80, α)	10.7	Adjusted Chi Square Value (19.80, β)	10.27
95% Gamma Approximate KM-UCL (use when n>=50)	0.878	95% Gamma Adjusted KM-UCL (use when n<50)	0.915

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.313
Maximum	3.8	Median	0.01
SD	0.858	CV	2.741
k hat (MLE)	0.263	k star (bias corrected MLE)	0.259

Theta hat (MLE)	1.189	Theta star (bias corrected MLE)	1.21
nu hat (MLE)	14.21	nu star (bias corrected)	13.97
MLE Mean (bias corrected)	0.313	MLE Sd (bias corrected)	0.615
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (13.97, α)	6.548	Adjusted Chi Square Value (13.97, β)	6.224
95% Gamma Approximate UCL (use when n>=50)	0.668	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.148	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.4	Mean in Log Scale	-2.517
SD in Original Scale	0.836	SD in Log Scale	1.94
95% t UCL (assumes normality of ROS data)	0.675	95% Percentile Bootstrap UCL	0.677
95% BCA Bootstrap UCL	0.802	95% Bootstrap t UCL	1.066
95% H-UCL (Log ROS)	2.373		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.286	95% H-UCL (KM -Log)	0.546
KM SD (logged)	0.804	95% Critical H Value (KM-Log)	2.279
KM Standard Error of Mean (logged)	0.179		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.39	Mean in Log Scale	-1.877
SD in Original Scale	0.83	SD in Log Scale	1.063
95% t UCL (Assumes normality)	0.662	95% H-Stat UCL	0.463

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.772	95% KM (Percentile Bootstrap) UCL	N/A

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.

Aluminum

General Statistics

Total Number of Observations	27	Number of Distinct Observations	12
Number of Detects	11	Number of Non-Detects	16
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	55.2	Minimum Non-Detect	200
Maximum Detect	28300	Maximum Non-Detect	200

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

Variance Detects	71417255	Percent Non-Detects	59.26%
Mean Detects	2837	SD Detects	8451
Median Detects	233	CV Detects	2.979
Skewness Detects	3.309	Kurtosis Detects	10.96
Mean of Logged Detects	5.751	SD of Logged Detects	1.705

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.37	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.487	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	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

Mean	1231	Standard Error of Mean	1073
SD	5313	95% KM (BCA) UCL	3351
95% KM (t) UCL	3060	95% KM (Percentile Bootstrap) UCL	3298
95% KM (z) UCL	2995	95% KM Bootstrap t UCL	56465
90% KM Chebyshev UCL	4448	95% KM Chebyshev UCL	5906
97.5% KM Chebyshev UCL	7929	99% KM Chebyshev UCL	11902

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.247	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.818	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.429	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.275	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)	0.312	k star (bias corrected MLE)	0.287
Theta hat (MLE)	9103	Theta star (bias corrected MLE)	9876
nu hat (MLE)	6.855	nu star (bias corrected)	6.319
MLE Mean (bias corrected)	2837	MLE Sd (bias corrected)	5293

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0537	nu hat (KM)	2.898
Approximate Chi Square Value (2.90, α)	0.343	Adjusted Chi Square Value (2.90, β)	0.299
95% Gamma Approximate KM-UCL (use when n>=50)	10402	95% Gamma Adjusted KM-UCL (use when n<50)	11951

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1171
Maximum	28300	Median	0.01
SD	5427	CV	4.635
k hat (MLE)	0.113	k star (bias corrected MLE)	0.125
Theta hat (MLE)	10341	Theta star (bias corrected MLE)	9342
nu hat (MLE)	6.115	nu star (bias corrected)	6.769

MLE Mean (bias corrected)	1171	MLE Sd (bias corrected)	3307
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (6.77, α)	2.044	Adjusted Chi Square Value (6.77, β)	1.883
95% Gamma Approximate UCL (use when n>=50)	3877	95% Gamma Adjusted UCL (use when n<50)	4209

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.772	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1230	Mean in Log Scale	4.997
SD in Original Scale	5414	SD in Log Scale	1.427
95% t UCL (assumes normality of ROS data)	3007	95% Percentile Bootstrap UCL	3299
95% BCA Bootstrap UCL	4430	95% Bootstrap t UCL	62984
95% H-UCL (Log ROS)	982.4		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1215	Mean in Log Scale	5.072
SD in Original Scale	5417	SD in Log Scale	1.203
95% t UCL (Assumes normality)	2993	95% H-Stat UCL	636.1

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

97.5% KM (Chebyshev) UCL 7929

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

General Statistics

Total Number of Observations	27	Number of Distinct Observations	4
Number of Detects	2	Number of Non-Detects	25
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	0.51	Minimum Non-Detect	0.043
Maximum Detect	7.1	Maximum Non-Detect	0.5
Variance Detects	21.71	Percent Non-Detects	92.59%
Mean Detects	3.805	SD Detects	4.66
Median Detects	3.805	CV Detects	1.225
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.643	SD of Logged Detects	1.862

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	0.322	Standard Error of Mean	0.363
SD	1.332	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.94	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.918	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.409	95% KM Chebyshev UCL	1.902
97.5% KM Chebyshev UCL	2.586	99% KM Chebyshev UCL	3.929

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	0.85	k star (bias corrected MLE)	N/A
Theta hat (MLE)	4.478	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	3.399	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0583	nu hat (KM)	3.148
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (3.15, α)	0.418	Adjusted Chi Square Value (3.15, β)	0.365
95% Gamma Approximate KM-UCL (use when n>=50)	2.425	95% Gamma Adjusted KM-UCL (use when n<50)	2.776

Gamma (KM) may not be used when k hat (KM) is < 0.1

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.282	Mean in Log Scale	-14.38
SD in Original Scale	1.366	SD in Log Scale	7.541
95% t UCL (assumes normality of ROS data)	0.731	95% Percentile Bootstrap UCL	0.808
95% BCA Bootstrap UCL	1.072	95% Bootstrap t UCL	180.2
95% H-UCL (Log ROS)	1.073E+15		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.336	Mean in Log Scale	-3.144
SD in Original Scale	1.357	SD in Log Scale	1.45
95% t UCL (Assumes normality)	0.781	95% H-Stat UCL	0.303

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

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 2.586

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.

Arsenic

General Statistics

Total Number of Observations	27	Number of Distinct Observations	23
Number of Detects	26	Number of Non-Detects	1
Number of Distinct Detects	22	Number of Distinct Non-Detects	1
Minimum Detect	0.23	Minimum Non-Detect	0.035
Maximum Detect	46.6	Maximum Non-Detect	0.035
Variance Detects	81.41	Percent Non-Detects	3.704%
Mean Detects	2.475	SD Detects	9.023
Median Detects	0.585	CV Detects	3.645
Skewness Detects	5.059	Kurtosis Detects	25.7
Mean of Logged Detects	-0.367	SD of Logged Detects	1.015

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.24	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.466	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.174	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

Mean	2.385	Standard Error of Mean	1.706
SD	8.694	95% KM (BCA) UCL	5.841
95% KM (t) UCL	5.295	95% KM (Percentile Bootstrap) UCL	5.786
95% KM (z) UCL	5.192	95% KM Bootstrap t UCL	67.38
90% KM Chebyshev UCL	7.504	95% KM Chebyshev UCL	9.823
97.5% KM Chebyshev UCL	13.04	99% KM Chebyshev UCL	19.36

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.075	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.809	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.42	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.181	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)	0.499	k star (bias corrected MLE)	0.467
Theta hat (MLE)	4.96	Theta star (bias corrected MLE)	5.299
nu hat (MLE)	25.95	nu star (bias corrected)	24.29
MLE Mean (bias corrected)	2.475	MLE Sd (bias corrected)	3.622

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0753	nu hat (KM)	4.064
Approximate Chi Square Value (4.06, α)	0.747	Adjusted Chi Square Value (4.06, β)	0.664
95% Gamma Approximate KM-UCL (use when n>=50)	12.97	95% Gamma Adjusted KM-UCL (use when n<50)	14.59

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.384
Maximum	46.6	Median	0.57
SD	8.86	CV	3.716
k hat (MLE)	0.462	k star (bias corrected MLE)	0.435
Theta hat (MLE)	5.162	Theta star (bias corrected MLE)	5.477
nu hat (MLE)	24.94	nu star (bias corrected)	23.5
MLE Mean (bias corrected)	2.384	MLE Sd (bias corrected)	3.614
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (23.50, α)	13.47	Adjusted Chi Square Value (23.50, β)	12.99
95% Gamma Approximate UCL (use when n>=50)	4.159	95% Gamma Adjusted UCL (use when n<50)	4.315

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.663	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.174	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.387	Mean in Log Scale	-0.442
SD in Original Scale	8.859	SD in Log Scale	1.071
95% t UCL (assumes normality of ROS data)	5.295	95% Percentile Bootstrap UCL	5.776
95% BCA Bootstrap UCL	7.563	95% Bootstrap t UCL	69.77
95% H-UCL (Log ROS)	1.973		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.384	Mean in Log Scale	-0.503
SD in Original Scale	8.86	SD in Log Scale	1.222
95% t UCL (Assumes normality)	5.293	95% H-Stat UCL	2.508

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

97.5% KM (Chebyshev) UCL	13.04

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.

Barium

General Statistics

Total Number of Observations	27	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	21.8	Mean	78.63
Maximum	1380	Median	26.7
SD	260.2	Std. Error of Mean	50.08
Coefficient of Variation	3.309	Skewness	5.188

Normal GOF Test

Shapiro Wilk Test Statistic	0.215	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.485	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	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	164	95% Adjusted-CLT UCL (Chen-1995)	214.4
		95% Modified-t UCL (Johnson-1978)	172.4

Gamma GOF Test

A-D Test Statistic	8.609	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.791	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.475	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.176	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.679	k star (bias corrected MLE)	0.628
Theta hat (MLE)	115.8	Theta star (bias corrected MLE)	125.2
nu hat (MLE)	36.66	nu star (bias corrected)	33.92
MLE Mean (bias corrected)	78.63	MLE Sd (bias corrected)	99.2
		Approximate Chi Square Value (0.05)	21.6
Adjusted Level of Significance	0.0401	Adjusted Chi Square Value	20.97

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	123.5	95% Adjusted Gamma UCL (use when n<50)	127.2

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.373	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.391	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.171	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.082	Mean of logged Data	3.471
Maximum of Logged Data	7.23	SD of logged Data	0.779

Assuming Lognormal Distribution

95% H-UCL	61.44	90% Chebyshev (MVUE) UCL	64.09
95% Chebyshev (MVUE) UCL	73.67	97.5% Chebyshev (MVUE) UCL	86.96
99% Chebyshev (MVUE) UCL	113.1		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	161	95% Jackknife UCL	164
95% Standard Bootstrap UCL	160.6	95% Bootstrap-t UCL	4219
95% Hall's Bootstrap UCL	1876	95% Percentile Bootstrap UCL	178.4
95% BCA Bootstrap UCL	230.4		
90% Chebyshev(Mean, Sd) UCL	228.9	95% Chebyshev(Mean, Sd) UCL	296.9
97.5% Chebyshev(Mean, Sd) UCL	391.4	99% Chebyshev(Mean, Sd) UCL	576.9

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	296.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Beryllium

General Statistics

Total Number of Observations	27	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	24
Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	0.045	Minimum Non-Detect	0.015
Maximum Detect	11.4	Maximum Non-Detect	0.25
Variance Detects	42.04	Percent Non-Detects	88.89%
Mean Detects	3.915	SD Detects	6.483
Median Detects	0.3	CV Detects	1.656
Skewness Detects	1.729	Kurtosis Detects	N/A
Mean of Logged Detects	-0.624	SD of Logged Detects	2.813

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.767	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.378	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.449	Standard Error of Mean	0.506
SD	2.148	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.312	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.281	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.968	95% KM Chebyshev UCL	2.656
97.5% KM Chebyshev UCL	3.611	99% KM Chebyshev UCL	5.487

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	0.34	k star (bias corrected MLE)	N/A
Theta hat (MLE)	11.52	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	2.039	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0436	nu hat (KM)	2.354
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (2.35, α)	0.21	Adjusted Chi Square Value (2.35, β)	0.184
95% Gamma Approximate KM-UCL (use when n>=50)	5.03	95% Gamma Adjusted KM-UCL (use when n<50)	5.749

Gamma (KM) may not be used when k hat (KM) is < 0.1

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.435	Mean in Log Scale	-14.14
SD in Original Scale	2.192	SD in Log Scale	7.536
95% t UCL (assumes normality of ROS data)	1.155	95% Percentile Bootstrap UCL	1.27
95% BCA Bootstrap UCL	1.722	95% Bootstrap t UCL	110.4
95% H-UCL (Log ROS)	1.291E+15		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.795	95% H-UCL (KM -Log)	0.127
KM SD (logged)	1.361	95% Critical H Value (KM-Log)	3.026
KM Standard Error of Mean (logged)	0.322		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.459	Mean in Log Scale	-4.002
SD in Original Scale	2.188	SD in Log Scale	1.762
95% t UCL (Assumes normality)	1.177	95% H-Stat UCL	0.305

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.312	95% KM (Percentile Bootstrap) UCL	N/A

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.

Cadmium

General Statistics

Total Number of Observations	27	Number of Distinct Observations	13
Number of Detects	12	Number of Non-Detects	15
Number of Distinct Detects	11	Number of Distinct Non-Detects	2
Minimum Detect	0.033	Minimum Non-Detect	0.028
Maximum Detect	12.7	Maximum Non-Detect	0.062
Variance Detects	13.31	Percent Non-Detects	55.56%
Mean Detects	1.114	SD Detects	3.649
Median Detects	0.0485	CV Detects	3.276
Skewness Detects	3.463	Kurtosis Detects	11.99
Mean of Logged Detects	-2.513	SD of Logged Detects	1.67

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.335	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.514	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	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

Mean	0.511	Standard Error of Mean	0.481
SD	2.391	95% KM (BCA) UCL	1.451
95% KM (t) UCL	1.331	95% KM (Percentile Bootstrap) UCL	1.448
95% KM (z) UCL	1.302	95% KM Bootstrap t UCL	96.1
90% KM Chebyshev UCL	1.953	95% KM Chebyshev UCL	2.606
97.5% KM Chebyshev UCL	3.512	99% KM Chebyshev UCL	5.293

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.354	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.839	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.471	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.267	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)	0.268	k star (bias corrected MLE)	0.257
Theta hat (MLE)	4.158	Theta star (bias corrected MLE)	4.343

nu hat (MLE)	6.43	nu star (bias corrected)	6.156
MLE Mean (bias corrected)	1.114	MLE Sd (bias corrected)	2.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0457	nu hat (KM)	2.468
Approximate Chi Square Value (2.47, α)	0.234	Adjusted Chi Square Value (2.47, β)	0.204
95% Gamma Approximate KM-UCL (use when n>=50)	5.39	95% Gamma Adjusted KM-UCL (use when n<50)	6.183

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.501
Maximum	12.7	Median	0.01
SD	2.438	CV	4.87
k hat (MLE)	0.24	k star (bias corrected MLE)	0.238
Theta hat (MLE)	2.089	Theta star (bias corrected MLE)	2.106
nu hat (MLE)	12.94	nu star (bias corrected)	12.84
MLE Mean (bias corrected)	0.501	MLE Sd (bias corrected)	1.027
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (12.84, α)	5.784	Adjusted Chi Square Value (12.84, β)	5.482
95% Gamma Approximate UCL (use when n>=50)	1.111	95% Gamma Adjusted UCL (use when n<50)	1.172

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.555	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.386	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.256	Detected Data Not Lognormal at 5% Significance Level	

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.498	Mean in Log Scale	-4.477
SD in Original Scale	2.439	SD in Log Scale	2.306
95% t UCL (assumes normality of ROS data)	1.298	95% Percentile Bootstrap UCL	1.436
95% BCA Bootstrap UCL	1.913	95% Bootstrap t UCL	55.35
95% H-UCL (Log ROS)	1.27		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.504	Mean in Log Scale	-3.43
SD in Original Scale	2.438	SD in Log Scale	1.385
95% t UCL (Assumes normality)	1.304	95% H-Stat UCL	0.194

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

97.5% KM (Chebyshev) UCL	3.512

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

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

General Statistics

Total Number of Observations	11	Number of Distinct Observations	8
		Number of Missing Observations	16
Minimum	1.2	Mean	9.109
Maximum	76.7	Median	1.8
SD	22.45	Std. Error of Mean	6.768
Coefficient of Variation	2.464	Skewness	3.301

Normal GOF Test

Shapiro Wilk Test Statistic	0.388	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.487	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	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	21.38	95% Adjusted-CLT UCL (Chen-1995)	27.44
		95% Modified-t UCL (Johnson-1978)	22.5

Gamma GOF Test

A-D Test Statistic	2.324	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.777	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.399	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.268	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.552	k star (bias corrected MLE)	0.462
Theta hat (MLE)	16.51	Theta star (bias corrected MLE)	19.72
nu hat (MLE)	12.14	nu star (bias corrected)	10.16
MLE Mean (bias corrected)	9.109	MLE Sd (bias corrected)	13.4
		Approximate Chi Square Value (0.05)	4.042
Adjusted Level of Significance	0.0278	Adjusted Chi Square Value	3.436

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	22.9	95% Adjusted Gamma UCL (use when n<50)	26.93

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.682	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.255	**Lilliefors Lognormal GOF Test**

5% Lilliefors Critical Value	0.267	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.182	Mean of logged Data	1.075
Maximum of Logged Data	4.34	SD of logged Data	1.171

Assuming Lognormal Distribution

95% H-UCL	19.98	90% Chebyshev (MVUE) UCL	11.31
95% Chebyshev (MVUE) UCL	14.04	97.5% Chebyshev (MVUE) UCL	17.81
99% Chebyshev (MVUE) UCL	25.23		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	20.24	95% Jackknife UCL	21.38
95% Standard Bootstrap UCL	19.87	95% Bootstrap-t UCL	189.9
95% Hall's Bootstrap UCL	121.5	95% Percentile Bootstrap UCL	22.52
95% BCA Bootstrap UCL	29.45		
90% Chebyshev(Mean, Sd) UCL	29.41	95% Chebyshev(Mean, Sd) UCL	38.61
97.5% Chebyshev(Mean, Sd) UCL	51.38	99% Chebyshev(Mean, Sd) UCL	76.45

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	38.61

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	27	Number of Distinct Observations	19
Number of Detects	22	Number of Non-Detects	5
Number of Distinct Detects	18	Number of Distinct Non-Detects	1
Minimum Detect	0.26	Minimum Non-Detect	0.013
Maximum Detect	67.5	Maximum Non-Detect	0.013
Variance Detects	204.3	Percent Non-Detects	18.52%
Mean Detects	3.546	SD Detects	14.29
Median Detects	0.385	CV Detects	4.031
Skewness Detects	4.68	Kurtosis Detects	21.93
Mean of Logged Detects	-0.654	SD of Logged Detects	1.192

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.237	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.49	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	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

Mean	2.892	Standard Error of Mean	2.498
SD	12.68	95% KM (BCA) UCL	7.88
95% KM (t) UCL	7.152	95% KM (Percentile Bootstrap) UCL	7.8
95% KM (z) UCL	7.001	95% KM Bootstrap t UCL	201.7
90% KM Chebyshev UCL	10.39	95% KM Chebyshev UCL	13.78
97.5% KM Chebyshev UCL	18.49	99% KM Chebyshev UCL	27.74

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.547	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.837	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.496	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.2	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)	0.35	k star (bias corrected MLE)	0.333
Theta hat (MLE)	10.13	Theta star (bias corrected MLE)	10.66
nu hat (MLE)	15.41	nu star (bias corrected)	14.64
MLE Mean (bias corrected)	3.546	MLE Sd (bias corrected)	6.148

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.052	nu hat (KM)	2.809
Approximate Chi Square Value (2.81, α)	0.318	Adjusted Chi Square Value (2.81, β)	0.277
95% Gamma Approximate KM-UCL (use when n>=50)	25.54	95% Gamma Adjusted KM-UCL (use when n<50)	29.36

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.891
Maximum	67.5	Median	0.32
SD	12.92	CV	4.469
k hat (MLE)	0.284	k star (bias corrected MLE)	0.277
Theta hat (MLE)	10.17	Theta star (bias corrected MLE)	10.43
nu hat (MLE)	15.35	nu star (bias corrected)	14.98
MLE Mean (bias corrected)	2.891	MLE Sd (bias corrected)	5.491
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (14.98, α)	7.245	Adjusted Chi Square Value (14.98, β)	6.902
95% Gamma Approximate UCL (use when n>=50)	5.977	95% Gamma Adjusted UCL (use when n<50)	6.274

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.498	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.356	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.903	Mean in Log Scale	-1.034
SD in Original Scale	12.92	SD in Log Scale	1.353
95% t UCL (assumes normality of ROS data)	7.144	95% Percentile Bootstrap UCL	7.862
95% BCA Bootstrap UCL	10.46	95% Bootstrap t UCL	228
95% H-UCL (Log ROS)	1.976		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.891	Mean in Log Scale	-1.466
SD in Original Scale	12.92	SD in Log Scale	2.038
95% t UCL (Assumes normality)	7.133	95% H-Stat UCL	9.504

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

97.5% KM (Chebyshev) UCL	18.49

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.

Copper

General Statistics

Total Number of Observations	27	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	1.8	Mean	7.837
Maximum	150	Median	2.2
SD	28.42	Std. Error of Mean	5.47
Coefficient of Variation	3.627	Skewness	5.19

Normal GOF Test

Shapiro Wilk Test Statistic	0.212	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.495	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.171	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	17.17	95% Adjusted-CLT UCL (Chen-1995)	22.67
		95% Modified-t UCL (Johnson-1978)	18.08

Gamma GOF Test

A-D Test Statistic	8.631	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.8	Data Not Gamma Distributed at 5% Significance Level	

K-S Test Statistic	0.5	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.177	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.579	k star (bias corrected MLE)	0.539
Theta hat (MLE)	13.53	Theta star (bias corrected MLE)	14.53
nu hat (MLE)	31.27	nu star (bias corrected)	29.13
MLE Mean (bias corrected)	7.837	MLE Sd (bias corrected)	10.67
		Approximate Chi Square Value (0.05)	17.81
Adjusted Level of Significance	0.0401	Adjusted Chi Square Value	17.25

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	12.82	95% Adjusted Gamma UCL (use when n<50)	13.24

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.387	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.389	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.171	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.588	Mean of logged Data	0.986
Maximum of Logged Data	5.011	SD of logged Data	0.835

Assuming Lognormal Distribution

95% H-UCL	5.552	90% Chebyshev (MVUE) UCL	5.728
95% Chebyshev (MVUE) UCL	6.63	97.5% Chebyshev (MVUE) UCL	7.882
99% Chebyshev (MVUE) UCL	10.34		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	16.83	95% Jackknife UCL	17.17
95% Standard Bootstrap UCL	16.75	95% Bootstrap-t UCL	575.6
95% Hall's Bootstrap UCL	191.6	95% Percentile Bootstrap UCL	18.74
95% BCA Bootstrap UCL	24.23		
90% Chebyshev(Mean, Sd) UCL	24.25	95% Chebyshev(Mean, Sd) UCL	31.68
97.5% Chebyshev(Mean, Sd) UCL	42	99% Chebyshev(Mean, Sd) UCL	62.26

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	31.68

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cyanide

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

General Statistics

Total Number of Observations	27	Number of Distinct Observations	3
Number of Detects	2	Number of Non-Detects	25
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	3.2	Minimum Non-Detect	10
Maximum Detect	3.5	Maximum Non-Detect	10
Variance Detects	0.045	Percent Non-Detects	92.59%
Mean Detects	3.35	SD Detects	0.212
Median Detects	3.35	CV Detects	0.0633
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	1.208	SD of Logged Detects	0.0634

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	3.35	Standard Error of Mean	0.15
SD	0.15	95% KM (BCA) UCL	N/A
95% KM (t) UCL	3.606	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	3.597	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	3.8	95% KM Chebyshev UCL	4.004
97.5% KM Chebyshev UCL	4.287	99% KM Chebyshev UCL	4.842

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	498.4	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00672	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	1994	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	498.8	nu hat (KM)	26934
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (N/A, α)	26553	Adjusted Chi Square Value (N/A, β)	26529
95% Gamma Approximate KM-UCL (use when n>=50)	3.398	95% Gamma Adjusted KM-UCL (use when n<50)	3.401

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.36	Mean in Log Scale	1.208
SD in Original Scale	0.307	SD in Log Scale	0.0914
95% t UCL (assumes normality of ROS data)	3.461	95% Percentile Bootstrap UCL	3.461
95% BCA Bootstrap UCL	3.458	95% Bootstrap t UCL	3.463

95% H-UCL (Log ROS) N/A

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.878	Mean in Log Scale	1.58
SD in Original Scale	0.442	SD in Log Scale	0.108
95% t UCL (Assumes normality)	5.023	95% H-Stat UCL	5.062

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

95% KM (t) UCL	3.606	95% KM (% Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Warning: Recommended UCL exceeds the maximum observation

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

General Statistics

Total Number of Observations	19	Number of Distinct Observations	19
		Number of Missing Observations	8
Minimum	176	Mean	12600
Maximum	220000	Median	557
SD	50272	Std. Error of Mean	11533
Coefficient of Variation	3.99	Skewness	4.345

Normal GOF Test

Shapiro Wilk Test Statistic	0.262	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.487	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	32599	95% Adjusted-CLT UCL (Chen-1995)	43855
		95% Modified-t UCL (Johnson-1978)	34515

Gamma GOF Test

A-D Test Statistic	5.247	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.863	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.501	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.217	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.259	k star (bias corrected MLE)	0.253
Theta hat (MLE)	48726	Theta star (bias corrected MLE)	49832
nu hat (MLE)	9.826	nu star (bias corrected)	9.608
MLE Mean (bias corrected)	12600	MLE Sd (bias corrected)	25057
		Approximate Chi Square Value (0.05)	3.698
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	3.383

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	32734	95% Adjusted Gamma UCL (use when n<50)	35780

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.602	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.366	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.17	Mean of logged Data	6.709
Maximum of Logged Data	12.3	SD of logged Data	1.565

Assuming Lognormal Distribution

95% H-UCL	10145	90% Chebyshev (MVUE) UCL	5638
95% Chebyshev (MVUE) UCL	7074	97.5% Chebyshev (MVUE) UCL	9068
99% Chebyshev (MVUE) UCL	12984		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	31570	95% Jackknife UCL	32599
95% Standard Bootstrap UCL	30785	95% Bootstrap-t UCL	3305422
95% Hall's Bootstrap UCL	627395	95% Percentile Bootstrap UCL	35664
95% BCA Bootstrap UCL	47787		
90% Chebyshev(Mean, Sd) UCL	47199	95% Chebyshev(Mean, Sd) UCL	62872
97.5% Chebyshev(Mean, Sd) UCL	84625	99% Chebyshev(Mean, Sd) UCL	127354

Suggested UCL to Use

99% Chebyshev (Mean, Sd) UCL 127354

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

Total Number of Observations	27	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	1.3	Mean	27.41
Maximum	654	Median	2.4
SD	125.3	Std. Error of Mean	24.11
Coefficient of Variation	4.57	Skewness	5.192

Normal GOF Test

Shapiro Wilk Test Statistic	0.211	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.501	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	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	68.53	95% Adjusted-CLT UCL (Chen-1995)	92.8
		95% Modified-t UCL (Johnson-1978)	72.54

Gamma GOF Test

A-D Test Statistic	7.376	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.848	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.433	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.322	k star (bias corrected MLE)	0.311
Theta hat (MLE)	85.23	Theta star (bias corrected MLE)	88.26
nu hat (MLE)	17.37	nu star (bias corrected)	16.77
MLE Mean (bias corrected)	27.41	MLE Sd (bias corrected)	49.19
		Approximate Chi Square Value (0.05)	8.508
Adjusted Level of Significance	0.0401	Adjusted Chi Square Value	8.132

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	54.03	95% Adjusted Gamma UCL (use when n<50)	56.52

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.608	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.245	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.171	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.262	Mean of logged Data	1.191
Maximum of Logged Data	6.483	SD of logged Data	1.206

Assuming Lognormal Distribution

95% H-UCL	13.2	90% Chebyshev (MVUE) UCL	11.9
95% Chebyshev (MVUE) UCL	14.34	97.5% Chebyshev (MVUE) UCL	17.73

99% Chebyshev (MVUE) UCL	24.38

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	67.06	95% Jackknife UCL	68.53
95% Standard Bootstrap UCL	66.5	95% Bootstrap-t UCL	2150
95% Hall's Bootstrap UCL	991.4	95% Percentile Bootstrap UCL	75.51
95% BCA Bootstrap UCL	100.6		
90% Chebyshev(Mean, Sd) UCL	99.73	95% Chebyshev(Mean, Sd) UCL	132.5
97.5% Chebyshev(Mean, Sd) UCL	178	99% Chebyshev(Mean, Sd) UCL	267.3

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	132.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	27	Number of Distinct Observations	27
		Number of Missing Observations	0
Minimum	34.2	Mean	109.9
Maximum	1270	Median	56.9
SD	233.7	Std. Error of Mean	44.97
Coefficient of Variation	2.126	Skewness	5.069

Normal GOF Test

Shapiro Wilk Test Statistic	0.294	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.409	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	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	186.6	95% Adjusted-CLT UCL (Chen-1995)	230.8
		95% Modified-t UCL (Johnson-1978)	193.9

Gamma GOF Test

A-D Test Statistic	4.035	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.77	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.276	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.173	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.15	k star (bias corrected MLE)	1.047
Theta hat (MLE)	95.57	Theta star (bias corrected MLE)	105
nu hat (MLE)	62.11	nu star (bias corrected)	56.54
MLE Mean (bias corrected)	109.9	MLE Sd (bias corrected)	107.4
		Approximate Chi Square Value (0.05)	40.26
Adjusted Level of Significance	0.0401	Adjusted Chi Square Value	39.38

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	154.4	95% Adjusted Gamma UCL (use when n<50)	157.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.726	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.176	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.171	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.532	Mean of logged Data	4.206
Maximum of Logged Data	7.147	SD of logged Data	0.713

Assuming Lognormal Distribution

95% H-UCL	117.3	90% Chebyshev (MVUE) UCL	123.6
95% Chebyshev (MVUE) UCL	140.8	97.5% Chebyshev (MVUE) UCL	164.8
99% Chebyshev (MVUE) UCL	211.8		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	183.9	95% Jackknife UCL	186.6
95% Standard Bootstrap UCL	182.5	95% Bootstrap-t UCL	591.9
95% Hall's Bootstrap UCL	472.8	95% Percentile Bootstrap UCL	198.1
95% BCA Bootstrap UCL	245.6		
90% Chebyshev(Mean, Sd) UCL	244.8	95% Chebyshev(Mean, Sd) UCL	305.9
97.5% Chebyshev(Mean, Sd) UCL	390.7	99% Chebyshev(Mean, Sd) UCL	557.3

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	305.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	27	Number of Distinct Observations	3
Number of Detects	2	Number of Non-Detects	25

Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	0.61	Minimum Non-Detect	0.2
Maximum Detect	0.68	Maximum Non-Detect	0.2
Variance Detects	0.00245	Percent Non-Detects	92.59%
Mean Detects	0.645	SD Detects	0.0495
Median Detects	0.645	CV Detects	0.0767
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.44	SD of Logged Detects	0.0768

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Mean	0.233	Standard Error of Mean	0.0318
SD	0.117	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.287	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.285	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.328	95% KM Chebyshev UCL	0.372
97.5% KM Chebyshev UCL	0.432	99% KM Chebyshev UCL	0.55

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	339.3	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0019	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	1357	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.969	nu hat (KM)	214.3
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (214.34, α)	181.5	Adjusted Chi Square Value (214.34, β)	179.5
95% Gamma Approximate KM-UCL (use when n>=50)	0.275	95% Gamma Adjusted KM-UCL (use when n<50)	0.278

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.364	Mean in Log Scale	-1.062
SD in Original Scale	0.121	SD in Log Scale	0.323
95% t UCL (assumes normality of ROS data)	0.403	95% Percentile Bootstrap UCL	0.403
95% BCA Bootstrap UCL	0.407	95% Bootstrap t UCL	0.411
95% H-UCL (Log ROS)	0.409		

DL/2 Statistics

DL/2 Normal **DL/2 Log-Transformed**

Mean in Original Scale	0.14	Mean in Log Scale	-2.165
SD in Original Scale	0.146	SD in Log Scale	0.497
95% t UCL (Assumes normality)	0.188	95% H-Stat UCL	0.157

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

95% KM (t) UCL	0.287	95% KM (% Bootstrap) UCL	N/A

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.

Nickel

General Statistics

Total Number of Observations	19	Number of Distinct Observations	14
		Number of Missing Observations	8
Minimum	1.3	Mean	14.51
Maximum	229	Median	1.7
SD	52.01	Std. Error of Mean	11.93
Coefficient of Variation	3.586	Skewness	4.341

Normal GOF Test

Shapiro Wilk Test Statistic	0.271	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.473	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.203	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	35.2	95% Adjusted-CLT UCL (Chen-1995)	46.83
		95% Modified-t UCL (Johnson-1978)	37.18

Gamma GOF Test

A-D Test Statistic	5.022	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.825	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.424	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.213	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.389	k star (bias corrected MLE)	0.362
Theta hat (MLE)	37.31	Theta star (bias corrected MLE)	40.02
nu hat (MLE)	14.77	nu star (bias corrected)	13.77

MLE Mean (bias corrected)	14.51	MLE Sd (bias corrected)	24.09
		Approximate Chi Square Value (0.05)	6.416
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	5.981

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	31.14	95% Adjusted Gamma UCL (use when n<50)	33.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.572	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.298	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.262	Mean of logged Data	0.974
Maximum of Logged Data	5.434	SD of logged Data	1.213

Assuming Lognormal Distribution

95% H-UCL	12.75	90% Chebyshev (MVUE) UCL	10.18
95% Chebyshev (MVUE) UCL	12.43	97.5% Chebyshev (MVUE) UCL	15.56
99% Chebyshev (MVUE) UCL	21.72		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	34.13	95% Jackknife UCL	35.2
95% Standard Bootstrap UCL	33.02	95% Bootstrap-t UCL	847.1
95% Hall's Bootstrap UCL	462.6	95% Percentile Bootstrap UCL	38.08
95% BCA Bootstrap UCL	50.55		
90% Chebyshev(Mean, Sd) UCL	50.3	95% Chebyshev(Mean, Sd) UCL	66.51
97.5% Chebyshev(Mean, Sd) UCL	89.02	99% Chebyshev(Mean, Sd) UCL	133.2

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	66.51

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Vanadium

General Statistics

Total Number of Observations	27	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	24
Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	1.6	Minimum Non-Detect	0.028
Maximum Detect	155	Maximum Non-Detect	1.2
Variance Detects	7738	Percent Non-Detects	88.89%

Mean Detects	53.43	SD Detects	87.97
Median Detects	3.7	CV Detects	1.646
Skewness Detects	1.731	Kurtosis Detects	N/A
Mean of Logged Detects	2.274	SD of Logged Detects	2.435

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.76	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.381	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	5.962	Standard Error of Mean	6.892
SD	29.24	95% KM (BCA) UCL	N/A
95% KM (t) UCL	17.72	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	17.3	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	26.64	95% KM Chebyshev UCL	36
97.5% KM Chebyshev UCL	49	99% KM Chebyshev UCL	74.53

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	0.388	k star (bias corrected MLE)	N/A
Theta hat (MLE)	137.7	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	2.328	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0416	nu hat (KM)	2.245
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (2.25, α)	0.189	Adjusted Chi Square Value (2.25, β)	0.166
95% Gamma Approximate KM-UCL (use when n>=50)	70.76	95% Gamma Adjusted KM-UCL (use when n<50)	80.42

Gamma (KM) may not be used when k hat (KM) is < 0.1

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.882	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.321	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5.939	Mean in Log Scale	-12.03
SD in Original Scale	29.8	SD in Log Scale	7.997
95% t UCL (assumes normality of ROS data)	15.72	95% Percentile Bootstrap UCL	17.36

95% BCA Bootstrap UCL	23.28	95% Bootstrap t UCL	575.7
95% H-UCL (Log ROS)	5.047E+18		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.926	95% H-UCL (KM -Log)	1.652
KM SD (logged)	1.954	95% Critical H Value (KM-Log)	3.962
KM Standard Error of Mean (logged)	0.461		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.036	Mean in Log Scale	-2.985
SD in Original Scale	29.78	SD in Log Scale	2.42
95% t UCL (Assumes normality)	15.81	95% H-Stat UCL	8.976

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	17.72	95% KM (Percentile Bootstrap) UCL	N/A

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.

Zinc

General Statistics

Total Number of Observations	27	Number of Distinct Observations	25
		Number of Missing Observations	0
Minimum	7	Mean	94.05
Maximum	2210	Median	10.4
SD	423	Std. Error of Mean	81.41
Coefficient of Variation	4.498	Skewness	5.19

Normal GOF Test

Shapiro Wilk Test Statistic	0.21	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.499	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.171	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	232.9	95% Adjusted-CLT UCL (Chen-1995)	314.8
		95% Modified-t UCL (Johnson-1978)	246.5

Gamma GOF Test

Appendix C-9
ProUCL Output - Current/Future Surface Water
Matteo Sons, Inc. Site
Thorofare, New Jersey

A-D Test Statistic	8.595	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.843	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.506	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.344	k star (bias corrected MLE)	0.331
Theta hat (MLE)	273.3	Theta star (bias corrected MLE)	284.5
nu hat (MLE)	18.58	nu star (bias corrected)	17.85
MLE Mean (bias corrected)	94.05	MLE Sd (bias corrected)	163.6
		Approximate Chi Square Value (0.05)	9.282
Adjusted Level of Significance	0.0401	Adjusted Chi Square Value	8.887

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	180.9	95% Adjusted Gamma UCL (use when n<50)	188.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.452	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.35	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.171	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.946	Mean of logged Data	2.584
Maximum of Logged Data	7.701	SD of logged Data	1.109

Assuming Lognormal Distribution

95% H-UCL	43.77	90% Chebyshev (MVUE) UCL	41.34
95% Chebyshev (MVUE) UCL	49.35	97.5% Chebyshev (MVUE) UCL	60.46
99% Chebyshev (MVUE) UCL	82.28		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	228	95% Jackknife UCL	232.9
95% Standard Bootstrap UCL	224.8	95% Bootstrap-t UCL	16080
95% Hall's Bootstrap UCL	4688	95% Percentile Bootstrap UCL	256.4
95% BCA Bootstrap UCL	419.7		
90% Chebyshev(Mean, Sd) UCL	338.3	95% Chebyshev(Mean, Sd) UCL	448.9
97.5% Chebyshev(Mean, Sd) UCL	602.5	99% Chebyshev(Mean, Sd) UCL	904.1

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	448.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-10
ProUCL Output - Current/Future Sediment
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 10:44:31 PM
From File	ProUCL_Input_Sed.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aroclor 1248

General Statistics

Total Number of Observations	46	Number of Distinct Observations	33
Number of Detects	13	Number of Non-Detects	33
Number of Distinct Detects	11	Number of Distinct Non-Detects	22
Minimum Detect	10	Minimum Non-Detect	1.8
Maximum Detect	340	Maximum Non-Detect	7
Variance Detects	7681	Percent Non-Detects	71.74%
Mean Detects	87.38	SD Detects	87.64
Median Detects	56	CV Detects	1.003
Skewness Detects	2.181	Kurtosis Detects	5.842
Mean of Logged Detects	4.048	SD of Logged Detects	1.003

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.762	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	25.99	Standard Error of Mean	9.064
SD	59.07	95% KM (BCA) UCL	41.73
95% KM (t) UCL	41.21	95% KM (Percentile Bootstrap) UCL	41.49
95% KM (z) UCL	40.9	95% KM Bootstrap t UCL	51.65
90% KM Chebyshev UCL	53.18	95% KM Chebyshev UCL	65.5
97.5% KM Chebyshev UCL	82.59	99% KM Chebyshev UCL	116.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.253	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.143	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.242	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)	1.325	k star (bias corrected MLE)	1.071
Theta hat (MLE)	65.93	Theta star (bias corrected MLE)	81.61
nu hat (MLE)	34.46	nu star (bias corrected)	27.84
MLE Mean (bias corrected)	87.38	MLE Sd (bias corrected)	84.45

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.194	nu hat (KM)	17.81
Approximate Chi Square Value (17.81, α)	9.253	Adjusted Chi Square Value (17.81, β)	9.053
95% Gamma Approximate KM-UCL (use when n>=50)	50.02	95% Gamma Adjusted KM-UCL (use when n<50)	51.12

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	24.7
Maximum	340	Median	0.01
SD	60.25	CV	2.439
k hat (MLE)	0.144	k star (bias corrected MLE)	0.149
Theta hat (MLE)	171.5	Theta star (bias corrected MLE)	165.6
nu hat (MLE)	13.25	nu star (bias corrected)	13.72
MLE Mean (bias corrected)	24.7	MLE Sd (bias corrected)	63.96
		Adjusted Level of Significance (β)	0.0448
Approximate Chi Square Value (13.72, α)	6.381	Adjusted Chi Square Value (13.72, β)	6.219
95% Gamma Approximate UCL (use when n>=50)	53.12	95% Gamma Adjusted UCL (use when n<50)	54.51

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.13	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	26.35	Mean in Log Scale	1.617
SD in Original Scale	59.58	SD in Log Scale	1.709
95% t UCL (assumes normality of ROS data)	41.1	95% Percentile Bootstrap UCL	42.17
95% BCA Bootstrap UCL	50.35	95% Bootstrap t UCL	53.6
95% H-UCL (Log ROS)	48.9		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.566	95% H-UCL (KM -Log)	39.14
KM SD (logged)	1.64	95% Critical H Value (KM-Log)	3.095
KM Standard Error of Mean (logged)	0.252		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	26.12	Mean in Log Scale	1.584
SD in Original Scale	59.66	SD in Log Scale	1.682
95% t UCL (Assumes normality)	40.9	95% H-Stat UCL	44.17

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	41.21	95% KM (Percentile Bootstrap) UCL	41.49

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.

Aroclor 1254

General Statistics

Total Number of Observations	46	Number of Distinct Observations	36
Number of Detects	42	Number of Non-Detects	4
Number of Distinct Detects	32	Number of Distinct Non-Detects	4
Minimum Detect	2.1	Minimum Non-Detect	1.8
Maximum Detect	670	Maximum Non-Detect	3.2
Variance Detects	22602	Percent Non-Detects	8.696%
Mean Detects	146.5	SD Detects	150.3
Median Detects	115	CV Detects	1.026
Skewness Detects	1.572	Kurtosis Detects	2.519
Mean of Logged Detects	4.271	SD of Logged Detects	1.49

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.799	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.137	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

Mean	134	Standard Error of Mean	22.04
SD	147.7	95% KM (BCA) UCL	174.2
95% KM (t) UCL	171	95% KM (Percentile Bootstrap) UCL	171.4
95% KM (z) UCL	170.2	95% KM Bootstrap t UCL	179.4
90% KM Chebyshev UCL	200.1	95% KM Chebyshev UCL	230
97.5% KM Chebyshev UCL	271.6	99% KM Chebyshev UCL	353.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.374	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.786	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0818	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.141	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)	0.825	k star (bias corrected MLE)	0.782
Theta hat (MLE)	177.6	Theta star (bias corrected MLE)	187.4
nu hat (MLE)	69.3	nu star (bias corrected)	65.69
MLE Mean (bias corrected)	146.5	MLE Sd (bias corrected)	165.7

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.823	nu hat (KM)	75.71

Approximate Chi Square Value (75.71, α)	56.67	Adjusted Chi Square Value (75.71, β)	56.14
95% Gamma Approximate KM-UCL (use when n>=50)	179	95% Gamma Adjusted KM-UCL (use when n<50)	180.7

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	133.8
Maximum	670	Median	90
SD	149.4	CV	1.117
k hat (MLE)	0.46	k star (bias corrected MLE)	0.445
Theta hat (MLE)	290.5	Theta star (bias corrected MLE)	300.7
nu hat (MLE)	42.36	nu star (bias corrected)	40.93
MLE Mean (bias corrected)	133.8	MLE Sd (bias corrected)	200.6
		Adjusted Level of Significance (β)	0.0448
Approximate Chi Square Value (40.93, α)	27.27	Adjusted Chi Square Value (40.93, β)	26.91
95% Gamma Approximate UCL (use when n>=50)	200.8	95% Gamma Adjusted UCL (use when n<50)	203.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.145	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.137	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	134.1	Mean in Log Scale	4.002
SD in Original Scale	149.2	SD in Log Scale	1.675
95% t UCL (assumes normality of ROS data)	171	95% Percentile Bootstrap UCL	170.8
95% BCA Bootstrap UCL	175.5	95% Bootstrap t UCL	177.1
95% H-UCL (Log ROS)	487.2		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	133.9	Mean in Log Scale	3.915
SD in Original Scale	149.4	SD in Log Scale	1.84
95% t UCL (Assumes normality)	170.9	95% H-Stat UCL	685

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	230	95% GROS Adjusted Gamma UCL	203.5
95% Adjusted Gamma KM-UCL	180.7		

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.

Aroclor 1268

General Statistics

Total Number of Observations	43	Number of Distinct Observations	37
		Number of Missing Observations	3
Number of Detects	22	Number of Non-Detects	21
Number of Distinct Detects	20	Number of Distinct Non-Detects	17
Minimum Detect	4.9	Minimum Non-Detect	1.8
Maximum Detect	150	Maximum Non-Detect	7
Variance Detects	872.7	Percent Non-Detects	48.84%
Mean Detects	33.86	SD Detects	29.54
Median Detects	27.5	CV Detects	0.872
Skewness Detects	3.134	Kurtosis Detects	11.9
Mean of Logged Detects	3.287	SD of Logged Detects	0.684

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.663	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	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

Mean	18.21	Standard Error of Mean	4.078
SD	26.13	95% KM (BCA) UCL	25.9
95% KM (t) UCL	25.07	95% KM (Percentile Bootstrap) UCL	25.65
95% KM (z) UCL	24.92	95% KM Bootstrap t UCL	28.81
90% KM Chebyshev UCL	30.45	95% KM Chebyshev UCL	35.99
97.5% KM Chebyshev UCL	43.68	99% KM Chebyshev UCL	58.79

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.593	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.14	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.188	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)	2.276	k star (bias corrected MLE)	1.996
Theta hat (MLE)	14.87	Theta star (bias corrected MLE)	16.96
nu hat (MLE)	100.2	nu star (bias corrected)	87.84
MLE Mean (bias corrected)	33.86	MLE Sd (bias corrected)	23.96

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.486	nu hat (KM)	41.79
Approximate Chi Square Value (41.79, α)	27.97	Adjusted Chi Square Value (41.79, β)	27.58
95% Gamma Approximate KM-UCL (use when n>=50)	27.21	95% Gamma Adjusted KM-UCL (use when n<50)	27.6

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

Appendix C-10
ProUCL Output - Current/Future Sediment
Matteo Sons, Inc. Site
Thorofare, New Jersey

GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	17.33
Maximum	150	Median	4.9
SD	27.01	CV	1.559
k hat (MLE)	0.213	k star (bias corrected MLE)	0.214
Theta hat (MLE)	81.33	Theta star (bias corrected MLE)	81.08
nu hat (MLE)	18.32	nu star (bias corrected)	18.38
MLE Mean (bias corrected)	17.33	MLE Sd (bias corrected)	37.48
		Adjusted Level of Significance (β)	0.0444
Approximate Chi Square Value (18.38, α)	9.665	Adjusted Chi Square Value (18.38, β)	9.445
95% Gamma Approximate UCL (use when n>=50)	32.95	95% Gamma Adjusted UCL (use when n<50)	33.72

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.108	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	19.74	Mean in Log Scale	2.454
SD in Original Scale	25.51	SD in Log Scale	1
95% t UCL (assumes normality of ROS data)	26.29	95% Percentile Bootstrap UCL	26.78
95% BCA Bootstrap UCL	28.67	95% Bootstrap t UCL	30.84
95% H-UCL (Log ROS)	27.59		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.972	95% H-UCL (KM -Log)	37.66
KM SD (logged)	1.429	95% Critical H Value (KM-Log)	2.88
KM Standard Error of Mean (logged)	0.223		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	18.15	Mean in Log Scale	1.901
SD in Original Scale	26.48	SD in Log Scale	1.541
95% t UCL (Assumes normality)	24.94	95% H-Stat UCL	45.02

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	25.07	95% GROS Adjusted Gamma UCL	33.72
95% Adjusted Gamma KM-UCL	27.6		

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.

Appendix C-10
ProUCL Output - Current/Future Sediment
Matteo Sons, Inc. Site
Thorofare, New Jersey

Aluminum

General Statistics

Total Number of Observations	60	Number of Distinct Observations	50
		Number of Missing Observations	0
Minimum	189	Mean	11673
Maximum	22800	Median	12200
SD	6157	Std. Error of Mean	794.8
Coefficient of Variation	0.527	Skewness	-0.242

Normal GOF Test

Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0153	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.089	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.114	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	13001	95% Adjusted-CLT UCL (Chen-1995)	12954
		95% Modified-t UCL (Johnson-1978)	12997

Gamma GOF Test

A-D Test Statistic	2.805	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.763	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.177	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.116	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.997	k star (bias corrected MLE)	1.908
Theta hat (MLE)	5845	Theta star (bias corrected MLE)	6116
nu hat (MLE)	239.7	nu star (bias corrected)	229
MLE Mean (bias corrected)	11673	MLE Sd (bias corrected)	8449
		Approximate Chi Square Value (0.05)	195
Adjusted Level of Significance	0.046	Adjusted Chi Square Value	194.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	13710	95% Adjusted Gamma UCL (use when n<50)	13764

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.789	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	2.748E-11	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.214	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.114	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.242	Mean of logged Data	9.094
Maximum of Logged Data	10.03	SD of logged Data	0.94

Assuming Lognormal Distribution

95% H-UCL	18305	90% Chebyshev (MVUE) UCL	19525
95% Chebyshev (MVUE) UCL	22160	97.5% Chebyshev (MVUE) UCL	25816
99% Chebyshev (MVUE) UCL	32999		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	12980	95% Jackknife UCL	13001
95% Standard Bootstrap UCL	12974	95% Bootstrap-t UCL	12914
95% Hall's Bootstrap UCL	12976	95% Percentile Bootstrap UCL	12992
95% BCA Bootstrap UCL	12963		
90% Chebyshev(Mean, Sd) UCL	14057	95% Chebyshev(Mean, Sd) UCL	15137
97.5% Chebyshev(Mean, Sd) UCL	16636	99% Chebyshev(Mean, Sd) UCL	19581

Suggested UCL to Use

95% Student's-t UCL 13001

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Antimony

General Statistics

Total Number of Observations	60	Number of Distinct Observations	46
Number of Detects	54	Number of Non-Detects	6
Number of Distinct Detects	40	Number of Distinct Non-Detects	6
Minimum Detect	0.041	Minimum Non-Detect	0.0039
Maximum Detect	10.4	Maximum Non-Detect	0.71
Variance Detects	4.644	Percent Non-Detects	10%
Mean Detects	2.336	SD Detects	2.155
Median Detects	1.8	CV Detects	0.923
Skewness Detects	1.7	Kurtosis Detects	3.847
Mean of Logged Detects	0.297	SD of Logged Detects	1.28

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.849	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	3.7075E-7	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.144	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.121	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

Mean	2.106	Standard Error of Mean	0.279

SD	2.14	95% KM (BCA) UCL	2.603
95% KM (t) UCL	2.572	95% KM (Percentile Bootstrap) UCL	2.555
95% KM (z) UCL	2.564	95% KM Bootstrap t UCL	2.657
90% KM Chebyshev UCL	2.942	95% KM Chebyshev UCL	3.321
97.5% KM Chebyshev UCL	3.847	99% KM Chebyshev UCL	4.881

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.333	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.779	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0923	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.124	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)	1.042	k star (bias corrected MLE)	0.997
Theta hat (MLE)	2.241	Theta star (bias corrected MLE)	2.343
nu hat (MLE)	112.6	nu star (bias corrected)	107.6
MLE Mean (bias corrected)	2.336	MLE Sd (bias corrected)	2.34

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.968	nu hat (KM)	116.2
Approximate Chi Square Value (116.20, α)	92.32	Adjusted Chi Square Value (116.20, β)	91.79
95% Gamma Approximate KM-UCL (use when n>=50)	2.651	95% Gamma Adjusted KM-UCL (use when n<50)	2.666

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.106
Maximum	10.4	Median	1.5
SD	2.158	CV	1.024
k hat (MLE)	0.682	k star (bias corrected MLE)	0.659
Theta hat (MLE)	3.087	Theta star (bias corrected MLE)	3.195
nu hat (MLE)	81.86	nu star (bias corrected)	79.1
MLE Mean (bias corrected)	2.106	MLE Sd (bias corrected)	2.594
		Adjusted Level of Significance (β)	0.046
Approximate Chi Square Value (79.10, α)	59.61	Adjusted Chi Square Value (79.10, β)	59.2
95% Gamma Approximate UCL (use when n>=50)	2.795	95% Gamma Adjusted UCL (use when n<50)	2.814

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.121	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.113	Mean in Log Scale	0.0409
SD in Original Scale	2.15	SD in Log Scale	1.445
95% t UCL (assumes normality of ROS data)	2.577	95% Percentile Bootstrap UCL	2.588
95% BCA Bootstrap UCL	2.656	95% Bootstrap t UCL	2.64
95% H-UCL (Log ROS)	5.333		

Appendix C-10
ProUCL Output - Current/Future Sediment
Matteo Sons, Inc. Site
Thorofare, New Jersey

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	2.108	Mean in Log Scale	-0.222
SD in Original Scale	2.156	SD in Log Scale	2.063
95% t UCL (Assumes normality)	2.573	95% H-Stat UCL	19.68

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	3.321	95% GROS Approximate Gamma UCL	2.795
95% Approximate Gamma KM-UCL	2.651		

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.

Arsenic

General Statistics

Total Number of Observations	60	Number of Distinct Observations	55
		Number of Missing Observations	0
Minimum	0.29	Mean	15.15
Maximum	42	Median	15.15
SD	9.716	Std. Error of Mean	1.254
Coefficient of Variation	0.641	Skewness	0.528

Normal GOF Test

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0748	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.066	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.114	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	17.24	95% Adjusted-CLT UCL (Chen-1995)	17.3
		95% Modified-t UCL (Johnson-1978)	17.26

Gamma GOF Test

A-D Test Statistic	1.118	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.767	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.133	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.117	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.655	k star (bias corrected MLE)	1.584
Theta hat (MLE)	9.15	Theta star (bias corrected MLE)	9.564
nu hat (MLE)	198.6	nu star (bias corrected)	190
MLE Mean (bias corrected)	15.15	MLE Sd (bias corrected)	12.04
		Approximate Chi Square Value (0.05)	159.2
Adjusted Level of Significance	0.046	Adjusted Chi Square Value	158.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	18.09	95% Adjusted Gamma UCL (use when n<50)	18.17

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	6.0278E-7	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.173	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.114	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.238	Mean of logged Data	2.386
Maximum of Logged Data	3.738	SD of logged Data	1.006

Assuming Lognormal Distribution

95% H-UCL	24.58	90% Chebyshev (MVUE) UCL	26.05
95% Chebyshev (MVUE) UCL	29.77	97.5% Chebyshev (MVUE) UCL	34.95
99% Chebyshev (MVUE) UCL	45.11		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	17.21	95% Jackknife UCL	17.24
95% Standard Bootstrap UCL	17.19	95% Bootstrap-t UCL	17.18
95% Hall's Bootstrap UCL	17.37	95% Percentile Bootstrap UCL	17.25
95% BCA Bootstrap UCL	17.2		
90% Chebyshev(Mean, Sd) UCL	18.91	95% Chebyshev(Mean, Sd) UCL	20.61
97.5% Chebyshev(Mean, Sd) UCL	22.98	99% Chebyshev(Mean, Sd) UCL	27.63

Suggested UCL to Use

95% Student's-t UCL 17.24

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cadmium

General Statistics

Total Number of Observations	60	Number of Distinct Observations	43
Number of Detects	59	Number of Non-Detects	1
Number of Distinct Detects	42	Number of Distinct Non-Detects	1

Appendix C-10
ProUCL Output - Current/Future Sediment
Matteo Sons, Inc. Site
Thorofare, New Jersey

Minimum Detect	0.017	Minimum Non-Detect	0.54
Maximum Detect	8.6	Maximum Non-Detect	0.54
Variance Detects	4.978	Percent Non-Detects	1.667%
Mean Detects	2.975	SD Detects	2.231
Median Detects	3	CV Detects	0.75
Skewness Detects	0.342	Kurtosis Detects	-0.681
Mean of Logged Detects	0.473	SD of Logged Detects	1.5

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.929	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0.00236	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.109	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.115	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2.929	Standard Error of Mean	0.289
SD	2.222	95% KM (BCA) UCL	3.388
95% KM (t) UCL	3.413	95% KM (Percentile Bootstrap) UCL	3.359
95% KM (z) UCL	3.405	95% KM Bootstrap t UCL	3.425
90% KM Chebyshev UCL	3.797	95% KM Chebyshev UCL	4.19
97.5% KM Chebyshev UCL	4.736	99% KM Chebyshev UCL	5.808

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.2	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.782	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.186	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.119	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)	0.942	k star (bias corrected MLE)	0.905
Theta hat (MLE)	3.16	Theta star (bias corrected MLE)	3.287
nu hat (MLE)	111.1	nu star (bias corrected)	106.8
MLE Mean (bias corrected)	2.975	MLE Sd (bias corrected)	3.127

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.738	nu hat (KM)	208.6
Approximate Chi Square Value (208.57, α)	176.2	Adjusted Chi Square Value (208.57, β)	175.4
95% Gamma Approximate KM-UCL (use when n>=50)	3.468	95% Gamma Adjusted KM-UCL (use when n<50)	3.483

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.017	Mean	2.943
Maximum	8.6	Median	3
SD	2.227	CV	0.757
k hat (MLE)	0.946	k star (bias corrected MLE)	0.91
Theta hat (MLE)	3.109	Theta star (bias corrected MLE)	3.233

nu hat (MLE)	113.6	nu star (bias corrected)	109.2
MLE Mean (bias corrected)	2.943	MLE Sd (bias corrected)	3.084
		Adjusted Level of Significance (β)	0.046
Approximate Chi Square Value (109.22, α)	86.1	Adjusted Chi Square Value (109.22, β)	85.59
95% Gamma Approximate UCL (use when n>=50)	3.733	95% Gamma Adjusted UCL (use when n<50)	3.755

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.115	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.931	Mean in Log Scale	0.445
SD in Original Scale	2.239	SD in Log Scale	1.503
95% t UCL (assumes normality of ROS data)	3.414	95% Percentile Bootstrap UCL	3.387
95% BCA Bootstrap UCL	3.425	95% Bootstrap t UCL	3.425
95% H-UCL (Log ROS)	9.012		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.93	Mean in Log Scale	0.443
SD in Original Scale	2.24	SD in Log Scale	1.504
95% t UCL (Assumes normality)	3.413	95% H-Stat UCL	9.033

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	3.413	95% KM (Percentile Bootstrap) UCL	3.359

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

General Statistics

Total Number of Observations	60	Number of Distinct Observations	56
		Number of Missing Observations	0
Minimum	1.5	Mean	78.41
Maximum	229	Median	77.6
SD	58.46	Std. Error of Mean	7.548
Coefficient of Variation	0.746	Skewness	0.645

Normal GOF Test

Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.00159	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.0977	**Lilliefors GOF Test**

5% Lilliefors Critical Value	0.114	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	91.02	95% Adjusted-CLT UCL (Chen-1995)	91.49
		95% Modified-t UCL (Johnson-1978)	91.12

Gamma GOF Test

A-D Test Statistic	0.932	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.774	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.142	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.117	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.256	k star (bias corrected MLE)	1.205
Theta hat (MLE)	62.4	Theta star (bias corrected MLE)	65.08
nu hat (MLE)	150.8	nu star (bias corrected)	144.6
MLE Mean (bias corrected)	78.41	MLE Sd (bias corrected)	71.43
		Approximate Chi Square Value (0.05)	117.8
Adjusted Level of Significance	0.046	Adjusted Chi Square Value	117.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	96.24	95% Adjusted Gamma UCL (use when n<50)	96.72

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	7.3439E-6	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.114	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.405	Mean of logged Data	3.914
Maximum of Logged Data	5.434	SD of logged Data	1.161

Assuming Lognormal Distribution

95% H-UCL	146.7	90% Chebyshev (MVUE) UCL	150.2
95% Chebyshev (MVUE) UCL	174.5	97.5% Chebyshev (MVUE) UCL	208.2
99% Chebyshev (MVUE) UCL	274.4		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	90.82	95% Jackknife UCL	91.02
95% Standard Bootstrap UCL	91.07	95% Bootstrap-t UCL	91.92
95% Hall's Bootstrap UCL	92.03	95% Percentile Bootstrap UCL	90.8
95% BCA Bootstrap UCL	91.26		
90% Chebyshev(Mean, Sd) UCL	101	95% Chebyshev(Mean, Sd) UCL	111.3

97.5% Chebyshev(Mean, Sd) UCL	125.5	99% Chebyshev(Mean, Sd) UCL	153.5

Suggested UCL to Use

95% Student's-t UCL 91.02

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	60	Number of Distinct Observations	54
Number of Detects	52	Number of Non-Detects	8
Number of Distinct Detects	46	Number of Distinct Non-Detects	8
Minimum Detect	0.75	Minimum Non-Detect	4.2
Maximum Detect	28	Maximum Non-Detect	13.2
Variance Detects	44.66	Percent Non-Detects	13.33%
Mean Detects	13.14	SD Detects	6.683
Median Detects	13.4	CV Detects	0.509
Skewness Detects	0.0701	Kurtosis Detects	-0.527
Mean of Logged Detects	2.367	SD of Logged Detects	0.785

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.973	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0.455	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0547	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.123	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

Mean	11.88	Standard Error of Mean	0.925
SD	7.029	95% KM (BCA) UCL	13.25
95% KM (t) UCL	13.43	95% KM (Percentile Bootstrap) UCL	13.38
95% KM (z) UCL	13.4	95% KM Bootstrap t UCL	13.48
90% KM Chebyshev UCL	14.66	95% KM Chebyshev UCL	15.91
97.5% KM Chebyshev UCL	17.66	99% KM Chebyshev UCL	21.09

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.274	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.76	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.118	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.124	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.551	k star (bias corrected MLE)	2.417
Theta hat (MLE)	5.151	Theta star (bias corrected MLE)	5.438
nu hat (MLE)	265.3	nu star (bias corrected)	251.3
MLE Mean (bias corrected)	13.14	MLE Sd (bias corrected)	8.453

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.858	nu hat (KM)	342.9
Approximate Chi Square Value (342.92, α)	301	Adjusted Chi Square Value (342.92, β)	300
95% Gamma Approximate KM-UCL (use when n>=50)	13.54	95% Gamma Adjusted KM-UCL (use when n<50)	13.58

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.75	Mean	12.14
Maximum	28	Median	11.35
SD	6.736	CV	0.555
k hat (MLE)	2.462	k star (bias corrected MLE)	2.35
Theta hat (MLE)	4.932	Theta star (bias corrected MLE)	5.167
nu hat (MLE)	295.4	nu star (bias corrected)	281.9
MLE Mean (bias corrected)	12.14	MLE Sd (bias corrected)	7.921
		Adjusted Level of Significance (β)	0.046
Approximate Chi Square Value (281.95, α)	244.1	Adjusted Chi Square Value (281.95, β)	243.2
95% Gamma Approximate UCL (use when n>=50)	14.03	95% Gamma Adjusted UCL (use when n<50)	14.08

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.123	Detected Data Not Lognormal at 5% Significance Level	

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	11.94	Mean in Log Scale	2.237
SD in Original Scale	6.947	SD in Log Scale	0.806
95% t UCL (assumes normality of ROS data)	13.44	95% Percentile Bootstrap UCL	13.32
95% BCA Bootstrap UCL	13.53	95% Bootstrap t UCL	13.45
95% H-UCL (Log ROS)	16.23		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	11.9	Mean in Log Scale	2.221
SD in Original Scale	7.006	SD in Log Scale	0.832
95% t UCL (Assumes normality)	13.41	95% H-Stat UCL	16.47

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	13.43	95% KM (Percentile Bootstrap) UCL	13.38

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.

Cyanide

General Statistics

Total Number of Observations	60	Number of Distinct Observations	36
Number of Detects	16	Number of Non-Detects	44
Number of Distinct Detects	14	Number of Distinct Non-Detects	22
Minimum Detect	0.07	Minimum Non-Detect	0.56
Maximum Detect	2.6	Maximum Non-Detect	2.3
Variance Detects	0.488	Percent Non-Detects	73.33%
Mean Detects	0.564	SD Detects	0.698
Median Detects	0.26	CV Detects	1.237
Skewness Detects	2.169	Kurtosis Detects	4.584
Mean of Logged Detects	-1.152	SD of Logged Detects	1.105

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.706	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.247	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	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

Mean	0.363	Standard Error of Mean	0.0727
SD	0.417	95% KM (BCA) UCL	0.474
95% KM (t) UCL	0.484	95% KM (Percentile Bootstrap) UCL	0.484
95% KM (z) UCL	0.482	95% KM Bootstrap t UCL	0.513
90% KM Chebyshev UCL	0.581	95% KM Chebyshev UCL	0.679
97.5% KM Chebyshev UCL	0.817	99% KM Chebyshev UCL	1.086

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.538	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.764	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.176	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.221	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)	0.995	k star (bias corrected MLE)	0.85
Theta hat (MLE)	0.567	Theta star (bias corrected MLE)	0.664
nu hat (MLE)	31.85	nu star (bias corrected)	27.21
MLE Mean (bias corrected)	0.564	MLE Sd (bias corrected)	0.612

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.755	nu hat (KM)	90.57
Approximate Chi Square Value (90.57, α)	69.63	Adjusted Chi Square Value (90.57, β)	69.17
95% Gamma Approximate KM-UCL (use when n>=50)	0.472	95% Gamma Adjusted KM-UCL (use when n<50)	0.475

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.327
Maximum	2.6	Median	0.213
SD	0.414	CV	1.268
k hat (MLE)	1.04	k star (bias corrected MLE)	0.999
Theta hat (MLE)	0.314	Theta star (bias corrected MLE)	0.327
nu hat (MLE)	124.8	nu star (bias corrected)	119.9
MLE Mean (bias corrected)	0.327	MLE Sd (bias corrected)	0.327
		Adjusted Level of Significance (β)	0.046
Approximate Chi Square Value (119.90, α)	95.62	Adjusted Chi Square Value (119.90, β)	95.09
95% Gamma Approximate UCL (use when n>=50)	0.41	95% Gamma Adjusted UCL (use when n<50)	0.412

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.328	Mean in Log Scale	-1.431
SD in Original Scale	0.395	SD in Log Scale	0.715
95% t UCL (assumes normality of ROS data)	0.413	95% Percentile Bootstrap UCL	0.421
95% BCA Bootstrap UCL	0.454	95% Bootstrap t UCL	0.499
95% H-UCL (Log ROS)	0.374		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.436	95% H-UCL (KM -Log)	0.457
KM SD (logged)	0.89	95% Critical H Value (KM-Log)	2.221
KM Standard Error of Mean (logged)	0.215		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.608	Mean in Log Scale	-0.702
SD in Original Scale	0.401	SD in Log Scale	0.699
95% t UCL (Assumes normality)	0.695	95% H-Stat UCL	0.763

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.484	95% GROS Approximate Gamma UCL	0.41
95% Approximate Gamma KM-UCL	0.472		

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

General Statistics

Total Number of Observations	60	Number of Distinct Observations	55
		Number of Missing Observations	0
Minimum	621	Mean	23452
Maximum	44100	Median	24300
SD	11230	Std. Error of Mean	1450
Coefficient of Variation	0.479	Skewness	-0.464

Normal GOF Test

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.00476	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.0997	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.114	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	25875	95% Adjusted-CLT UCL (Chen-1995)	25744
		95% Modified-t UCL (Johnson-1978)	25860

Gamma GOF Test

A-D Test Statistic	3.333	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.116	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.402	k star (bias corrected MLE)	2.293
Theta hat (MLE)	9763	Theta star (bias corrected MLE)	10227
nu hat (MLE)	288.3	nu star (bias corrected)	275.2
MLE Mean (bias corrected)	23452	MLE Sd (bias corrected)	15487
		Approximate Chi Square Value (0.05)	237.8
Adjusted Level of Significance	0.046	Adjusted Chi Square Value	236.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	27143	95% Adjusted Gamma UCL (use when n<50)	27240

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.774	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	4.283E-12	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.228	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.114	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	6.431	Mean of logged Data	9.84
Maximum of Logged Data	10.69	SD of logged Data	0.841

Assuming Lognormal Distribution

95% H-UCL	33926	90% Chebyshev (MVUE) UCL	36353
95% Chebyshev (MVUE) UCL	40800	97.5% Chebyshev (MVUE) UCL	46973
99% Chebyshev (MVUE) UCL	59099		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	25837	95% Jackknife UCL	25875
95% Standard Bootstrap UCL	25846	95% Bootstrap-t UCL	25732
95% Hall's Bootstrap UCL	25833	95% Percentile Bootstrap UCL	25823
95% BCA Bootstrap UCL	25837		
90% Chebyshev(Mean, Sd) UCL	27801	95% Chebyshev(Mean, Sd) UCL	29771
97.5% Chebyshev(Mean, Sd) UCL	32506	99% Chebyshev(Mean, Sd) UCL	37877

Suggested UCL to Use

95% Student's-t UCL 25875

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Lead

General Statistics

Total Number of Observations	60	Number of Distinct Observations	58
		Number of Missing Observations	0
Minimum	2.4	Mean	280.1
Maximum	6430	Median	146.5
SD	843.1	Std. Error of Mean	108.8
Coefficient of Variation	3.01	Skewness	6.886

Normal GOF Test

Shapiro Wilk Test Statistic	0.28	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.419	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.114	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	462	95% Adjusted-CLT UCL (Chen-1995)	562.5
		95% Modified-t UCL (Johnson-1978)	478.1

Appendix C-10
ProUCL Output - Current/Future Sediment
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma GOF Test

A-D Test Statistic	2.966	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.811	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.232	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.121	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.552	k star (bias corrected MLE)	0.535
Theta hat (MLE)	507.4	Theta star (bias corrected MLE)	523.1
nu hat (MLE)	66.23	nu star (bias corrected)	64.25
MLE Mean (bias corrected)	280.1	MLE Sd (bias corrected)	382.8
		Approximate Chi Square Value (0.05)	46.81
Adjusted Level of Significance	0.046	Adjusted Chi Square Value	46.45

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	384.4	95% Adjusted Gamma UCL (use when n<50)	387.5

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	2.1792E-4	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.173	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.114	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.875	Mean of logged Data	4.502
Maximum of Logged Data	8.769	SD of logged Data	1.559

Assuming Lognormal Distribution

95% H-UCL	590.8	90% Chebyshev (MVUE) UCL	531.7
95% Chebyshev (MVUE) UCL	640.5	97.5% Chebyshev (MVUE) UCL	791.6
99% Chebyshev (MVUE) UCL	1088		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	459.1	95% Jackknife UCL	462
95% Standard Bootstrap UCL	457	95% Bootstrap-t UCL	1216
95% Hall's Bootstrap UCL	1141	95% Percentile Bootstrap UCL	480.9
95% BCA Bootstrap UCL	655.9		
90% Chebyshev(Mean, Sd) UCL	606.6	95% Chebyshev(Mean, Sd) UCL	754.5
97.5% Chebyshev(Mean, Sd) UCL	959.8	99% Chebyshev(Mean, Sd) UCL	1363

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	754.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

Appendix C-10
ProUCL Output - Current/Future Sediment
Matteo Sons, Inc. Site
Thorofare, New Jersey

For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	60	Number of Distinct Observations	59
		Number of Missing Observations	0
Minimum	11.8	Mean	319.4
Maximum	1080	Median	320
SD	203.4	Std. Error of Mean	26.26
Coefficient of Variation	0.637	Skewness	0.721

Normal GOF Test

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0156	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.0815	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.114	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	363.2	95% Adjusted-CLT UCL (Chen-1995)	365.2
		95% Modified-t UCL (Johnson-1978)	363.6

Gamma GOF Test

A-D Test Statistic	2.393	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.182	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.117	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.534	k star (bias corrected MLE)	1.469
Theta hat (MLE)	208.2	Theta star (bias corrected MLE)	217.5
nu hat (MLE)	184.1	nu star (bias corrected)	176.2
MLE Mean (bias corrected)	319.4	MLE Sd (bias corrected)	263.5
		Approximate Chi Square Value (0.05)	146.5
Adjusted Level of Significance	0.046	Adjusted Chi Square Value	145.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	384.1	95% Adjusted Gamma UCL (use when n<50)	385.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	4.823E-10	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.24	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.114	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.468	Mean of logged Data	5.406
Maximum of Logged Data	6.985	SD of logged Data	1.077

Assuming Lognormal Distribution

95% H-UCL	563.7	90% Chebyshev (MVUE) UCL	589.8
95% Chebyshev (MVUE) UCL	679.4	97.5% Chebyshev (MVUE) UCL	803.6
99% Chebyshev (MVUE) UCL	1048		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	362.5	95% Jackknife UCL	363.2
95% Standard Bootstrap UCL	360.9	95% Bootstrap-t UCL	365
95% Hall's Bootstrap UCL	367.7	95% Percentile Bootstrap UCL	362.7
95% BCA Bootstrap UCL	363		
90% Chebyshev(Mean, Sd) UCL	398.1	95% Chebyshev(Mean, Sd) UCL	433.8
97.5% Chebyshev(Mean, Sd) UCL	483.3	99% Chebyshev(Mean, Sd) UCL	580.6

Suggested UCL to Use

95% Student's-t UCL 363.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Thallium

General Statistics

Total Number of Observations	60	Number of Distinct Observations	34
Number of Detects	53	Number of Non-Detects	7
Number of Distinct Detects	28	Number of Distinct Non-Detects	6
Minimum Detect	0.019	Minimum Non-Detect	0.0021
Maximum Detect	0.36	Maximum Non-Detect	0.004
Variance Detects	0.00671	Percent Non-Detects	11.67%
Mean Detects	0.186	SD Detects	0.0819
Median Detects	0.19	CV Detects	0.441
Skewness Detects	-0.22	Kurtosis Detects	-0.477
Mean of Logged Detects	-1.834	SD of Logged Detects	0.649

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.969	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0.334	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0859	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	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

Mean	0.164	Standard Error of Mean	0.0126
SD	0.0964	95% KM (BCA) UCL	0.184

95% KM (t) UCL	0.185	95% KM (Percentile Bootstrap) UCL	0.184
95% KM (z) UCL	0.185	95% KM Bootstrap t UCL	0.185
90% KM Chebyshev UCL	0.202	95% KM Chebyshev UCL	0.219
97.5% KM Chebyshev UCL	0.243	99% KM Chebyshev UCL	0.29

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.637	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.756	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.153	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.123	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)	3.461	k star (bias corrected MLE)	3.278
Theta hat (MLE)	0.0537	Theta star (bias corrected MLE)	0.0567
nu hat (MLE)	366.9	nu star (bias corrected)	347.4
MLE Mean (bias corrected)	0.186	MLE Sd (bias corrected)	0.103

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.908	nu hat (KM)	349
Approximate Chi Square Value (349.01, α)	306.7	Adjusted Chi Square Value (349.01, β)	305.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.187	95% Gamma Adjusted KM-UCL (use when n<50)	0.188

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.019	Mean	0.171
Maximum	0.36	Median	0.185
SD	0.0869	CV	0.507
k hat (MLE)	2.904	k star (bias corrected MLE)	2.77
Theta hat (MLE)	0.059	Theta star (bias corrected MLE)	0.0619
nu hat (MLE)	348.4	nu star (bias corrected)	332.3
MLE Mean (bias corrected)	0.171	MLE Sd (bias corrected)	0.103
		Adjusted Level of Significance (β)	0.046
Approximate Chi Square Value (332.35, α)	291.1	Adjusted Chi Square Value (332.35, β)	290.2
95% Gamma Approximate UCL (use when n>=50)	0.196	95% Gamma Adjusted UCL (use when n<50)	0.196

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.122	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.17	Mean in Log Scale	-1.98
SD in Original Scale	0.0893	SD in Log Scale	0.732
95% t UCL (assumes normality of ROS data)	0.189	95% Percentile Bootstrap UCL	0.188
95% BCA Bootstrap UCL	0.188	95% Bootstrap t UCL	0.189
95% H-UCL (Log ROS)	0.22		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.164	Mean in Log Scale	-2.392
SD in Original Scale	0.0974	SD in Log Scale	1.667
95% t UCL (Assumes normality)	0.185	95% H-Stat UCL	0.77

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.185	95% KM (Percentile Bootstrap) UCL	0.184

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

General Statistics

Total Number of Observations	60	Number of Distinct Observations	59
Number of Detects	59	Number of Non-Detects	1
Number of Distinct Detects	58	Number of Distinct Non-Detects	1
Minimum Detect	6.3	Minimum Non-Detect	4.2
Maximum Detect	212	Maximum Non-Detect	4.2
Variance Detects	2225	Percent Non-Detects	1.667%
Mean Detects	64.63	SD Detects	47.17
Median Detects	57.3	CV Detects	0.73
Skewness Detects	1.139	Kurtosis Detects	1.176
Mean of Logged Detects	3.866	SD of Logged Detects	0.857

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.9	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	5.1089E-5	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.115	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

Mean	63.63	Standard Error of Mean	6.122
SD	47.02	95% KM (BCA) UCL	74.16
95% KM (t) UCL	73.86	95% KM (Percentile Bootstrap) UCL	73.82
95% KM (z) UCL	73.69	95% KM Bootstrap t UCL	74.95
90% KM Chebyshev UCL	81.99	95% KM Chebyshev UCL	90.31
97.5% KM Chebyshev UCL	101.9	99% KM Chebyshev UCL	124.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.219	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.765	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0574	**Kolmogrov-Smirnoff GOF**	

5% K-S Critical Value	0.117	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)	1.802	k star (bias corrected MLE)	1.721
Theta hat (MLE)	35.88	Theta star (bias corrected MLE)	37.55
nu hat (MLE)	212.6	nu star (bias corrected)	203.1
MLE Mean (bias corrected)	64.63	MLE Sd (bias corrected)	49.26

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.831	nu hat (KM)	219.7
Approximate Chi Square Value (219.74, α)	186.4	Adjusted Chi Square Value (219.74, β)	185.7
95% Gamma Approximate KM-UCL (use when n>=50)	74.99	95% Gamma Adjusted KM-UCL (use when n<50)	75.3

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	63.56
Maximum	212	Median	55.65
SD	47.51	CV	0.747
k hat (MLE)	1.313	k star (bias corrected MLE)	1.258
Theta hat (MLE)	48.41	Theta star (bias corrected MLE)	50.51
nu hat (MLE)	157.5	nu star (bias corrected)	151
MLE Mean (bias corrected)	63.56	MLE Sd (bias corrected)	56.66
		Adjusted Level of Significance (β)	0.046
Approximate Chi Square Value (151.00, α)	123.6	Adjusted Chi Square Value (151.00, β)	123
95% Gamma Approximate UCL (use when n>=50)	77.65	95% Gamma Adjusted UCL (use when n<50)	78.03

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.105	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.115	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	63.64	Mean in Log Scale	3.829
SD in Original Scale	47.39	SD in Log Scale	0.897
95% t UCL (assumes normality of ROS data)	73.87	95% Percentile Bootstrap UCL	73.93
95% BCA Bootstrap UCL	73.8	95% Bootstrap t UCL	75.46
95% H-UCL (Log ROS)	89.24		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.826	95% H-UCL (KM -Log)	89.07
KM SD (logged)	0.898	95% Critical H Value (KM-Log)	2.229
KM Standard Error of Mean (logged)	0.117		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	63.59	Mean in Log Scale	3.814
SD in Original Scale	47.46	SD in Log Scale	0.94

95% t UCL (Assumes normality)	73.83	95% H-Stat UCL	93.23

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	90.31	95% GROS Approximate Gamma UCL	77.65
95% Approximate Gamma KM-UCL	74.99		

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.

Appendix C-11
ProUCL Output - Current/Future Whole-body Fish
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 11:05:40 PM
From File	ProUCL_Input_Fish.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aroclor 1248

General Statistics

Total Number of Observations	6	Number of Distinct Observations	6
		Number of Missing Observations	0
Minimum	0.035	Mean	0.0793
Maximum	0.11	Median	0.0815
SD	0.0263	Std. Error of Mean	0.0108
Coefficient of Variation	0.332	Skewness	-0.835

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.192	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	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	0.101	95% Adjusted-CLT UCL (Chen-1995)	0.0931
		95% Modified-t UCL (Johnson-1978)	0.1

Gamma GOF Test

A-D Test Statistic	0.403	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.236	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	8.49	k star (bias corrected MLE)	4.356
Theta hat (MLE)	0.00934	Theta star (bias corrected MLE)	0.0182
nu hat (MLE)	101.9	nu star (bias corrected)	52.27
MLE Mean (bias corrected)	0.0793	MLE Sd (bias corrected)	0.038
		Approximate Chi Square Value (0.05)	36.67
Adjusted Level of Significance	0.0122	Adjusted Chi Square Value	32.01

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.113	95% Adjusted Gamma UCL (use when n<50)	0.13

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.858	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.245	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.362	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.352	Mean of logged Data	-2.594
Maximum of Logged Data	-2.207	SD of logged Data	0.408

Assuming Lognormal Distribution

95% H-UCL	0.127	90% Chebyshev (MVUE) UCL	0.12
95% Chebyshev (MVUE) UCL	0.138	97.5% Chebyshev (MVUE) UCL	0.163
99% Chebyshev (MVUE) UCL	0.213		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.097	95% Jackknife UCL	0.101
95% Standard Bootstrap UCL	0.0952	95% Bootstrap-t UCL	0.0974
95% Hall's Bootstrap UCL	0.0943	95% Percentile Bootstrap UCL	0.0948
95% BCA Bootstrap UCL	0.0932		
90% Chebyshev(Mean, Sd) UCL	0.112	95% Chebyshev(Mean, Sd) UCL	0.126
97.5% Chebyshev(Mean, Sd) UCL	0.147	99% Chebyshev(Mean, Sd) UCL	0.186

Suggested UCL to Use

95% Student's-t UCL	0.101

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Aroclor 1254

General Statistics

Total Number of Observations	6	Number of Distinct Observations	6
		Number of Missing Observations	0
Minimum	0.12	Mean	0.208
Maximum	0.28	Median	0.22
SD	0.0671	Std. Error of Mean	0.0274

Coefficient of Variation	0.322	Skewness	-0.373

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.182	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	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	0.263	95% Adjusted-CLT UCL (Chen-1995)	0.249
		95% Modified-t UCL (Johnson-1978)	0.263

Gamma GOF Test

A-D Test Statistic	0.383	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.215	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	10.38	k star (bias corrected MLE)	5.303
Theta hat (MLE)	0.0201	Theta star (bias corrected MLE)	0.0393
nu hat (MLE)	124.6	nu star (bias corrected)	63.64
MLE Mean (bias corrected)	0.208	MLE Sd (bias corrected)	0.0905
		Approximate Chi Square Value (0.05)	46.29
Adjusted Level of Significance	0.0122	Adjusted Chi Square Value	41

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.286	95% Adjusted Gamma UCL (use when n<50)	0.323

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.889	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.788	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.205	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.362	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.12	Mean of logged Data	-1.618
Maximum of Logged Data	-1.273	SD of logged Data	0.353

Assuming Lognormal Distribution

95% H-UCL	0.305	90% Chebyshev (MVUE) UCL	0.299
95% Chebyshev (MVUE) UCL	0.34	97.5% Chebyshev (MVUE) UCL	0.397

99% Chebyshev (MVUE) UCL	0.509

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.253	95% Jackknife UCL	0.263
95% Standard Bootstrap UCL	0.25	95% Bootstrap-t UCL	0.259
95% Hall's Bootstrap UCL	0.24	95% Percentile Bootstrap UCL	0.248
95% BCA Bootstrap UCL	0.247		
90% Chebyshev(Mean, Sd) UCL	0.29	95% Chebyshev(Mean, Sd) UCL	0.328
97.5% Chebyshev(Mean, Sd) UCL	0.379	99% Chebyshev(Mean, Sd) UCL	0.481

Suggested UCL to Use

95% Student's-t UCL	0.263

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Aroclor 1260

General Statistics

Total Number of Observations	6	Number of Distinct Observations	6
		Number of Missing Observations	0
Minimum	0.069	Mean	0.12
Maximum	0.29	Median	0.084
SD	0.0855	Std. Error of Mean	0.0349
Coefficient of Variation	0.713	Skewness	2.201

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.675	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.333	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	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	0.19	95% Adjusted-CLT UCL (Chen-1995)	0.211
		95% Modified-t UCL (Johnson-1978)	0.195

Appendix C-11
ProUCL Output - Current/Future Whole-body Fish
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma GOF Test

A-D Test Statistic	0.779	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.701	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.281	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.334	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.506	k star (bias corrected MLE)	1.864
Theta hat (MLE)	0.0342	Theta star (bias corrected MLE)	0.0643
nu hat (MLE)	42.08	nu star (bias corrected)	22.37
MLE Mean (bias corrected)	0.12	MLE Sd (bias corrected)	0.0878
		Approximate Chi Square Value (0.05)	12.62
Adjusted Level of Significance	0.0122	Adjusted Chi Square Value	10.08

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.212	95% Adjusted Gamma UCL (use when n<50)	0.266

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.788	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.788	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.25	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.362	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.674	Mean of logged Data	-2.271
Maximum of Logged Data	-1.238	SD of logged Data	0.546

Assuming Lognormal Distribution

95% H-UCL	0.234	90% Chebyshev (MVUE) UCL	0.194
95% Chebyshev (MVUE) UCL	0.23	97.5% Chebyshev (MVUE) UCL	0.278
99% Chebyshev (MVUE) UCL	0.375		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.177	95% Jackknife UCL	0.19
95% Standard Bootstrap UCL	0.173	95% Bootstrap-t UCL	0.475
95% Hall's Bootstrap UCL	0.475	95% Percentile Bootstrap UCL	0.181
95% BCA Bootstrap UCL	0.2		
90% Chebyshev(Mean, Sd) UCL	0.225	95% Chebyshev(Mean, Sd) UCL	0.272
97.5% Chebyshev(Mean, Sd) UCL	0.338	99% Chebyshev(Mean, Sd) UCL	0.467

Suggested UCL to Use

95% Student's-t UCL	0.19

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)

and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead

General Statistics

Total Number of Observations	6	Number of Distinct Observations	6
		Number of Missing Observations	0
Minimum	0.17	Mean	0.442
Maximum	0.61	Median	0.495
SD	0.179	Std. Error of Mean	0.0731
Coefficient of Variation	0.405	Skewness	-0.786

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 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	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	0.589	95% Adjusted-CLT UCL (Chen-1995)	0.537
		95% Modified-t UCL (Johnson-1978)	0.585

Gamma GOF Test

A-D Test Statistic	0.494	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.281	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.559	k star (bias corrected MLE)	2.891
Theta hat (MLE)	0.0795	Theta star (bias corrected MLE)	0.153
nu hat (MLE)	66.71	nu star (bias corrected)	34.69
MLE Mean (bias corrected)	0.442	MLE Sd (bias corrected)	0.26
		Approximate Chi Square Value (0.05)	22.21
Adjusted Level of Significance	0.0122	Adjusted Chi Square Value	18.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.69	95% Adjusted Gamma UCL (use when n<50)	0.819

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk Lognormal GOF Test**

Appendix C-11
ProUCL Output - Current/Future Whole-body Fish
Matteo Sons, Inc. Site
Thorofare, New Jersey

5% Shapiro Wilk Critical Value	0.788	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.286	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.362	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.772	Mean of logged Data	-0.91
Maximum of Logged Data	-0.494	SD of logged Data	0.509

Assuming Lognormal Distribution

95% H-UCL	0.84	90% Chebyshev (MVUE) UCL	0.727
95% Chebyshev (MVUE) UCL	0.853	97.5% Chebyshev (MVUE) UCL	1.028
99% Chebyshev (MVUE) UCL	1.373		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.562	95% Jackknife UCL	0.589
95% Standard Bootstrap UCL	0.55	95% Bootstrap-t UCL	0.559
95% Hall's Bootstrap UCL	0.521	95% Percentile Bootstrap UCL	0.553
95% BCA Bootstrap UCL	0.532		
90% Chebyshev(Mean, Sd) UCL	0.661	95% Chebyshev(Mean, Sd) UCL	0.76
97.5% Chebyshev(Mean, Sd) UCL	0.898	99% Chebyshev(Mean, Sd) UCL	1.169

Suggested UCL to Use

95% Student's-t UCL	0.589

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/1/2015 5:30:14 PM
From File	ProUCL_Input_Dioxin.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

SB-101-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.0387	Mean	1.781
Maximum	5.71	Median	1.44
SD	1.683	Std. Error of Mean	0.408
Coefficient of Variation	0.945	Skewness	1.171

Normal GOF Test

Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	2.494	95% Adjusted-CLT UCL (Chen-1995)	2.576
		95% Modified-t UCL (Johnson-1978)	2.513

Gamma GOF Test

A-D Test Statistic	0.178	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.768	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0992	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.961	k star (bias corrected MLE)	0.83
Theta hat (MLE)	1.854	Theta star (bias corrected MLE)	2.145
nu hat (MLE)	32.66	nu star (bias corrected)	28.23
MLE Mean (bias corrected)	1.781	MLE Sd (bias corrected)	1.955
		Approximate Chi Square Value (0.05)	17.11
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	16.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2.939	95% Adjusted Gamma UCL (use when n<50)	3.103

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.172	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.252	Mean of logged Data	-0.0266
Maximum of Logged Data	1.742	SD of logged Data	1.372

Assuming Lognormal Distribution

95% H-UCL	7.644	90% Chebyshev (MVUE) UCL	4.883
95% Chebyshev (MVUE) UCL	6.067	97.5% Chebyshev (MVUE) UCL	7.709
99% Chebyshev (MVUE) UCL	10.94		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.453	95% Jackknife UCL	2.494
95% Standard Bootstrap UCL	2.437	95% Bootstrap-t UCL	2.728
95% Hall's Bootstrap UCL	2.594	95% Percentile Bootstrap UCL	2.481
95% BCA Bootstrap UCL	2.581		
90% Chebyshev(Mean, Sd) UCL	3.006	95% Chebyshev(Mean, Sd) UCL	3.561
97.5% Chebyshev(Mean, Sd) UCL	4.331	99% Chebyshev(Mean, Sd) UCL	5.843

Suggested UCL to Use

95% Student's-t UCL	2.494

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SB-102-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.0867	Mean	2.845
Maximum	12.66	Median	1.96
SD	3.09	Std. Error of Mean	0.749
Coefficient of Variation	1.086	Skewness	2.204

Normal GOF Test

Shapiro Wilk Test Statistic	0.773	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.196	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	4.154	95% Adjusted-CLT UCL (Chen-1995)	4.506
		95% Modified-t UCL (Johnson-1978)	4.22

Gamma GOF Test

A-D Test Statistic	0.117	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.766	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0852	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.014	k star (bias corrected MLE)	0.874
Theta hat (MLE)	2.806	Theta star (bias corrected MLE)	3.255
nu hat (MLE)	34.47	nu star (bias corrected)	29.72
MLE Mean (bias corrected)	2.845	MLE Sd (bias corrected)	3.043
		Approximate Chi Square Value (0.05)	18.27
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	17.33

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	4.627	95% Adjusted Gamma UCL (use when n<50)	4.878

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.132	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.445	Mean of logged Data	0.477
Maximum of Logged Data	2.538	SD of logged Data	1.242

Assuming Lognormal Distribution

95% H-UCL	8.988	90% Chebyshev (MVUE) UCL	6.58
95% Chebyshev (MVUE) UCL	8.091	97.5% Chebyshev (MVUE) UCL	10.19
99% Chebyshev (MVUE) UCL	14.31		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	4.078	95% Jackknife UCL	4.154
95% Standard Bootstrap UCL	4.061	95% Bootstrap-t UCL	5.03
95% Hall's Bootstrap UCL	9.349	95% Percentile Bootstrap UCL	4.191
95% BCA Bootstrap UCL	4.511		
90% Chebyshev(Mean, Sd) UCL	5.094	95% Chebyshev(Mean, Sd) UCL	6.112
97.5% Chebyshev(Mean, Sd) UCL	7.526	99% Chebyshev(Mean, Sd) UCL	10.3

Suggested UCL to Use

95% Student's-t UCL 4.154

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SB-103-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	15	Number of Non-Detects	2
Number of Distinct Detects	15	Number of Distinct Non-Detects	2
Minimum Detect	0.00336	Minimum Non-Detect	0.199
Maximum Detect	0.741	Maximum Non-Detect	0.438
Variance Detects	0.0328	Percent Non-Detects	11.76%
Mean Detects	0.158	SD Detects	0.181
Median Detects	0.111	CV Detects	1.146
Skewness Detects	2.594	Kurtosis Detects	8.17
Mean of Logged Detects	-2.457	SD of Logged Detects	1.343

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	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

Mean	0.15	Standard Error of Mean	0.0425
SD	0.168	95% KM (BCA) UCL	0.221
95% KM (t) UCL	0.225	95% KM (Percentile Bootstrap) UCL	0.223
95% KM (z) UCL	0.22	95% KM Bootstrap t UCL	0.289
90% KM Chebyshev UCL	0.278	95% KM Chebyshev UCL	0.336
97.5% KM Chebyshev UCL	0.416	99% KM Chebyshev UCL	0.573

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.22	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.766	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.138	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.228	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)	0.948	k star (bias corrected MLE)	0.803
Theta hat (MLE)	0.167	Theta star (bias corrected MLE)	0.197
nu hat (MLE)	28.45	nu star (bias corrected)	24.09
MLE Mean (bias corrected)	0.158	MLE Sd (bias corrected)	0.177

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.806	nu hat (KM)	27.42
Approximate Chi Square Value (27.42, α)	16.48	Adjusted Chi Square Value (27.42, β)	15.59
95% Gamma Approximate KM-UCL (use when n>=50)	0.25	95% Gamma Adjusted KM-UCL (use when n<50)	0.265

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00336	Mean	0.148
Maximum	0.741	Median	0.108
SD	0.172	CV	1.164
k hat (MLE)	1.007	k star (bias corrected MLE)	0.869
Theta hat (MLE)	0.147	Theta star (bias corrected MLE)	0.17
nu hat (MLE)	34.25	nu star (bias corrected)	29.54
MLE Mean (bias corrected)	0.148	MLE Sd (bias corrected)	0.159
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (29.54, α)	18.13	Adjusted Chi Square Value (29.54, β)	17.19
95% Gamma Approximate UCL (use when n>=50)	0.241	95% Gamma Adjusted UCL (use when n<50)	0.254

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.147	Mean in Log Scale	-2.503
SD in Original Scale	0.173	SD in Log Scale	1.265
95% t UCL (assumes normality of ROS data)	0.22	95% Percentile Bootstrap UCL	0.221
95% BCA Bootstrap UCL	0.25	95% Bootstrap t UCL	0.291
95% H-UCL (Log ROS)	0.484		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.503	95% H-UCL (KM -Log)	0.518
KM SD (logged)	1.292	95% Critical H Value (KM-Log)	3.13
KM Standard Error of Mean (logged)	0.342		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.158	Mean in Log Scale	-2.393
SD in Original Scale	0.171	SD in Log Scale	1.276
95% t UCL (Assumes normality)	0.231	95% H-Stat UCL	0.556

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.336	95% GROS Adjusted Gamma UCL	0.254

95% Adjusted Gamma KM-UCL 0.265

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.

SB-104-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	15	Number of Non-Detects	2
Number of Distinct Detects	15	Number of Distinct Non-Detects	2
Minimum Detect	0.00498	Minimum Non-Detect	0.199
Maximum Detect	0.414	Maximum Non-Detect	0.265
Variance Detects	0.0147	Percent Non-Detects	11.76%
Mean Detects	0.117	SD Detects	0.121
Median Detects	0.0864	CV Detects	1.034
Skewness Detects	1.782	Kurtosis Detects	2.648
Mean of Logged Detects	-2.696	SD of Logged Detects	1.24

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.264	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	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

Mean	0.112	Standard Error of Mean	0.0284
SD	0.112	95% KM (BCA) UCL	0.159
95% KM (t) UCL	0.162	95% KM (Percentile Bootstrap) UCL	0.162
95% KM (z) UCL	0.159	95% KM Bootstrap t UCL	0.207
90% KM Chebyshev UCL	0.197	95% KM Chebyshev UCL	0.236
97.5% KM Chebyshev UCL	0.29	99% KM Chebyshev UCL	0.395

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.363	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.762	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.137	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.228	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)	1.041	k star (bias corrected MLE)	0.877
Theta hat (MLE)	0.113	Theta star (bias corrected MLE)	0.134
nu hat (MLE)	31.22	nu star (bias corrected)	26.31
MLE Mean (bias corrected)	0.117	MLE Sd (bias corrected)	0.125

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.004	nu hat (KM)	34.12

Approximate Chi Square Value (34.12, α)	21.76	Adjusted Chi Square Value (34.12, β)	20.73
95% Gamma Approximate KM-UCL (use when n>=50)	0.176	95% Gamma Adjusted KM-UCL (use when n<50)	0.185

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00498	Mean	0.111
Maximum	0.414	Median	0.0816
SD	0.115	CV	1.031
k hat (MLE)	1.134	k star (bias corrected MLE)	0.973
Theta hat (MLE)	0.098	Theta star (bias corrected MLE)	0.114
nu hat (MLE)	38.54	nu star (bias corrected)	33.07
MLE Mean (bias corrected)	0.111	MLE Sd (bias corrected)	0.113
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (33.07, α)	20.92	Adjusted Chi Square Value (33.07, β)	19.91
95% Gamma Approximate UCL (use when n>=50)	0.176	95% Gamma Adjusted UCL (use when n<50)	0.185

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.11	Mean in Log Scale	-2.725
SD in Original Scale	0.115	SD in Log Scale	1.163
95% t UCL (assumes normality of ROS data)	0.158	95% Percentile Bootstrap UCL	0.156
95% BCA Bootstrap UCL	0.167	95% Bootstrap t UCL	0.217
95% H-UCL (Log ROS)	0.301		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.728	95% H-UCL (KM -Log)	0.317
KM SD (logged)	1.185	95% Critical H Value (KM-Log)	2.956
KM Standard Error of Mean (logged)	0.313		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.117	Mean in Log Scale	-2.634
SD in Original Scale	0.113	SD in Log Scale	1.175
95% t UCL (Assumes normality)	0.165	95% H-Stat UCL	0.339

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.236	95% GROS Adjusted Gamma UCL	0.185
95% Adjusted Gamma KM-UCL	0.185		

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

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.

SB-105-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.00636	Mean	0.126
Maximum	0.334	Median	0.104
SD	0.105	Std. Error of Mean	0.0256
Coefficient of Variation	0.834	Skewness	0.936

Normal GOF Test

Shapiro Wilk Test Statistic	0.872	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	0.171	95% Adjusted-CLT UCL (Chen-1995)	0.175
		95% Modified-t UCL (Johnson-1978)	0.172

Gamma GOF Test

A-D Test Statistic	0.436	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.763	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.189	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.161	k star (bias corrected MLE)	0.995
Theta hat (MLE)	0.109	Theta star (bias corrected MLE)	0.127
nu hat (MLE)	39.47	nu star (bias corrected)	33.84
MLE Mean (bias corrected)	0.126	MLE Sd (bias corrected)	0.127
		Approximate Chi Square Value (0.05)	21.53
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	20.51

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.199	95% Adjusted Gamma UCL (use when n<50)	0.209

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.249	**Lilliefors Lognormal GOF Test**

5% Lilliefors Critical Value	0.215	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-5.058	Mean of logged Data	-2.557
Maximum of Logged Data	-1.097	SD of logged Data	1.211

Assuming Lognormal Distribution

95% H-UCL	0.4	90% Chebyshev (MVUE) UCL	0.302
95% Chebyshev (MVUE) UCL	0.37	97.5% Chebyshev (MVUE) UCL	0.465
99% Chebyshev (MVUE) UCL	0.651		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.169	95% Jackknife UCL	0.171
95% Standard Bootstrap UCL	0.167	95% Bootstrap-t UCL	0.181
95% Hall's Bootstrap UCL	0.173	95% Percentile Bootstrap UCL	0.168
95% BCA Bootstrap UCL	0.176		
90% Chebyshev(Mean, Sd) UCL	0.203	95% Chebyshev(Mean, Sd) UCL	0.238
97.5% Chebyshev(Mean, Sd) UCL	0.286	99% Chebyshev(Mean, Sd) UCL	0.381

Suggested UCL to Use

95% Student's-t UCL	0.171

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SB-106-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.00202	Mean	0.0433
Maximum	0.168	Median	0.0414
SD	0.041	Std. Error of Mean	0.00994
Coefficient of Variation	0.948	Skewness	1.948

Normal GOF Test

Shapiro Wilk Test Statistic	0.815	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.215	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	0.0606	95% Adjusted-CLT UCL (Chen-1995)	0.0646
		95% Modified-t UCL (Johnson-1978)	0.0614

Gamma GOF Test

A-D Test Statistic	0.226	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.762	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.133	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.191	k star (bias corrected MLE)	1.02
Theta hat (MLE)	0.0363	Theta star (bias corrected MLE)	0.0424
nu hat (MLE)	40.49	nu star (bias corrected)	34.68
MLE Mean (bias corrected)	0.0433	MLE Sd (bias corrected)	0.0428
		Approximate Chi Square Value (0.05)	22.21
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	21.16

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.0675	95% Adjusted Gamma UCL (use when n<50)	0.0709

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.175	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-6.207	Mean of logged Data	-3.616
Maximum of Logged Data	-1.782	SD of logged Data	1.153

Assuming Lognormal Distribution

95% H-UCL	0.121	90% Chebyshev (MVUE) UCL	0.0958
95% Chebyshev (MVUE) UCL	0.117	97.5% Chebyshev (MVUE) UCL	0.146
99% Chebyshev (MVUE) UCL	0.204		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0596	95% Jackknife UCL	0.0606
95% Standard Bootstrap UCL	0.0588	95% Bootstrap-t UCL	0.0695
95% Hall's Bootstrap UCL	0.143	95% Percentile Bootstrap UCL	0.0603
95% BCA Bootstrap UCL	0.065		
90% Chebyshev(Mean, Sd) UCL	0.0731	95% Chebyshev(Mean, Sd) UCL	0.0866
97.5% Chebyshev(Mean, Sd) UCL	0.105	99% Chebyshev(Mean, Sd) UCL	0.142

Suggested UCL to Use

95% Adjusted Gamma UCL	0.0709

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SB-107-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.0807	Mean	1.319
Maximum	4.56	Median	0.826
SD	1.274	Std. Error of Mean	0.309
Coefficient of Variation	0.966	Skewness	1.4

Normal GOF Test

Shapiro Wilk Test Statistic	0.853	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	1.858	95% Adjusted-CLT UCL (Chen-1995)	1.939
		95% Modified-t UCL (Johnson-1978)	1.876

Gamma GOF Test

A-D Test Statistic	0.166	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.765	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.102	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.065	k star (bias corrected MLE)	0.916
Theta hat (MLE)	1.239	Theta star (bias corrected MLE)	1.44
nu hat (MLE)	36.2	nu star (bias corrected)	31.14
MLE Mean (bias corrected)	1.319	MLE Sd (bias corrected)	1.378
		Approximate Chi Square Value (0.05)	19.39
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	18.43

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2.118	95% Adjusted Gamma UCL (use when n<50)	2.229

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.132	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.517	Mean of logged Data	-0.262
Maximum of Logged Data	1.517	SD of logged Data	1.199

Assuming Lognormal Distribution

95% H-UCL	3.861	90% Chebyshev (MVUE) UCL	2.942
95% Chebyshev (MVUE) UCL	3.605	97.5% Chebyshev (MVUE) UCL	4.524
99% Chebyshev (MVUE) UCL	6.33		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.827	95% Jackknife UCL	1.858
95% Standard Bootstrap UCL	1.818	95% Bootstrap-t UCL	2.15
95% Hall's Bootstrap UCL	2.38	95% Percentile Bootstrap UCL	1.822
95% BCA Bootstrap UCL	1.915		
90% Chebyshev(Mean, Sd) UCL	2.246	95% Chebyshev(Mean, Sd) UCL	2.665
97.5% Chebyshev(Mean, Sd) UCL	3.248	99% Chebyshev(Mean, Sd) UCL	4.393

Suggested UCL to Use

95% Student's-t UCL 1.858

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SB-108-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.00197	Mean	0.0593
Maximum	0.207	Median	0.0486
SD	0.0602	Std. Error of Mean	0.0146
Coefficient of Variation	1.015	Skewness	1.642

Normal GOF Test

Shapiro Wilk Test Statistic	0.796	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.252	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.215	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	0.0848	95% Adjusted-CLT UCL (Chen-1995)	0.0895

95% Modified-t UCL (Johnson-1978)	0.0858

Gamma GOF Test

A-D Test Statistic	0.369	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.769	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.127	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.929	k star (bias corrected MLE)	0.804
Theta hat (MLE)	0.0638	Theta star (bias corrected MLE)	0.0737
nu hat (MLE)	31.59	nu star (bias corrected)	27.35
MLE Mean (bias corrected)	0.0593	MLE Sd (bias corrected)	0.0661
		Approximate Chi Square Value (0.05)	16.42
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	15.54

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.0988	95% Adjusted Gamma UCL (use when n<50)	0.104

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-6.23	Mean of logged Data	-3.452
Maximum of Logged Data	-1.575	SD of logged Data	1.371

Assuming Lognormal Distribution

95% H-UCL	0.248	90% Chebyshev (MVUE) UCL	0.159
95% Chebyshev (MVUE) UCL	0.197	97.5% Chebyshev (MVUE) UCL	0.251
99% Chebyshev (MVUE) UCL	0.355		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0833	95% Jackknife UCL	0.0848
95% Standard Bootstrap UCL	0.0831	95% Bootstrap-t UCL	0.106
95% Hall's Bootstrap UCL	0.229	95% Percentile Bootstrap UCL	0.084
95% BCA Bootstrap UCL	0.0868		
90% Chebyshev(Mean, Sd) UCL	0.103	95% Chebyshev(Mean, Sd) UCL	0.123
97.5% Chebyshev(Mean, Sd) UCL	0.15	99% Chebyshev(Mean, Sd) UCL	0.205

Suggested UCL to Use

95% Adjusted Gamma UCL	0.104

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SB-109-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	0.00564	Mean	0.502
Maximum	2.5	Median	0.311
SD	0.668	Std. Error of Mean	0.162
Coefficient of Variation	1.332	Skewness	2.226

Normal GOF Test

Shapiro Wilk Test Statistic	0.677	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.387	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	0.785	95% Adjusted-CLT UCL (Chen-1995)	0.862
		95% Modified-t UCL (Johnson-1978)	0.799

Gamma GOF Test

A-D Test Statistic	0.537	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.777	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.244	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.217	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.741	k star (bias corrected MLE)	0.649
Theta hat (MLE)	0.677	Theta star (bias corrected MLE)	0.772
nu hat (MLE)	25.19	nu star (bias corrected)	22.08
MLE Mean (bias corrected)	0.502	MLE Sd (bias corrected)	0.623
		Approximate Chi Square Value (0.05)	12.4
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	11.64

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.893	95% Adjusted Gamma UCL (use when n<50)	0.951

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.179	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

Lognormal Statistics

Minimum of Logged Data	-5.178	Mean of logged Data	-1.499
Maximum of Logged Data	0.916	SD of logged Data	1.533

Assuming Lognormal Distribution

95% H-UCL	2.814	90% Chebyshev (MVUE) UCL	1.466
95% Chebyshev (MVUE) UCL	1.841	97.5% Chebyshev (MVUE) UCL	2.363
99% Chebyshev (MVUE) UCL	3.387		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.768	95% Jackknife UCL	0.785
95% Standard Bootstrap UCL	0.753	95% Bootstrap-t UCL	1.069
95% Hall's Bootstrap UCL	1.101	95% Percentile Bootstrap UCL	0.804
95% BCA Bootstrap UCL	0.86		
90% Chebyshev(Mean, Sd) UCL	0.988	95% Chebyshev(Mean, Sd) UCL	1.208
97.5% Chebyshev(Mean, Sd) UCL	1.514	99% Chebyshev(Mean, Sd) UCL	2.115

Suggested UCL to Use

95% Adjusted Gamma UCL 0.951

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SB-110-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.0072	Mean	0.628
Maximum	2.68	Median	0.363
SD	0.752	Std. Error of Mean	0.182
Coefficient of Variation	1.196	Skewness	1.981

Normal GOF Test

Shapiro Wilk Test Statistic	0.736	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.215	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	0.947	95% Adjusted-CLT UCL (Chen-1995)	1.022
		95% Modified-t UCL (Johnson-1978)	0.961

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma GOF Test

A-D Test Statistic	0.25	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.774	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.131	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.217	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.802	k star (bias corrected MLE)	0.7
Theta hat (MLE)	0.783	Theta star (bias corrected MLE)	0.898
nu hat (MLE)	27.27	nu star (bias corrected)	23.79
MLE Mean (bias corrected)	0.628	MLE Sd (bias corrected)	0.751
		Approximate Chi Square Value (0.05)	13.69
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	12.89

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	1.092	95% Adjusted Gamma UCL (use when n<50)	1.159

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.158	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-4.934	Mean of logged Data	-1.204
Maximum of Logged Data	0.986	SD of logged Data	1.494

Assuming Lognormal Distribution

95% H-UCL	3.356	90% Chebyshev (MVUE) UCL	1.842
95% Chebyshev (MVUE) UCL	2.309	97.5% Chebyshev (MVUE) UCL	2.956
99% Chebyshev (MVUE) UCL	4.227		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.928	95% Jackknife UCL	0.947
95% Standard Bootstrap UCL	0.914	95% Bootstrap-t UCL	1.321
95% Hall's Bootstrap UCL	2.554	95% Percentile Bootstrap UCL	0.927
95% BCA Bootstrap UCL	1.022		
90% Chebyshev(Mean, Sd) UCL	1.175	95% Chebyshev(Mean, Sd) UCL	1.423
97.5% Chebyshev(Mean, Sd) UCL	1.767	99% Chebyshev(Mean, Sd) UCL	2.442

Suggested UCL to Use

95% Adjusted Gamma UCL	1.159

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)

and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

For additional insight the user may want to consult a statistician.

SB-111-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.00453	Mean	0.276
Maximum	1.611	Median	0.165
SD	0.395	Std. Error of Mean	0.0958
Coefficient of Variation	1.433	Skewness	2.826

Normal GOF Test

Shapiro Wilk Test Statistic	0.629	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.311	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	0.443	95% Adjusted-CLT UCL (Chen-1995)	0.503
		95% Modified-t UCL (Johnson-1978)	0.454

Gamma GOF Test

A-D Test Statistic	0.369	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.776	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.16	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.217	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.757	k star (bias corrected MLE)	0.663
Theta hat (MLE)	0.364	Theta star (bias corrected MLE)	0.416
nu hat (MLE)	25.74	nu star (bias corrected)	22.53
MLE Mean (bias corrected)	0.276	MLE Sd (bias corrected)	0.339
		Approximate Chi Square Value (0.05)	12.74
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	11.97

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.488	95% Adjusted Gamma UCL (use when n<50)	0.519

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.16	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

Lognormal Statistics

Minimum of Logged Data	-5.397	Mean of logged Data	-2.078
Maximum of Logged Data	0.477	SD of logged Data	1.45

Assuming Lognormal Distribution

95% H-UCL	1.225	90% Chebyshev (MVUE) UCL	0.713
95% Chebyshev (MVUE) UCL	0.891	97.5% Chebyshev (MVUE) UCL	1.138
99% Chebyshev (MVUE) UCL	1.622		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.433	95% Jackknife UCL	0.443
95% Standard Bootstrap UCL	0.428	95% Bootstrap-t UCL	0.744
95% Hall's Bootstrap UCL	1.229	95% Percentile Bootstrap UCL	0.448
95% BCA Bootstrap UCL	0.498		
90% Chebyshev(Mean, Sd) UCL	0.563	95% Chebyshev(Mean, Sd) UCL	0.693
97.5% Chebyshev(Mean, Sd) UCL	0.874	99% Chebyshev(Mean, Sd) UCL	1.229

Suggested UCL to Use

95% Adjusted Gamma UCL 0.519

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SS-125-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.128	Mean	2.133
Maximum	12.9	Median	0.943
SD	3.09	Std. Error of Mean	0.75
Coefficient of Variation	1.449	Skewness	2.927

Normal GOF Test

Shapiro Wilk Test Statistic	0.631	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.258	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.215	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	3.441	95% Adjusted-CLT UCL (Chen-1995)	3.934
		95% Modified-t UCL (Johnson-1978)	3.53

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma GOF Test

A-D Test Statistic	0.5	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.774	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.153	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.217	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.816	k star (bias corrected MLE)	0.711
Theta hat (MLE)	2.614	Theta star (bias corrected MLE)	3
nu hat (MLE)	27.73	nu star (bias corrected)	24.17
MLE Mean (bias corrected)	2.133	MLE Sd (bias corrected)	2.529
		Approximate Chi Square Value (0.05)	13.98
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	13.17

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	3.687	95% Adjusted Gamma UCL (use when n<50)	3.914

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.116	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.057	Mean of logged Data	0.0315
Maximum of Logged Data	2.557	SD of logged Data	1.246

Assuming Lognormal Distribution

95% H-UCL	5.814	90% Chebyshev (MVUE) UCL	4.24
95% Chebyshev (MVUE) UCL	5.215	97.5% Chebyshev (MVUE) UCL	6.569
99% Chebyshev (MVUE) UCL	9.229		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3.365	95% Jackknife UCL	3.441
95% Standard Bootstrap UCL	3.318	95% Bootstrap-t UCL	4.871
95% Hall's Bootstrap UCL	7.963	95% Percentile Bootstrap UCL	3.462
95% BCA Bootstrap UCL	4.025		
90% Chebyshev(Mean, Sd) UCL	4.381	95% Chebyshev(Mean, Sd) UCL	5.4
97.5% Chebyshev(Mean, Sd) UCL	6.813	99% Chebyshev(Mean, Sd) UCL	9.59

Suggested UCL to Use

95% Adjusted Gamma UCL	3.914

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

For additional insight the user may want to consult a statistician.

SS-126-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	15	Number of Non-Detects	2
Number of Distinct Detects	15	Number of Distinct Non-Detects	2
Minimum Detect	0.0016	Minimum Non-Detect	0.0163
Maximum Detect	0.197	Maximum Non-Detect	0.0173
Variance Detects	0.00368	Percent Non-Detects	11.76%
Mean Detects	0.0584	SD Detects	0.0607
Median Detects	0.0348	CV Detects	1.038
Skewness Detects	1.342	Kurtosis Detects	0.706
Mean of Logged Detects	-3.499	SD of Logged Detects	1.408

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.806	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.291	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	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

Mean	0.0524	Standard Error of Mean	0.0145
SD	0.0576	95% KM (BCA) UCL	0.0784
95% KM (t) UCL	0.0776	95% KM (Percentile Bootstrap) UCL	0.0761
95% KM (z) UCL	0.0762	95% KM Bootstrap t UCL	0.09
90% KM Chebyshev UCL	0.0958	95% KM Chebyshev UCL	0.115
97.5% KM Chebyshev UCL	0.143	99% KM Chebyshev UCL	0.196

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.347	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.768	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.15	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.229	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)	0.889	k star (bias corrected MLE)	0.755
Theta hat (MLE)	0.0658	Theta star (bias corrected MLE)	0.0774
nu hat (MLE)	26.66	nu star (bias corrected)	22.66
MLE Mean (bias corrected)	0.0584	MLE Sd (bias corrected)	0.0672

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.828	nu hat (KM)	28.14
Approximate Chi Square Value (28.14, α)	17.04	Adjusted Chi Square Value (28.14, β)	16.13
95% Gamma Approximate KM-UCL (use when n>=50)	0.0865	95% Gamma Adjusted KM-UCL (use when n<50)	0.0913

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0016	Mean	0.0527
Maximum	0.197	Median	0.0343
SD	0.059	CV	1.119
k hat (MLE)	0.857	k star (bias corrected MLE)	0.745
Theta hat (MLE)	0.0616	Theta star (bias corrected MLE)	0.0708
nu hat (MLE)	29.13	nu star (bias corrected)	25.32
MLE Mean (bias corrected)	0.0527	MLE Sd (bias corrected)	0.0611
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (25.32, α)	14.86	Adjusted Chi Square Value (25.32, β)	14.02
95% Gamma Approximate UCL (use when n>=50)	0.0899	95% Gamma Adjusted UCL (use when n<50)	0.0952

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0522	Mean in Log Scale	-3.695
SD in Original Scale	0.0594	SD in Log Scale	1.429
95% t UCL (assumes normality of ROS data)	0.0774	95% Percentile Bootstrap UCL	0.0761
95% BCA Bootstrap UCL	0.0782	95% Bootstrap t UCL	0.0875
95% H-UCL (Log ROS)	0.229		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.72	95% H-UCL (KM -Log)	0.236
KM SD (logged)	1.448	95% Critical H Value (KM-Log)	3.395
KM Standard Error of Mean (logged)	0.376		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0526	Mean in Log Scale	-3.649
SD in Original Scale	0.0591	SD in Log Scale	1.384
95% t UCL (Assumes normality)	0.0776	95% H-Stat UCL	0.211

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.115	95% GROS Adjusted Gamma UCL	0.0952
95% Adjusted Gamma KM-UCL	0.0913		

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.

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

SS-127-0-2

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.00633	Mean	0.14
Maximum	0.486	Median	0.107
SD	0.139	Std. Error of Mean	0.0338
Coefficient of Variation	0.994	Skewness	1.53

Normal GOF Test

Shapiro Wilk Test Statistic	0.819	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	0.199	95% Adjusted-CLT UCL (Chen-1995)	0.209
		95% Modified-t UCL (Johnson-1978)	0.201

Gamma GOF Test

A-D Test Statistic	0.187	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.765	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.059	k star (bias corrected MLE)	0.911
Theta hat (MLE)	0.132	Theta star (bias corrected MLE)	0.154
nu hat (MLE)	36	nu star (bias corrected)	30.98
MLE Mean (bias corrected)	0.14	MLE Sd (bias corrected)	0.147
		Approximate Chi Square Value (0.05)	19.27
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	18.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.226	95% Adjusted Gamma UCL (use when n<50)	0.237

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.15	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-5.062	Mean of logged Data	-2.506

Maximum of Logged Data	-0.722	SD of logged Data	1.217

Assuming Lognormal Distribution

95% H-UCL	0.427	90% Chebyshev (MVUE) UCL	0.32
95% Chebyshev (MVUE) UCL	0.393	97.5% Chebyshev (MVUE) UCL	0.494
99% Chebyshev (MVUE) UCL	0.692		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.196	95% Jackknife UCL	0.199
95% Standard Bootstrap UCL	0.194	95% Bootstrap-t UCL	0.223
95% Hall's Bootstrap UCL	0.242	95% Percentile Bootstrap UCL	0.2
95% BCA Bootstrap UCL	0.207		
90% Chebyshev(Mean, Sd) UCL	0.242	95% Chebyshev(Mean, Sd) UCL	0.288
97.5% Chebyshev(Mean, Sd) UCL	0.351	99% Chebyshev(Mean, Sd) UCL	0.477

Suggested UCL to Use

95% Adjusted Gamma UCL	0.237

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SD-ST4-0-0.5

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	16	Number of Non-Detects	1
Number of Distinct Detects	16	Number of Distinct Non-Detects	1
Minimum Detect	0.0189	Minimum Non-Detect	0.0818
Maximum Detect	0.911	Maximum Non-Detect	0.0818
Variance Detects	0.0622	Percent Non-Detects	5.882%
Mean Detects	0.264	SD Detects	0.249
Median Detects	0.22	CV Detects	0.945
Skewness Detects	1.312	Kurtosis Detects	1.627
Mean of Logged Detects	-1.874	SD of Logged Detects	1.215

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.87	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.222	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.25	Standard Error of Mean	0.0603
SD	0.241	95% KM (BCA) UCL	0.348
95% KM (t) UCL	0.355	95% KM (Percentile Bootstrap) UCL	0.35

95% KM (z) UCL	0.349	95% KM Bootstrap t UCL	0.384
90% KM Chebyshev UCL	0.431	95% KM Chebyshev UCL	0.513
97.5% KM Chebyshev UCL	0.626	99% KM Chebyshev UCL	0.85

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.234	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.762	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.121	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.221	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)	1.06	k star (bias corrected MLE)	0.903
Theta hat (MLE)	0.249	Theta star (bias corrected MLE)	0.292
nu hat (MLE)	33.91	nu star (bias corrected)	28.88
MLE Mean (bias corrected)	0.264	MLE Sd (bias corrected)	0.278

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.081	nu hat (KM)	36.74
Approximate Chi Square Value (36.74, α)	23.86	Adjusted Chi Square Value (36.74, β)	22.78
95% Gamma Approximate KM-UCL (use when n>=50)	0.385	95% Gamma Adjusted KM-UCL (use when n<50)	0.403

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0118	Mean	0.249
Maximum	0.911	Median	0.219
SD	0.249	CV	1
k hat (MLE)	0.92	k star (bias corrected MLE)	0.796
Theta hat (MLE)	0.271	Theta star (bias corrected MLE)	0.313
nu hat (MLE)	31.26	nu star (bias corrected)	27.08
MLE Mean (bias corrected)	0.249	MLE Sd (bias corrected)	0.279
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (27.08, α)	16.21	Adjusted Chi Square Value (27.08, β)	15.34
95% Gamma Approximate UCL (use when n>=50)	0.416	95% Gamma Adjusted UCL (use when n<50)	0.44

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.25	Mean in Log Scale	-1.962
SD in Original Scale	0.248	SD in Log Scale	1.231
95% t UCL (assumes normality of ROS data)	0.355	95% Percentile Bootstrap UCL	0.352
95% BCA Bootstrap UCL	0.363	95% Bootstrap t UCL	0.404
95% H-UCL (Log ROS)	0.762		

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.975	95% H-UCL (KM -Log)	0.723
KM SD (logged)	1.215	95% Critical H Value (KM-Log)	3.004
KM Standard Error of Mean (logged)	0.306		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.251	Mean in Log Scale	-1.952
SD in Original Scale	0.247	SD in Log Scale	1.219
95% t UCL (Assumes normality)	0.355	95% H-Stat UCL	0.748

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.355	95% KM (Percentile Bootstrap) UCL	0.35

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.

SD-T7-E-0-0.5

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.00576	Mean	0.186
Maximum	0.612	Median	0.162
SD	0.168	Std. Error of Mean	0.0407
Coefficient of Variation	0.902	Skewness	1.333

Normal GOF Test

Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	0.257	95% Adjusted-CLT UCL (Chen-1995)	0.267
		95% Modified-t UCL (Johnson-1978)	0.259

Gamma GOF Test

A-D Test Statistic	0.314	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.765	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.153	**Kolmogrov-Smirnoff Gamma GOF Test**

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.053	k star (bias corrected MLE)	0.907
Theta hat (MLE)	0.177	Theta star (bias corrected MLE)	0.205
nu hat (MLE)	35.81	nu star (bias corrected)	30.82
MLE Mean (bias corrected)	0.186	MLE Sd (bias corrected)	0.195
		Approximate Chi Square Value (0.05)	19.14
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	18.18

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.3	95% Adjusted Gamma UCL (use when n<50)	0.316

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.22	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.215	Data Not Lognormal at 5% Significance Level	

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-5.157	Mean of logged Data	-2.226
Maximum of Logged Data	-0.491	SD of logged Data	1.307

Assuming Lognormal Distribution

95% H-UCL	0.711	90% Chebyshev (MVUE) UCL	0.488
95% Chebyshev (MVUE) UCL	0.603	97.5% Chebyshev (MVUE) UCL	0.763
99% Chebyshev (MVUE) UCL	1.077		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.253	95% Jackknife UCL	0.257
95% Standard Bootstrap UCL	0.251	95% Bootstrap-t UCL	0.276
95% Hall's Bootstrap UCL	0.307	95% Percentile Bootstrap UCL	0.253
95% BCA Bootstrap UCL	0.266		
90% Chebyshev(Mean, Sd) UCL	0.308	95% Chebyshev(Mean, Sd) UCL	0.364
97.5% Chebyshev(Mean, Sd) UCL	0.44	99% Chebyshev(Mean, Sd) UCL	0.591

Suggested UCL to Use

95% Adjusted Gamma UCL	0.316

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

SD-T14-E-0-0.5

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	14	Number of Non-Detects	3
Number of Distinct Detects	14	Number of Distinct Non-Detects	3
Minimum Detect	0.00136	Minimum Non-Detect	0.00301
Maximum Detect	0.173	Maximum Non-Detect	0.16
Variance Detects	0.00306	Percent Non-Detects	17.65%
Mean Detects	0.0604	SD Detects	0.0554
Median Detects	0.0389	CV Detects	0.916
Skewness Detects	1.246	Kurtosis Detects	0.545
Mean of Logged Detects	-3.313	SD of Logged Detects	1.26

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.832	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.249	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	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

Mean	0.0522	Standard Error of Mean	0.0134
SD	0.0526	95% KM (BCA) UCL	0.0764
95% KM (t) UCL	0.0756	95% KM (Percentile Bootstrap) UCL	0.0741
95% KM (z) UCL	0.0742	95% KM Bootstrap t UCL	0.0824
90% KM Chebyshev UCL	0.0923	95% KM Chebyshev UCL	0.111
97.5% KM Chebyshev UCL	0.136	99% KM Chebyshev UCL	0.185

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.3	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.758	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.142	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.235	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)	1.124	k star (bias corrected MLE)	0.931
Theta hat (MLE)	0.0538	Theta star (bias corrected MLE)	0.0649
nu hat (MLE)	31.47	nu star (bias corrected)	26.06
MLE Mean (bias corrected)	0.0604	MLE Sd (bias corrected)	0.0626

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.986	nu hat (KM)	33.54
Approximate Chi Square Value (33.54, α)	21.29	Adjusted Chi Square Value (33.54, β)	20.28
95% Gamma Approximate KM-UCL (use when n>=50)	0.0822	95% Gamma Adjusted KM-UCL (use when n<50)	0.0863

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00136	Mean	0.0527

Maximum	0.173	Median	0.0324
SD	0.0529	CV	1.004
k hat (MLE)	1.073	k star (bias corrected MLE)	0.923
Theta hat (MLE)	0.0491	Theta star (bias corrected MLE)	0.0571
nu hat (MLE)	36.48	nu star (bias corrected)	31.38
MLE Mean (bias corrected)	0.0527	MLE Sd (bias corrected)	0.0549
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (31.38, α)	19.58	Adjusted Chi Square Value (31.38, β)	18.61
95% Gamma Approximate UCL (use when n>=50)	0.0845	95% Gamma Adjusted UCL (use when n<50)	0.0889

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0516	Mean in Log Scale	-3.584
SD in Original Scale	0.0537	SD in Log Scale	1.326
95% t UCL (assumes normality of ROS data)	0.0744	95% Percentile Bootstrap UCL	0.0739
95% BCA Bootstrap UCL	0.0782	95% Bootstrap t UCL	0.0856
95% H-UCL (Log ROS)	0.193		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.702	95% H-UCL (KM -Log)	0.298
KM SD (logged)	1.52	95% Critical H Value (KM-Log)	3.52
KM Standard Error of Mean (logged)	0.398		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0552	Mean in Log Scale	-3.529
SD in Original Scale	0.0535	SD in Log Scale	1.42
95% t UCL (Assumes normality)	0.0778	95% H-Stat UCL	0.264

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.111	95% GROS Adjusted Gamma UCL	0.0889
95% Adjusted Gamma KM-UCL	0.0863		

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.

Appendix C-12
ProUCL Output - Dioxin/Furan Calculation
Matteo Sons, Inc. Site
Thorofare, New Jersey

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.00528	Mean	0.113
Maximum	0.43	Median	0.0691
SD	0.115	Std. Error of Mean	0.0278
Coefficient of Variation	1.011	Skewness	1.663

Normal GOF Test

Shapiro Wilk Test Statistic	0.825	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.203	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	0.162	95% Adjusted-CLT UCL (Chen-1995)	0.171
		95% Modified-t UCL (Johnson-1978)	0.164

Gamma GOF Test

A-D Test Statistic	0.289	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.767	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.14	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.97	k star (bias corrected MLE)	0.838
Theta hat (MLE)	0.117	Theta star (bias corrected MLE)	0.135
nu hat (MLE)	32.99	nu star (bias corrected)	28.5
MLE Mean (bias corrected)	0.113	MLE Sd (bias corrected)	0.124
		Approximate Chi Square Value (0.05)	17.32
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	16.41

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.186	95% Adjusted Gamma UCL (use when n<50)	0.197

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-5.244	Mean of logged Data	-2.775
Maximum of Logged Data	-0.844	SD of logged Data	1.319

Assuming Lognormal Distribution

95% H-UCL	0.424	90% Chebyshev (MVUE) UCL	0.287

95% Chebyshev (MVUE) UCL	0.355	97.5% Chebyshev (MVUE) UCL	0.45
99% Chebyshev (MVUE) UCL	0.636		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.159	95% Jackknife UCL	0.162
95% Standard Bootstrap UCL	0.156	95% Bootstrap-t UCL	0.183
95% Hall's Bootstrap UCL	0.224	95% Percentile Bootstrap UCL	0.157
95% BCA Bootstrap UCL	0.168		
90% Chebyshev(Mean, Sd) UCL	0.197	95% Chebyshev(Mean, Sd) UCL	0.234
97.5% Chebyshev(Mean, Sd) UCL	0.287	99% Chebyshev(Mean, Sd) UCL	0.39

Suggested UCL to Use

95% Student's-t UCL	0.162

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-13

ProUCL Output - Current/Future Surface Soil - Scrapyard Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	3/31/2016 4:21:17 PM
From File	ProUCL_Input_Organic.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aroclor 1260

General Statistics

Total Number of Observations	6	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	2
Number of Distinct Detects	4	Number of Distinct Non-Detects	2
Minimum Detect	20	Minimum Non-Detect	35
Maximum Detect	290	Maximum Non-Detect	38
Variance Detects	15406	Percent Non-Detects	33.33%
Mean Detects	111.3	SD Detects	124.1
Median Detects	67.5	CV Detects	1.116
Skewness Detects	1.571	Kurtosis Detects	2.286
Mean of Logged Detects	4.207	SD of Logged Detects	1.182

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.286	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	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

Mean	81.67	Standard Error of Mean	45.89
SD	97.28	95% KM (BCA) UCL	N/A
95% KM (t) UCL	174.1	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	157.1	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	219.3	95% KM Chebyshev UCL	281.7
97.5% KM Chebyshev UCL	368.2	99% KM Chebyshev UCL	538.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.291	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.666	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.256	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.402	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Appendix C-13

ProUCL Output - Current/Future Surface Soil - Scrapyard Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Gamma Statistics on Detected Data Only

k hat (MLE)	1.127	k star (bias corrected MLE)	0.448
Theta hat (MLE)	98.71	Theta star (bias corrected MLE)	248.1
nu hat (MLE)	9.017	nu star (bias corrected)	3.587
MLE Mean (bias corrected)	111.3	MLE Sd (bias corrected)	166.1

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.705	nu hat (KM)	8.457
Approximate Chi Square Value (8.46, α)	3.002	Adjusted Chi Square Value (8.46, β)	1.958
95% Gamma Approximate KM-UCL (use when n>=50)	230	95% Gamma Adjusted KM-UCL (use when n<50)	352.6

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	74.97
Maximum	290	Median	27.5
SD	111.4	CV	1.486
k hat (MLE)	0.336	k star (bias corrected MLE)	0.279
Theta hat (MLE)	223.4	Theta star (bias corrected MLE)	268.8
nu hat (MLE)	4.027	nu star (bias corrected)	3.347
MLE Mean (bias corrected)	74.97	MLE Sd (bias corrected)	142
		Adjusted Level of Significance (β)	0.0122
Approximate Chi Square Value (3.35, α)	0.482	Adjusted Chi Square Value (3.35, β)	0.22
95% Gamma Approximate UCL (use when n>=50)	520.4	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.209	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	80.81	Mean in Log Scale	3.794
SD in Original Scale	107.1	SD in Log Scale	1.125
95% t UCL (assumes normality of ROS data)	168.9	95% Percentile Bootstrap UCL	156.8
95% BCA Bootstrap UCL	171.5	95% Bootstrap t UCL	880.3
95% H-UCL (Log ROS)	832.4		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.834	95% H-UCL (KM -Log)	472.3
KM SD (logged)	0.995	95% Critical H Value (KM-Log)	4.108
KM Standard Error of Mean (logged)	0.473		

DL/2 Statistics

DL/2 Normal **DL/2 Log-Transformed**

Appendix C-13

ProUCL Output - Current/Future Surface Soil - Scrapyard Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Mean in Original Scale	80.25	Mean in Log Scale	3.772
SD in Original Scale	107.5	SD in Log Scale	1.137
95% t UCL (Assumes normality)	168.7	95% H-Stat UCL	860.9

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	174.1	95% KM (Percentile Bootstrap) UCL	N/A

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.

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/15/2015 1:26:14 AM
From File	ProUCL_Input_RHA.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	8	Number of Non-Detects	1
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	27	Minimum Non-Detect	180
Maximum Detect	240	Maximum Non-Detect	180
Variance Detects	6944	Percent Non-Detects	11.11%
Mean Detects	103.5	SD Detects	83.33
Median Detects	68.5	CV Detects	0.805
Skewness Detects	0.872	Kurtosis Detects	-0.935
Mean of Logged Detects	4.336	SD of Logged Detects	0.848

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.849	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	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

Mean	99	Standard Error of Mean	27.41
SD	75.67	95% KM (BCA) UCL	147.9
95% KM (t) UCL	150	95% KM (Percentile Bootstrap) UCL	145.6
95% KM (z) UCL	144.1	95% KM Bootstrap t UCL	179.7
90% KM Chebyshev UCL	181.2	95% KM Chebyshev UCL	218.5
97.5% KM Chebyshev UCL	270.2	99% KM Chebyshev UCL	371.7

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.378	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.726	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.205	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.298	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Gamma Statistics on Detected Data Only

k hat (MLE)	1.797	k star (bias corrected MLE)	1.207
Theta hat (MLE)	57.59	Theta star (bias corrected MLE)	85.78
nu hat (MLE)	28.76	nu star (bias corrected)	19.31
MLE Mean (bias corrected)	103.5	MLE Sd (bias corrected)	94.22

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.712	nu hat (KM)	30.81
Approximate Chi Square Value (30.81, α)	19.13	Adjusted Chi Square Value (30.81, β)	17.22
95% Gamma Approximate KM-UCL (use when n>=50)	159.4	95% Gamma Adjusted KM-UCL (use when n<50)	177.2

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	27	Mean	98.8
Maximum	240	Median	65
SD	79.21	CV	0.802
k hat (MLE)	1.926	k star (bias corrected MLE)	1.358
Theta hat (MLE)	51.29	Theta star (bias corrected MLE)	72.75
nu hat (MLE)	34.67	nu star (bias corrected)	24.45
MLE Mean (bias corrected)	98.8	MLE Sd (bias corrected)	84.78
		Adjusted Level of Significance (β)	0.0231
Approximate Chi Square Value (24.45, α)	14.19	Adjusted Chi Square Value (24.45, β)	12.57
95% Gamma Approximate UCL (use when n>=50)	170.2	95% Gamma Adjusted UCL (use when n<50)	192.1

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.153	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	98.16	Mean in Log Scale	4.301
SD in Original Scale	79.57	SD in Log Scale	0.8
95% t UCL (assumes normality of ROS data)	147.5	95% Percentile Bootstrap UCL	141.9
95% BCA Bootstrap UCL	148.6	95% Bootstrap t UCL	185.6
95% H-UCL (Log ROS)	225.1		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.296	95% H-UCL (KM -Log)	213.5
KM SD (logged)	0.779	95% Critical H Value (KM-Log)	2.771
KM Standard Error of Mean (logged)	0.287		

DL/2 Statistics

DL/2 Normal **DL/2 Log-Transformed**

Mean in Original Scale	102	Mean in Log Scale	4.354
SD in Original Scale	78.08	SD in Log Scale	0.795
95% t UCL (Assumes normality)	150.4	95% H-Stat UCL	234.6

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	150	95% KM (Percentile Bootstrap) UCL	145.6

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.

Benzo(a)pyrene

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	8	Number of Distinct Non-Detects	1
Minimum Detect	29	Minimum Non-Detect	180
Maximum Detect	210	Maximum Non-Detect	180
Variance Detects	4971	Percent Non-Detects	11.11%
Mean Detects	102.1	SD Detects	70.51
Median Detects	75	CV Detects	0.69
Skewness Detects	0.581	Kurtosis Detects	-1.58
Mean of Logged Detects	4.393	SD of Logged Detects	0.752

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.873	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.264	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.313	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

Mean	98.69	Standard Error of Mean	23.68
SD	64.58	95% KM (BCA) UCL	133.2
95% KM (t) UCL	142.7	95% KM (Percentile Bootstrap) UCL	137.6
95% KM (z) UCL	137.6	95% KM Bootstrap t UCL	151.2
90% KM Chebyshev UCL	169.7	95% KM Chebyshev UCL	201.9
97.5% KM Chebyshev UCL	246.6	99% KM Chebyshev UCL	334.3

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.382	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.204	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.297	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)	2.295	k star (bias corrected MLE)	1.518
Theta hat (MLE)	44.5	Theta star (bias corrected MLE)	67.28
nu hat (MLE)	36.72	nu star (bias corrected)	24.28
MLE Mean (bias corrected)	102.1	MLE Sd (bias corrected)	82.89

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.335	nu hat (KM)	42.03
Approximate Chi Square Value (42.03, α)	28.17	Adjusted Chi Square Value (42.03, β)	25.8
95% Gamma Approximate KM-UCL (use when n>=50)	147.2	95% Gamma Adjusted KM-UCL (use when n<50)	160.8

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	29	Mean	98.32
Maximum	210	Median	73
SD	66.93	CV	0.681
k hat (MLE)	2.481	k star (bias corrected MLE)	1.728
Theta hat (MLE)	39.63	Theta star (bias corrected MLE)	56.9
nu hat (MLE)	44.66	nu star (bias corrected)	31.11
MLE Mean (bias corrected)	98.32	MLE Sd (bias corrected)	74.79
		Adjusted Level of Significance (β)	0.0231
Approximate Chi Square Value (31.11, α)	19.36	Adjusted Chi Square Value (31.11, β)	17.44
95% Gamma Approximate UCL (use when n>=50)	157.9	95% Gamma Adjusted UCL (use when n<50)	175.4

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.193	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	97.56	Mean in Log Scale	4.362
SD in Original Scale	67.36	SD in Log Scale	0.71
95% t UCL (assumes normality of ROS data)	139.3	95% Percentile Bootstrap UCL	134
95% BCA Bootstrap UCL	137.6	95% Bootstrap t UCL	150.8
95% H-UCL (Log ROS)	195.4		

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.36	95% H-UCL (KM -Log)	189.4
KM SD (logged)	0.695	95% Critical H Value (KM-Log)	2.611
KM Standard Error of Mean (logged)	0.258		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	100.8	Mean in Log Scale	4.405
SD in Original Scale	66.08	SD in Log Scale	0.705
95% t UCL (Assumes normality)	141.7	95% H-Stat UCL	201.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	142.7	95% KM (Percentile Bootstrap) UCL	137.6

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	8	Number of Non-Detects	1
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	41	Minimum Non-Detect	180
Maximum Detect	340	Maximum Non-Detect	180
Variance Detects	12919	Percent Non-Detects	11.11%
Mean Detects	158.5	SD Detects	113.7
Median Detects	125	CV Detects	0.717
Skewness Detects	0.703	Kurtosis Detects	-1.065
Mean of Logged Detects	4.813	SD of Logged Detects	0.787

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.313	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	150.2	Standard Error of Mean	37.26
SD	103.7	95% KM (BCA) UCL	211.4
95% KM (t) UCL	219.5	95% KM (Percentile Bootstrap) UCL	212.9
95% KM (z) UCL	211.5	95% KM Bootstrap t UCL	243.4
90% KM Chebyshev UCL	262	95% KM Chebyshev UCL	312.6
97.5% KM Chebyshev UCL	382.9	99% KM Chebyshev UCL	520.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.251	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.146	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.297	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)	2.13	k star (bias corrected MLE)	1.415
Theta hat (MLE)	74.41	Theta star (bias corrected MLE)	112
nu hat (MLE)	34.08	nu star (bias corrected)	22.63
MLE Mean (bias corrected)	158.5	MLE Sd (bias corrected)	133.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.098	nu hat (KM)	37.76
Approximate Chi Square Value (37.76, α)	24.69	Adjusted Chi Square Value (37.76, β)	22.48
95% Gamma Approximate KM-UCL (use when n>=50)	229.7	95% Gamma Adjusted KM-UCL (use when n<50)	252.2

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	41	Mean	150.2
Maximum	340	Median	110
SD	109.2	CV	0.727
k hat (MLE)	2.223	k star (bias corrected MLE)	1.556
Theta hat (MLE)	67.58	Theta star (bias corrected MLE)	96.54
nu hat (MLE)	40.02	nu star (bias corrected)	28.01
MLE Mean (bias corrected)	150.2	MLE Sd (bias corrected)	120.4
		Adjusted Level of Significance (β)	0.0231
Approximate Chi Square Value (28.01, α)	16.94	Adjusted Chi Square Value (28.01, β)	15.15
95% Gamma Approximate UCL (use when n>=50)	248.5	95% Gamma Adjusted UCL (use when n<50)	277.8

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.126	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	149.7	Mean in Log Scale	4.764
SD in Original Scale	109.6	SD in Log Scale	0.751
95% t UCL (assumes normality of ROS data)	217.6	95% Percentile Bootstrap UCL	208
95% BCA Bootstrap UCL	218.6	95% Bootstrap t UCL	252.1
95% H-UCL (Log ROS)	319.5		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.759	95% H-UCL (KM -Log)	301.6
KM SD (logged)	0.727	95% Critical H Value (KM-Log)	2.669
KM Standard Error of Mean (logged)	0.266		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	150.9	Mean in Log Scale	4.778
SD in Original Scale	108.7	SD in Log Scale	0.744
95% t UCL (Assumes normality)	218.3	95% H-Stat UCL	318.9

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	219.5	95% KM (Percentile Bootstrap) UCL	212.9

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.

Benzo(k)fluoranthene

General Statistics

Total Number of Observations	9	Number of Distinct Observations	5
Number of Detects	5	Number of Non-Detects	4
Number of Distinct Detects	4	Number of Distinct Non-Detects	2
Minimum Detect	50	Minimum Non-Detect	180
Maximum Detect	180	Maximum Non-Detect	190
Variance Detects	2841	Percent Non-Detects	44.44%
Mean Detects	100.8	SD Detects	53.3
Median Detects	72	CV Detects	0.529
Skewness Detects	0.943	Kurtosis Detects	-0.55
Mean of Logged Detects	4.505	SD of Logged Detects	0.515

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 5.0

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.306	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	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

Mean	95.14	Standard Error of Mean	20.41
SD	44.22	95% KM (BCA) UCL	N/A
95% KM (t) UCL	133.1	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	128.7	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	156.4	95% KM Chebyshev UCL	184.1
97.5% KM Chebyshev UCL	222.6	99% KM Chebyshev UCL	298.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.364	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.681	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.306	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.358	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)	4.791	k star (bias corrected MLE)	2.05
Theta hat (MLE)	21.04	Theta star (bias corrected MLE)	49.17
nu hat (MLE)	47.91	nu star (bias corrected)	20.5
MLE Mean (bias corrected)	100.8	MLE Sd (bias corrected)	70.4

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	4.63	nu hat (KM)	83.33
Approximate Chi Square Value (83.33, α)	63.29	Adjusted Chi Square Value (83.33, β)	59.62
95% Gamma Approximate KM-UCL (use when n>=50)	125.3	95% Gamma Adjusted KM-UCL (use when n<50)	133

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	50	Mean	93.84
Maximum	180	Median	72
SD	41.28	CV	0.44
k hat (MLE)	6.669	k star (bias corrected MLE)	4.52
Theta hat (MLE)	14.07	Theta star (bias corrected MLE)	20.76
nu hat (MLE)	120	nu star (bias corrected)	81.36
MLE Mean (bias corrected)	93.84	MLE Sd (bias corrected)	44.14
		Adjusted Level of Significance (β)	0.0231
Approximate Chi Square Value (81.36, α)	61.58	Adjusted Chi Square Value (81.36, β)	57.96
95% Gamma Approximate UCL (use when n>=50)	124	95% Gamma Adjusted UCL (use when n<50)	131.7

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.931	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.271	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	92.54	Mean in Log Scale	4.451
SD in Original Scale	41.07	SD in Log Scale	0.403
95% t UCL (assumes normality of ROS data)	118	95% Percentile Bootstrap UCL	115.2
95% BCA Bootstrap UCL	120.8	95% Bootstrap t UCL	132.3
95% H-UCL (Log ROS)	126		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.456	95% H-UCL (KM -Log)	132.6
KM SD (logged)	0.437	95% Critical H Value (KM-Log)	2.172
KM Standard Error of Mean (logged)	0.208		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	97.11	Mean in Log Scale	4.515
SD in Original Scale	37.99	SD in Log Scale	0.365
95% t UCL (Assumes normality)	120.7	95% H-Stat UCL	127.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	133.1	95% KM (Percentile Bootstrap) UCL	N/A

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.

Chrysene

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	8	Number of Non-Detects	1
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	35	Minimum Non-Detect	180
Maximum Detect	280	Maximum Non-Detect	180
Variance Detects	9278	Percent Non-Detects	11.11%
Mean Detects	127.6	SD Detects	96.32
Median Detects	91.5	CV Detects	0.755

Skewness Detects	0.863	Kurtosis Detects	-0.911
Mean of Logged Detects	4.585	SD of Logged Detects	0.791

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	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

Mean	122.4	Standard Error of Mean	31.61
SD	87.39	95% KM (BCA) UCL	171
95% KM (t) UCL	181.1	95% KM (Percentile Bootstrap) UCL	171.9
95% KM (z) UCL	174.3	95% KM Bootstrap t UCL	220.3
90% KM Chebyshev UCL	217.2	95% KM Chebyshev UCL	260.1
97.5% KM Chebyshev UCL	319.7	99% KM Chebyshev UCL	436.8

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.326	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.169	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.297	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)	2.048	k star (bias corrected MLE)	1.363
Theta hat (MLE)	62.32	Theta star (bias corrected MLE)	93.62
nu hat (MLE)	32.77	nu star (bias corrected)	21.81
MLE Mean (bias corrected)	127.6	MLE Sd (bias corrected)	109.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.96	nu hat (KM)	35.29
Approximate Chi Square Value (35.29, α)	22.69	Adjusted Chi Square Value (35.29, β)	20.59
95% Gamma Approximate KM-UCL (use when n>=50)	190.2	95% Gamma Adjusted KM-UCL (use when n<50)	209.7

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	35	Mean	122.3
Maximum	280	Median	84
SD	91.53	CV	0.749

k hat (MLE)	2.2	k star (bias corrected MLE)	1.541
Theta hat (MLE)	55.58	Theta star (bias corrected MLE)	79.36
nu hat (MLE)	39.6	nu star (bias corrected)	27.73
MLE Mean (bias corrected)	122.3	MLE Sd (bias corrected)	98.5
		Adjusted Level of Significance (β)	0.0231
Approximate Chi Square Value (27.73, α)	16.72	Adjusted Chi Square Value (27.73, β)	14.94
95% Gamma Approximate UCL (use when n>=50)	202.8	95% Gamma Adjusted UCL (use when n<50)	226.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	121.5	Mean in Log Scale	4.552
SD in Original Scale	91.95	SD in Log Scale	0.746
95% t UCL (assumes normality of ROS data)	178.5	95% Percentile Bootstrap UCL	171.3
95% BCA Bootstrap UCL	175.8	95% Bootstrap t UCL	222.9
95% H-UCL (Log ROS)	255.9		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.548	95% H-UCL (KM -Log)	244.1
KM SD (logged)	0.727	95% Critical H Value (KM-Log)	2.668
KM Standard Error of Mean (logged)	0.267		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	123.4	Mean in Log Scale	4.576
SD in Original Scale	90.97	SD in Log Scale	0.74
95% t UCL (Assumes normality)	179.8	95% H-Stat UCL	258.5

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	181.1	95% KM (Percentile Bootstrap) UCL	171.9

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	9	Number of Distinct Observations	5

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Number of Detects	2	Number of Non-Detects	7
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	40	Minimum Non-Detect	180
Maximum Detect	69	Maximum Non-Detect	200
Variance Detects	420.5	Percent Non-Detects	77.78%
Mean Detects	54.5	SD Detects	20.51
Median Detects	54.5	CV Detects	0.376
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	3.961	SD of Logged Detects	0.386

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 5.0

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

Mean	54.5	Standard Error of Mean	14.5
SD	14.5	95% KM (BCA) UCL	N/A
95% KM (t) UCL	81.46	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	78.35	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	98	95% KM Chebyshev UCL	117.7
97.5% KM Chebyshev UCL	145.1	99% KM Chebyshev UCL	198.8

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	13.79	k star (bias corrected MLE)	N/A
Theta hat (MLE)	3.953	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	55.14	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	14.13	nu hat (KM)	254.3
		Adjusted Level of Significance (β)	0.0231
Approximate Chi Square Value (254.29, α)	218.4	Adjusted Chi Square Value (254.29, β)	211.3
95% Gamma Approximate KM-UCL (use when n>=50)	63.47	95% Gamma Adjusted KM-UCL (use when n<50)	65.58

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	55.25	Mean in Log Scale	3.961
SD in Original Scale	18.61	SD in Log Scale	0.338
95% t UCL (assumes normality of ROS data)	66.79	95% Percentile Bootstrap UCL	65.67
95% BCA Bootstrap UCL	66.12	95% Bootstrap t UCL	68.56
95% H-UCL (Log ROS)	71.15		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	84.33	Mean in Log Scale	4.404
SD in Original Scale	18.71	SD in Log Scale	0.288
95% t UCL (Assumes normality)	95.93	95% H-Stat UCL	104.4

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

95% KM (t) UCL	81.46	95% KM (% Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Warning: Recommended UCL exceeds the maximum observation

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	9	Number of Distinct Observations	7
Number of Detects	5	Number of Non-Detects	4
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	45	Minimum Non-Detect	180
Maximum Detect	140	Maximum Non-Detect	190
Variance Detects	1568	Percent Non-Detects	44.44%
Mean Detects	87.8	SD Detects	39.59
Median Detects	91	CV Detects	0.451
Skewness Detects	0.219	Kurtosis Detects	-1.647
Mean of Logged Detects	4.386	SD of Logged Detects	0.483

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 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.396	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

Mean	87.8	Standard Error of Mean	17.71
SD	35.41	95% KM (BCA) UCL	114.5
95% KM (t) UCL	120.7	95% KM (Percentile Bootstrap) UCL	116.3
95% KM (z) UCL	116.9	95% KM Bootstrap t UCL	126.9
90% KM Chebyshev UCL	140.9	95% KM Chebyshev UCL	165
97.5% KM Chebyshev UCL	198.4	99% KM Chebyshev UCL	264

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.293	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.68	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.235	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.358	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)	5.775	k star (bias corrected MLE)	2.443
Theta hat (MLE)	15.2	Theta star (bias corrected MLE)	35.94
nu hat (MLE)	57.75	nu star (bias corrected)	24.43
MLE Mean (bias corrected)	87.8	MLE Sd (bias corrected)	56.17

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	6.147	nu hat (KM)	110.6
Approximate Chi Square Value (110.64, α)	87.36	Adjusted Chi Square Value (110.64, β)	83
95% Gamma Approximate KM-UCL (use when n>=50)	111.2	95% Gamma Adjusted KM-UCL (use when n<50)	117

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	45	Mean	86.94
Maximum	140	Median	91
SD	32.15	CV	0.37
k hat (MLE)	7.847	k star (bias corrected MLE)	5.306
Theta hat (MLE)	11.08	Theta star (bias corrected MLE)	16.39
nu hat (MLE)	141.3	nu star (bias corrected)	95.5
MLE Mean (bias corrected)	86.94	MLE Sd (bias corrected)	37.74
		Adjusted Level of Significance (β)	0.0231
Approximate Chi Square Value (95.50, α)	73.96	Adjusted Chi Square Value (95.50, β)	69.97
95% Gamma Approximate UCL (use when n>=50)	112.3	95% Gamma Adjusted UCL (use when n<50)	118.7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.205	**Lilliefors GOF Test**

5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	85.8	Mean in Log Scale	4.386
SD in Original Scale	32.14	SD in Log Scale	0.391
95% t UCL (assumes normality of ROS data)	105.7	95% Percentile Bootstrap UCL	102.1
95% BCA Bootstrap UCL	102.7	95% Bootstrap t UCL	105.8
95% H-UCL (Log ROS)	116.3		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.386	95% H-UCL (KM -Log)	122.7
KM SD (logged)	0.432	95% Critical H Value (KM-Log)	2.167
KM Standard Error of Mean (logged)	0.216		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	89.89	Mean in Log Scale	4.449
SD in Original Scale	28.16	SD in Log Scale	0.35
95% t UCL (Assumes normality)	107.3	95% H-Stat UCL	117.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	120.7	95% KM (Percentile Bootstrap) UCL	116.3

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.

Pyrene

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	41	Mean	163.3
Maximum	400	Median	100
SD	137.6	Std. Error of Mean	45.87
Coefficient of Variation	0.843	Skewness	1.263

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 5.0

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Normal GOF Test

Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.258	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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	248.6	95% Adjusted-CLT UCL (Chen-1995)	259.4
		95% Modified-t UCL (Johnson-1978)	251.9

Gamma GOF Test

A-D Test Statistic	0.475	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.199	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.283	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.875	k star (bias corrected MLE)	1.324
Theta hat (MLE)	87.11	Theta star (bias corrected MLE)	123.4
nu hat (MLE)	33.75	nu star (bias corrected)	23.83
MLE Mean (bias corrected)	163.3	MLE Sd (bias corrected)	141.9
		Approximate Chi Square Value (0.05)	13.72
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	12.13

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	283.7	95% Adjusted Gamma UCL (use when n<50)	320.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.155	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.295	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.714	Mean of logged Data	4.806
Maximum of Logged Data	5.991	SD of logged Data	0.795

Assuming Lognormal Distribution

95% H-UCL	368.5	90% Chebyshev (MVUE) UCL	292
95% Chebyshev (MVUE) UCL	351.5	97.5% Chebyshev (MVUE) UCL	434.1
99% Chebyshev (MVUE) UCL	596.3		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Appendix C-14

ProUCL Output - Current Surface Soil - Rental Home Area, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Nonparametric Distribution Free UCLs

95% CLT UCL	238.8	95% Jackknife UCL	248.6
95% Standard Bootstrap UCL	233.9	95% Bootstrap-t UCL	354.9
95% Hall's Bootstrap UCL	715.4	95% Percentile Bootstrap UCL	238.9
95% BCA Bootstrap UCL	258.9		
90% Chebyshev(Mean, Sd) UCL	300.9	95% Chebyshev(Mean, Sd) UCL	363.3
97.5% Chebyshev(Mean, Sd) UCL	449.8	99% Chebyshev(Mean, Sd) UCL	619.7

Suggested UCL to Use

95% Student's-t UCL	248.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/16/2015 11:12:32 AM
From File	ProUCL_Input_SS_matteo.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	19
		Number of Missing Observations	1
Number of Detects	18	Number of Non-Detects	5
Number of Distinct Detects	17	Number of Distinct Non-Detects	2
Minimum Detect	19	Minimum Non-Detect	180
Maximum Detect	1300	Maximum Non-Detect	190
Variance Detects	107151	Percent Non-Detects	21.74%
Mean Detects	253.1	SD Detects	327.3
Median Detects	125	CV Detects	1.294
Skewness Detects	2.219	Kurtosis Detects	5.553
Mean of Logged Detects	4.824	SD of Logged Detects	1.253

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	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

Mean	210.8	Standard Error of Mean	63.07
SD	293.2	95% KM (BCA) UCL	325.6
95% KM (t) UCL	319.1	95% KM (Percentile Bootstrap) UCL	314.4
95% KM (z) UCL	314.5	95% KM Bootstrap t UCL	398.6
90% KM Chebyshev UCL	400	95% KM Chebyshev UCL	485.7
97.5% KM Chebyshev UCL	604.6	99% KM Chebyshev UCL	838.3

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.56	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.774	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.156	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.211	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)	0.832	k star (bias corrected MLE)	0.73
Theta hat (MLE)	304.1	Theta star (bias corrected MLE)	346.4

nu hat (MLE)	29.96	nu star (bias corrected)	26.3
MLE Mean (bias corrected)	253.1	MLE Sd (bias corrected)	296.1

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.517	nu hat (KM)	23.78
Approximate Chi Square Value (23.78, α)	13.68	Adjusted Chi Square Value (23.78, β)	13.12
95% Gamma Approximate KM-UCL (use when n>=50)	366.3	95% Gamma Adjusted KM-UCL (use when n<50)	381.8

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	206.3
Maximum	1300	Median	72
SD	302.4	CV	1.466
k hat (MLE)	0.447	k star (bias corrected MLE)	0.417
Theta hat (MLE)	461.9	Theta star (bias corrected MLE)	494.3
nu hat (MLE)	20.55	nu star (bias corrected)	19.2
MLE Mean (bias corrected)	206.3	MLE Sd (bias corrected)	319.3
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (19.20, α)	10.26	Adjusted Chi Square Value (19.20, β)	9.791
95% Gamma Approximate UCL (use when n>=50)	385.9	95% Gamma Adjusted UCL (use when n<50)	404.6

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.125	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	211	Mean in Log Scale	4.64
SD in Original Scale	299.4	SD in Log Scale	1.18
95% t UCL (assumes normality of ROS data)	318.2	95% Percentile Bootstrap UCL	309.4
95% BCA Bootstrap UCL	354.3	95% Bootstrap t UCL	387
95% H-UCL (Log ROS)	417.3		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.619	95% H-UCL (KM -Log)	408.1
KM SD (logged)	1.179	95% Critical H Value (KM-Log)	2.771
KM Standard Error of Mean (logged)	0.264		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	218.3	Mean in Log Scale	4.761
SD in Original Scale	295.6	SD in Log Scale	1.108
95% t UCL (Assumes normality)	324.1	95% H-Stat UCL	406

DL/2 is not a recommended method, provided for comparisons and historical reasons

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	485.7	95% GROS Adjusted Gamma UCL	404.6
95% Adjusted Gamma KM-UCL	381.8		

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.

Benzo(a)pyrene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	14
		Number of Missing Observations	1
Number of Detects	15	Number of Non-Detects	8
Number of Distinct Detects	13	Number of Distinct Non-Detects	2
Minimum Detect	29	Minimum Non-Detect	180
Maximum Detect	630	Maximum Non-Detect	190
Variance Detects	41697	Percent Non-Detects	34.78%
Mean Detects	212.9	SD Detects	204.2
Median Detects	160	CV Detects	0.959
Skewness Detects	1.102	Kurtosis Detects	-0.122
Mean of Logged Detects	4.889	SD of Logged Detects	1.045

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.818	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.229	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

Mean	166.6	Standard Error of Mean	38.45
SD	174	95% KM (BCA) UCL	230
95% KM (t) UCL	232.6	95% KM (Percentile Bootstrap) UCL	232.4
95% KM (z) UCL	229.8	95% KM Bootstrap t UCL	257.3
90% KM Chebyshev UCL	281.9	95% KM Chebyshev UCL	334.2
97.5% KM Chebyshev UCL	406.7	99% KM Chebyshev UCL	549.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.476	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.759	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.155	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.227	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site
Thorofare, New Jersey

Gamma Statistics on Detected Data Only

k hat (MLE)	1.2	k star (bias corrected MLE)	1.004
Theta hat (MLE)	177.4	Theta star (bias corrected MLE)	212
nu hat (MLE)	35.99	nu star (bias corrected)	30.13
MLE Mean (bias corrected)	212.9	MLE Sd (bias corrected)	212.4

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.916	nu hat (KM)	42.15
Approximate Chi Square Value (42.15, α)	28.27	Adjusted Chi Square Value (42.15, β)	27.44
95% Gamma Approximate KM-UCL (use when n>=50)	248.4	95% Gamma Adjusted KM-UCL (use when n<50)	255.8

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	164.9
Maximum	630	Median	91
SD	180.1	CV	1.092
k hat (MLE)	0.681	k star (bias corrected MLE)	0.621
Theta hat (MLE)	242.1	Theta star (bias corrected MLE)	265.4
nu hat (MLE)	31.34	nu star (bias corrected)	28.59
MLE Mean (bias corrected)	164.9	MLE Sd (bias corrected)	209.2
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (28.59, α)	17.38	Adjusted Chi Square Value (28.59, β)	16.75
95% Gamma Approximate UCL (use when n>=50)	271.2	95% Gamma Adjusted UCL (use when n<50)	281.4

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.131	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	166.1	Mean in Log Scale	4.659
SD in Original Scale	177.2	SD in Log Scale	0.948
95% t UCL (assumes normality of ROS data)	229.5	95% Percentile Bootstrap UCL	230.7
95% BCA Bootstrap UCL	239.2	95% Bootstrap t UCL	251.4
95% H-UCL (Log ROS)	271.9		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.646	95% H-UCL (KM -Log)	270.2
KM SD (logged)	0.952	95% Critical H Value (KM-Log)	2.464
KM Standard Error of Mean (logged)	0.23		

DL/2 Statistics

DL/2 Normal **DL/2 Log-Transformed**

Mean in Original Scale	171.2	Mean in Log Scale	4.765
SD in Original Scale	173	SD in Log Scale	0.852
95% t UCL (Assumes normality)	233.2	95% H-Stat UCL	258.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Percentile Bootstrap) UCL	232.4	95% GROS Adjusted Gamma UCL	281.4
95% Adjusted Gamma KM-UCL	255.8		

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.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	1
Number of Detects	18	Number of Non-Detects	5
Number of Distinct Detects	18	Number of Distinct Non-Detects	2
Minimum Detect	23	Minimum Non-Detect	180
Maximum Detect	1000	Maximum Non-Detect	190
Variance Detects	95999	Percent Non-Detects	21.74%
Mean Detects	315	SD Detects	309.8
Median Detects	190	CV Detects	0.984
Skewness Detects	1.028	Kurtosis Detects	-0.222
Mean of Logged Detects	5.195	SD of Logged Detects	1.173

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.84	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.209	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	264.2	Standard Error of Mean	61.25
SD	284.2	95% KM (BCA) UCL	371.7
95% KM (t) UCL	369.3	95% KM (Percentile Bootstrap) UCL	365.1
95% KM (z) UCL	364.9	95% KM Bootstrap t UCL	405.2
90% KM Chebyshev UCL	447.9	95% KM Chebyshev UCL	531.1
97.5% KM Chebyshev UCL	646.7	99% KM Chebyshev UCL	873.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.376	**Anderson-Darling GOF Test**	

5% A-D Critical Value	0.766	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.14	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.209	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)	1.031	k star (bias corrected MLE)	0.896
Theta hat (MLE)	305.5	Theta star (bias corrected MLE)	351.5
nu hat (MLE)	37.11	nu star (bias corrected)	32.26
MLE Mean (bias corrected)	315	MLE Sd (bias corrected)	332.7

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.864	nu hat (KM)	39.75
Approximate Chi Square Value (39.75, α)	26.31	Adjusted Chi Square Value (39.75, β)	25.51
95% Gamma Approximate KM-UCL (use when n>=50)	399.2	95% Gamma Adjusted KM-UCL (use when n<50)	411.6

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	261.9
Maximum	1000	Median	140
SD	292.5	CV	1.117
k hat (MLE)	0.633	k star (bias corrected MLE)	0.58
Theta hat (MLE)	413.5	Theta star (bias corrected MLE)	451.7
nu hat (MLE)	29.13	nu star (bias corrected)	26.67
MLE Mean (bias corrected)	261.9	MLE Sd (bias corrected)	343.9
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (26.67, α)	15.89	Adjusted Chi Square Value (26.67, β)	15.29
95% Gamma Approximate UCL (use when n>=50)	439.4	95% Gamma Adjusted UCL (use when n<50)	456.7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	263.9	Mean in Log Scale	4.998
SD in Original Scale	290.3	SD in Log Scale	1.119
95% t UCL (assumes normality of ROS data)	367.8	95% Percentile Bootstrap UCL	367.9
95% BCA Bootstrap UCL	379.2	95% Bootstrap t UCL	400.7
95% H-UCL (Log ROS)	525.8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.981	95% H-UCL (KM -Log)	523.4
KM SD (logged)	1.125	95% Critical H Value (KM-Log)	2.694

KM Standard Error of Mean (logged)	0.254

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	266.7	Mean in Log Scale	5.051
SD in Original Scale	288	SD in Log Scale	1.068
95% t UCL (Assumes normality)	369.9	95% H-Stat UCL	501.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	369.3	95% KM (Percentile Bootstrap) UCL	365.1

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.

Benzo(k)fluoranthene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	12
		Number of Missing Observations	1
Number of Detects	12	Number of Non-Detects	11
Number of Distinct Detects	11	Number of Distinct Non-Detects	2
Minimum Detect	50	Minimum Non-Detect	180
Maximum Detect	870	Maximum Non-Detect	190
Variance Detects	77545	Percent Non-Detects	47.83%
Mean Detects	301.3	SD Detects	278.5
Median Detects	195	CV Detects	0.924
Skewness Detects	1.046	Kurtosis Detects	-0.163
Mean of Logged Detects	5.282	SD of Logged Detects	0.992

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.834	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.268	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.256	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

Mean	198	Standard Error of Mean	49.08
SD	222.1	95% KM (BCA) UCL	284.1
95% KM (t) UCL	282.3	95% KM (Percentile Bootstrap) UCL	279.5
95% KM (z) UCL	278.8	95% KM Bootstrap t UCL	320.7
90% KM Chebyshev UCL	345.3	95% KM Chebyshev UCL	412
97.5% KM Chebyshev UCL	504.5	99% KM Chebyshev UCL	686.4

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.498	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.178	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.251	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)	1.315	k star (bias corrected MLE)	1.042
Theta hat (MLE)	229.1	Theta star (bias corrected MLE)	289.2
nu hat (MLE)	31.56	nu star (bias corrected)	25
MLE Mean (bias corrected)	301.3	MLE Sd (bias corrected)	295.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.795	nu hat (KM)	36.57
Approximate Chi Square Value (36.57, α)	23.73	Adjusted Chi Square Value (36.57, β)	22.98
95% Gamma Approximate KM-UCL (use when n>=50)	305.2	95% Gamma Adjusted KM-UCL (use when n<50)	315.2

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	191.6
Maximum	870	Median	105.2
SD	234.7	CV	1.225
k hat (MLE)	0.404	k star (bias corrected MLE)	0.381
Theta hat (MLE)	473.8	Theta star (bias corrected MLE)	503.4
nu hat (MLE)	18.61	nu star (bias corrected)	17.51
MLE Mean (bias corrected)	191.6	MLE Sd (bias corrected)	310.6
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (17.51, α)	9.04	Adjusted Chi Square Value (17.51, β)	8.6
95% Gamma Approximate UCL (use when n>=50)	371.3	95% Gamma Adjusted UCL (use when n<50)	390.3

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	201.6	Mean in Log Scale	4.859
SD in Original Scale	226.2	SD in Log Scale	0.915
95% t UCL (assumes normality of ROS data)	282.6	95% Percentile Bootstrap UCL	285.5
95% BCA Bootstrap UCL	303.7	95% Bootstrap t UCL	331.7
95% H-UCL (Log ROS)	313.8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.848	95% H-UCL (KM -Log)	283.9
KM SD (logged)	0.86	95% Critical H Value (KM-Log)	2.35
KM Standard Error of Mean (logged)	0.207		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	201.7	Mean in Log Scale	4.924
SD in Original Scale	223.8	SD in Log Scale	0.799
95% t UCL (Assumes normality)	281.9	95% H-Stat UCL	278.9

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	282.3	95% GROS Adjusted Gamma UCL	390.3
95% Adjusted Gamma KM-UCL	315.2		

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.

Chrysene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	19
		Number of Missing Observations	1
Number of Detects	18	Number of Non-Detects	5
Number of Distinct Detects	17	Number of Distinct Non-Detects	2
Minimum Detect	27	Minimum Non-Detect	180
Maximum Detect	980	Maximum Non-Detect	190
Variance Detects	99653	Percent Non-Detects	21.74%
Mean Detects	290.6	SD Detects	315.7
Median Detects	145	CV Detects	1.086
Skewness Detects	1.22	Kurtosis Detects	0.174
Mean of Logged Detects	5.049	SD of Logged Detects	1.199

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.794	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.209	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

Mean	243.3	Standard Error of Mean	61.69
SD	286.5	95% KM (BCA) UCL	347.7

95% KM (t) UCL	349.3	95% KM (Percentile Bootstrap) UCL	349
95% KM (z) UCL	344.8	95% KM Bootstrap t UCL	394.2
90% KM Chebyshev UCL	428.4	95% KM Chebyshev UCL	512.2
97.5% KM Chebyshev UCL	628.6	99% KM Chebyshev UCL	857.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.574	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.77	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.141	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.21	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)	0.934	k star (bias corrected MLE)	0.815
Theta hat (MLE)	311.2	Theta star (bias corrected MLE)	356.5
nu hat (MLE)	33.62	nu star (bias corrected)	29.35
MLE Mean (bias corrected)	290.6	MLE Sd (bias corrected)	321.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.721	nu hat (KM)	33.18
Approximate Chi Square Value (33.18, α)	21.01	Adjusted Chi Square Value (33.18, β)	20.3
95% Gamma Approximate KM-UCL (use when n>=50)	384.3	95% Gamma Adjusted KM-UCL (use when n<50)	397.6

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	241.3
Maximum	980	Median	112
SD	294.8	CV	1.222
k hat (MLE)	0.585	k star (bias corrected MLE)	0.538
Theta hat (MLE)	412.5	Theta star (bias corrected MLE)	448.8
nu hat (MLE)	26.9	nu star (bias corrected)	24.73
MLE Mean (bias corrected)	241.3	MLE Sd (bias corrected)	329.1
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (24.73, α)	14.4	Adjusted Chi Square Value (24.73, β)	13.83
95% Gamma Approximate UCL (use when n>=50)	414.2	95% Gamma Adjusted UCL (use when n<50)	431.3

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.108	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	244.1	Mean in Log Scale	4.873
SD in Original Scale	292.2	SD in Log Scale	1.129

95% t UCL (assumes normality of ROS data)	348.7	95% Percentile Bootstrap UCL	348.3
95% BCA Bootstrap UCL	371.5	95% Bootstrap t UCL	391.3
95% H-UCL (Log ROS)	473.6		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.849	95% H-UCL (KM -Log)	462.8
KM SD (logged)	1.129	95% Critical H Value (KM-Log)	2.7
KM Standard Error of Mean (logged)	0.252		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	247.7	Mean in Log Scale	4.937
SD in Original Scale	289.7	SD in Log Scale	1.077
95% t UCL (Assumes normality)	351.4	95% H-Stat UCL	454.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	512.2	95% GROS Adjusted Gamma UCL	431.3
95% Adjusted Gamma KM-UCL	397.6		

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.

Dibenzo(a,h)anthracene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	9
		Number of Missing Observations	1
Number of Detects	8	Number of Non-Detects	15
Number of Distinct Detects	6	Number of Distinct Non-Detects	3
Minimum Detect	40	Minimum Non-Detect	180
Maximum Detect	230	Maximum Non-Detect	200
Variance Detects	5545	Percent Non-Detects	65.22%
Mean Detects	111.1	SD Detects	74.46
Median Detects	80	CV Detects	0.67
Skewness Detects	0.827	Kurtosis Detects	-0.957
Mean of Logged Detects	4.51	SD of Logged Detects	0.681

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.857	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.232	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.313	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	87.46	Standard Error of Mean	16.4
SD	52.42	95% KM (BCA) UCL	116.1
95% KM (t) UCL	115.6	95% KM (Percentile Bootstrap) UCL	114.3
95% KM (z) UCL	114.4	95% KM Bootstrap t UCL	127.6
90% KM Chebyshev UCL	136.7	95% KM Chebyshev UCL	158.9
97.5% KM Chebyshev UCL	189.9	99% KM Chebyshev UCL	250.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.39	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.194	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.297	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)	2.652	k star (bias corrected MLE)	1.741
Theta hat (MLE)	41.9	Theta star (bias corrected MLE)	63.83
nu hat (MLE)	42.44	nu star (bias corrected)	27.86
MLE Mean (bias corrected)	111.1	MLE Sd (bias corrected)	84.22

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.784	nu hat (KM)	128.1
Approximate Chi Square Value (128.06, α)	102.9	Adjusted Chi Square Value (128.06, β)	101.3
95% Gamma Approximate KM-UCL (use when n>=50)	108.8	95% Gamma Adjusted KM-UCL (use when n<50)	110.6

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	24.04	Mean	87.84
Maximum	230	Median	72.03
SD	53.49	CV	0.609
k hat (MLE)	3.201	k star (bias corrected MLE)	2.813
Theta hat (MLE)	27.44	Theta star (bias corrected MLE)	31.23
nu hat (MLE)	147.3	nu star (bias corrected)	129.4
MLE Mean (bias corrected)	87.84	MLE Sd (bias corrected)	52.37
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (129.39, α)	104.1	Adjusted Chi Square Value (129.39, β)	102.5
95% Gamma Approximate UCL (use when n>=50)	109.2	95% Gamma Adjusted UCL (use when n<50)	110.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	86.29	Mean in Log Scale	4.315
SD in Original Scale	51.66	SD in Log Scale	0.53
95% t UCL (assumes normality of ROS data)	104.8	95% Percentile Bootstrap UCL	104.5
95% BCA Bootstrap UCL	108.6	95% Bootstrap t UCL	112.6
95% H-UCL (Log ROS)	108		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.319	95% H-UCL (KM -Log)	109.1
KM SD (logged)	0.537	95% Critical H Value (KM-Log)	2.005
KM Standard Error of Mean (logged)	0.191		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	99.52	Mean in Log Scale	4.527
SD in Original Scale	42.96	SD in Log Scale	0.385
95% t UCL (Assumes normality)	114.9	95% H-Stat UCL	116.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	115.6	95% KM (Percentile Bootstrap) UCL	114.3

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.

Indeno(1,2,3-cd)pyrene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	14
		Number of Missing Observations	1
Number of Detects	12	Number of Non-Detects	11
Number of Distinct Detects	12	Number of Distinct Non-Detects	2
Minimum Detect	45	Minimum Non-Detect	180
Maximum Detect	540	Maximum Non-Detect	190
Variance Detects	30535	Percent Non-Detects	47.83%
Mean Detects	198.3	SD Detects	174.7
Median Detects	125	CV Detects	0.881
Skewness Detects	1.228	Kurtosis Detects	0.232
Mean of Logged Detects	4.948	SD of Logged Detects	0.863

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.808	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level	

Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.256	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	148.3	Standard Error of Mean	30.72
SD	134.5	95% KM (BCA) UCL	201.9
95% KM (t) UCL	201.1	95% KM (Percentile Bootstrap) UCL	200.2
95% KM (z) UCL	198.8	95% KM Bootstrap t UCL	225.1
90% KM Chebyshev UCL	240.5	95% KM Chebyshev UCL	282.2
97.5% KM Chebyshev UCL	340.2	99% KM Chebyshev UCL	454

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.454	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.164	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.249	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)	1.609	k star (bias corrected MLE)	1.262
Theta hat (MLE)	123.2	Theta star (bias corrected MLE)	157.1
nu hat (MLE)	38.62	nu star (bias corrected)	30.3
MLE Mean (bias corrected)	198.3	MLE Sd (bias corrected)	176.5

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.216	nu hat (KM)	55.93
Approximate Chi Square Value (55.93, α)	39.74	Adjusted Chi Square Value (55.93, β)	38.75
95% Gamma Approximate KM-UCL (use when n>=50)	208.7	95% Gamma Adjusted KM-UCL (use when n<50)	214.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	149.2
Maximum	540	Median	110
SD	142.3	CV	0.954
k hat (MLE)	0.838	k star (bias corrected MLE)	0.758
Theta hat (MLE)	178	Theta star (bias corrected MLE)	196.9
nu hat (MLE)	38.54	nu star (bias corrected)	34.85
MLE Mean (bias corrected)	149.2	MLE Sd (bias corrected)	171.4
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (34.85, α)	22.34	Adjusted Chi Square Value (34.85, β)	21.62
95% Gamma Approximate UCL (use when n>=50)	232.6	95% Gamma Adjusted UCL (use when n<50)	240.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.121	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.256	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	150.5	Mean in Log Scale	4.722
SD in Original Scale	137.4	SD in Log Scale	0.741
95% t UCL (assumes normality of ROS data)	199.7	95% Percentile Bootstrap UCL	198.6
95% BCA Bootstrap UCL	212.2	95% Bootstrap t UCL	230
95% H-UCL (Log ROS)	209.9		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.706	95% H-UCL (KM -Log)	200.6
KM SD (logged)	0.72	95% Critical H Value (KM-Log)	2.188
KM Standard Error of Mean (logged)	0.189		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	148	Mean in Log Scale	4.75
SD in Original Scale	134.7	SD in Log Scale	0.646
95% t UCL (Assumes normality)	196.3	95% H-Stat UCL	190.5

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	201.1	95% KM (Percentile Bootstrap) UCL	200.2

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.

Pyrene

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	1
Number of Detects	19	Number of Non-Detects	4
Number of Distinct Detects	19	Number of Distinct Non-Detects	2
Minimum Detect	27	Minimum Non-Detect	180
Maximum Detect	1200	Maximum Non-Detect	190
Variance Detects	129516	Percent Non-Detects	17.39%
Mean Detects	316	SD Detects	359.9
Median Detects	170	CV Detects	1.139
Skewness Detects	1.574	Kurtosis Detects	1.534
Mean of Logged Detects	5.143	SD of Logged Detects	1.175

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.768	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.216	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.203	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

Mean	275	Standard Error of Mean	71.12
SD	331.2	95% KM (BCA) UCL	410.4
95% KM (t) UCL	397.1	95% KM (Percentile Bootstrap) UCL	398.9
95% KM (z) UCL	392	95% KM Bootstrap t UCL	459.8
90% KM Chebyshev UCL	488.4	95% KM Chebyshev UCL	585
97.5% KM Chebyshev UCL	719.2	99% KM Chebyshev UCL	982.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.453	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.771	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.138	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.205	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)	0.948	k star (bias corrected MLE)	0.834
Theta hat (MLE)	333.2	Theta star (bias corrected MLE)	379
nu hat (MLE)	36.04	nu star (bias corrected)	31.68
MLE Mean (bias corrected)	316	MLE Sd (bias corrected)	346.1

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.69	nu hat (KM)	31.72
Approximate Chi Square Value (31.72, α)	19.85	Adjusted Chi Square Value (31.72, β)	19.17
95% Gamma Approximate KM-UCL (use when n>=50)	439.5	95% Gamma Adjusted KM-UCL (use when n<50)	455.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	270.6
Maximum	1200	Median	135.9
SD	341.6	CV	1.262
k hat (MLE)	0.608	k star (bias corrected MLE)	0.558
Theta hat (MLE)	445	Theta star (bias corrected MLE)	485.1
nu hat (MLE)	27.97	nu star (bias corrected)	25.66
MLE Mean (bias corrected)	270.6	MLE Sd (bias corrected)	362.3
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (25.66, α)	15.12	Adjusted Chi Square Value (25.66, β)	14.53
95% Gamma Approximate UCL (use when n>=50)	459.3	95% Gamma Adjusted UCL (use when n<50)	477.8

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0976	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	274.9	Mean in Log Scale	4.996
SD in Original Scale	338.4	SD in Log Scale	1.126
95% t UCL (assumes normality of ROS data)	396	95% Percentile Bootstrap UCL	393.9
95% BCA Bootstrap UCL	430	95% Bootstrap t UCL	439.2
95% H-UCL (Log ROS)	532.4		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.983	95% H-UCL (KM -Log)	522.8
KM SD (logged)	1.124	95% Critical H Value (KM-Log)	2.692
KM Standard Error of Mean (logged)	0.249		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	277.3	Mean in Log Scale	5.038
SD in Original Scale	336.7	SD in Log Scale	1.088
95% t UCL (Assumes normality)	397.9	95% H-Stat UCL	515

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	585	95% GROS Adjusted Gamma UCL	477.8
95% Adjusted Gamma KM-UCL	455.1		

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.

4,4'-DDT

General Statistics

Total Number of Observations	24	Number of Distinct Observations	12
		Number of Missing Observations	1
Number of Detects	9	Number of Non-Detects	15
Number of Distinct Detects	8	Number of Distinct Non-Detects	4
Minimum Detect	4.6	Minimum Non-Detect	3.5
Maximum Detect	250	Maximum Non-Detect	3.9
Variance Detects	7258	Percent Non-Detects	62.5%

Mean Detects	55.48	SD Detects	85.19
Median Detects	13	CV Detects	1.536
Skewness Detects	1.909	Kurtosis Detects	3.12
Mean of Logged Detects	2.985	SD of Logged Detects	1.497

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.682	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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

Mean	22.99	Standard Error of Mean	11.96
SD	55.25	95% KM (BCA) UCL	44.73
95% KM (t) UCL	43.49	95% KM (Percentile Bootstrap) UCL	43.88
95% KM (z) UCL	42.67	95% KM Bootstrap t UCL	106.2
90% KM Chebyshev UCL	58.88	95% KM Chebyshev UCL	75.13
97.5% KM Chebyshev UCL	97.69	99% KM Chebyshev UCL	142

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.738	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.763	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.276	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.292	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)	0.6	k star (bias corrected MLE)	0.474
Theta hat (MLE)	92.52	Theta star (bias corrected MLE)	117.1
nu hat (MLE)	10.79	nu star (bias corrected)	8.529
MLE Mean (bias corrected)	55.48	MLE Sd (bias corrected)	80.59

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.173	nu hat (KM)	8.313
Approximate Chi Square Value (8.31, α)	2.917	Adjusted Chi Square Value (8.31, β)	2.697
95% Gamma Approximate KM-UCL (use when n>=50)	65.51	95% Gamma Adjusted KM-UCL (use when n<50)	70.87

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	20.81
Maximum	250	Median	0.01
SD	57.24	CV	2.751
k hat (MLE)	0.159	k star (bias corrected MLE)	0.167
Theta hat (MLE)	130.9	Theta star (bias corrected MLE)	124.7
nu hat (MLE)	7.63	nu star (bias corrected)	8.01

MLE Mean (bias corrected)	20.81	MLE Sd (bias corrected)	50.94
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (8.01, α)	2.741	Adjusted Chi Square Value (8.01, β)	2.528
95% Gamma Approximate UCL (use when n>=50)	60.82	95% Gamma Adjusted UCL (use when n<50)	65.93

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.192	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	21	Mean in Log Scale	-0.113
SD in Original Scale	57.17	SD in Log Scale	2.863
95% t UCL (assumes normality of ROS data)	41	95% Percentile Bootstrap UCL	42.02
95% BCA Bootstrap UCL	51.26	95% Bootstrap t UCL	105.2
95% H-UCL (Log ROS)	1504		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.903	95% H-UCL (KM -Log)	28.17
KM SD (logged)	1.205	95% Critical H Value (KM-Log)	2.827
KM Standard Error of Mean (logged)	0.261		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	21.94	Mean in Log Scale	1.49
SD in Original Scale	56.82	SD in Log Scale	1.477
95% t UCL (Assumes normality)	41.81	95% H-Stat UCL	35.77

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	43.49	95% GROS Adjusted Gamma UCL	65.93
95% Adjusted Gamma KM-UCL	70.87		

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.

Dieldrin

General Statistics

Total Number of Observations	23	Number of Distinct Observations	10
		Number of Missing Observations	2
Number of Detects	5	Number of Non-Detects	18

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Number of Distinct Detects	5	Number of Distinct Non-Detects	6
Minimum Detect	3.6	Minimum Non-Detect	3.5
Maximum Detect	32	Maximum Non-Detect	4.5
Variance Detects	134.6	Percent Non-Detects	78.26%
Mean Detects	12.1	SD Detects	11.6
Median Detects	8.2	CV Detects	0.959
Skewness Detects	1.816	Kurtosis Detects	3.41
Mean of Logged Detects	2.177	SD of Logged Detects	0.86

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.791	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	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

Mean	5.372	Standard Error of Mean	1.398
SD	5.998	95% KM (BCA) UCL	7.798
95% KM (t) UCL	7.773	95% KM (Percentile Bootstrap) UCL	7.678
95% KM (z) UCL	7.672	95% KM Bootstrap t UCL	11.28
90% KM Chebyshev UCL	9.567	95% KM Chebyshev UCL	11.47
97.5% KM Chebyshev UCL	14.1	99% KM Chebyshev UCL	19.28

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.337	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.686	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.203	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.361	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)	1.727	k star (bias corrected MLE)	0.824
Theta hat (MLE)	7.005	Theta star (bias corrected MLE)	14.68
nu hat (MLE)	17.27	nu star (bias corrected)	8.243
MLE Mean (bias corrected)	12.1	MLE Sd (bias corrected)	13.33

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.802	nu hat (KM)	36.9
Approximate Chi Square Value (36.90, α)	24	Adjusted Chi Square Value (36.90, β)	23.24
95% Gamma Approximate KM-UCL (use when n>=50)	8.262	95% Gamma Adjusted KM-UCL (use when n<50)	8.53

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.638
Maximum	32	Median	0.01

SD	7.104	CV	2.693
k hat (MLE)	0.182	k star (bias corrected MLE)	0.187
Theta hat (MLE)	14.49	Theta star (bias corrected MLE)	14.09
nu hat (MLE)	8.375	nu star (bias corrected)	8.616
MLE Mean (bias corrected)	2.638	MLE Sd (bias corrected)	6.096
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (8.62, α)	3.097	Adjusted Chi Square Value (8.62, β)	2.861
95% Gamma Approximate UCL (use when n>=50)	7.34	95% Gamma Adjusted UCL (use when n<50)	7.945

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.953	Mean in Log Scale	-0.608
SD in Original Scale	6.992	SD in Log Scale	1.833
95% t UCL (assumes normality of ROS data)	5.456	95% Percentile Bootstrap UCL	5.552
95% BCA Bootstrap UCL	7.353	95% Bootstrap t UCL	11.28
95% H-UCL (Log ROS)	12.77		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.454	95% H-UCL (KM -Log)	6.132
KM SD (logged)	0.523	95% Critical H Value (KM-Log)	1.993
KM Standard Error of Mean (logged)	0.122		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.072	Mean in Log Scale	0.95
SD in Original Scale	6.572	SD in Log Scale	0.758
95% t UCL (Assumes normality)	6.425	95% H-Stat UCL	4.94

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	7.773	95% KM (Percentile Bootstrap) UCL	7.678

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.

Heptachlor Epoxide

General Statistics

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Total Number of Observations	24	Number of Distinct Observations	8
		Number of Missing Observations	1
Number of Detects	6	Number of Non-Detects	18
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	2.5	Minimum Non-Detect	1.8
Maximum Detect	120	Maximum Non-Detect	2
Variance Detects	2084	Percent Non-Detects	75%
Mean Detects	27.42	SD Detects	45.65
Median Detects	11.1	CV Detects	1.665
Skewness Detects	2.379	Kurtosis Detects	5.729
Mean of Logged Detects	2.444	SD of Logged Detects	1.338

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.601	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.441	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	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

Mean	8.204	Standard Error of Mean	5.279
SD	23.61	95% KM (BCA) UCL	18.45
95% KM (t) UCL	17.25	95% KM (Percentile Bootstrap) UCL	17.68
95% KM (z) UCL	16.89	95% KM Bootstrap t UCL	51.08
90% KM Chebyshev UCL	24.04	95% KM Chebyshev UCL	31.21
97.5% KM Chebyshev UCL	41.17	99% KM Chebyshev UCL	60.72

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.636	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.349	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.345	Detected Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.697	k star (bias corrected MLE)	0.46
Theta hat (MLE)	39.33	Theta star (bias corrected MLE)	59.64
nu hat (MLE)	8.366	nu star (bias corrected)	5.516
MLE Mean (bias corrected)	27.42	MLE Sd (bias corrected)	40.44

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.121	nu hat (KM)	5.798
Approximate Chi Square Value (5.80, α)	1.537	Adjusted Chi Square Value (5.80, β)	1.389
95% Gamma Approximate KM-UCL (use when n>=50)	30.94	95% Gamma Adjusted KM-UCL (use when n<50)	34.23

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	6.862
Maximum	120	Median	0.01
SD	24.5	CV	3.57
k hat (MLE)	0.16	k star (bias corrected MLE)	0.168
Theta hat (MLE)	42.97	Theta star (bias corrected MLE)	40.96
nu hat (MLE)	7.665	nu star (bias corrected)	8.04
MLE Mean (bias corrected)	6.862	MLE Sd (bias corrected)	16.77
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (8.04, α)	2.758	Adjusted Chi Square Value (8.04, β)	2.545
95% Gamma Approximate UCL (use when n>=50)	20	95% Gamma Adjusted UCL (use when n<50)	21.68

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.255	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	6.983	Mean in Log Scale	-1.711
SD in Original Scale	24.46	SD in Log Scale	3.066
95% t UCL (assumes normality of ROS data)	15.54	95% Percentile Bootstrap UCL	16.3
95% BCA Bootstrap UCL	22.84	95% Bootstrap t UCL	53.85
95% H-UCL (Log ROS)	884.3		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.052	95% H-UCL (KM -Log)	8.156
KM SD (logged)	1.009	95% Critical H Value (KM-Log)	2.554
KM Standard Error of Mean (logged)	0.226		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	7.552	Mean in Log Scale	0.557
SD in Original Scale	24.3	SD in Log Scale	1.276
95% t UCL (Assumes normality)	16.05	95% H-Stat UCL	8.598

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	17.25	95% GROS Adjusted Gamma UCL	21.68
95% Adjusted Gamma KM-UCL	34.23		

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.

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site
Thorofare, New Jersey

Aroclor 1260

General Statistics

Total Number of Observations	39	Number of Distinct Observations	25
		Number of Missing Observations	3
Number of Detects	22	Number of Non-Detects	17
Number of Distinct Detects	22	Number of Distinct Non-Detects	5
Minimum Detect	20	Minimum Non-Detect	35
Maximum Detect	3000	Maximum Non-Detect	39
Variance Detects	401997	Percent Non-Detects	43.59%
Mean Detects	342.5	SD Detects	634
Median Detects	115	CV Detects	1.851
Skewness Detects	3.831	Kurtosis Detects	16.15
Mean of Logged Detects	4.954	SD of Logged Detects	1.297

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.501	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.305	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	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

Mean	204	Standard Error of Mean	80.52
SD	491.2	95% KM (BCA) UCL	362.4
95% KM (t) UCL	339.8	95% KM (Percentile Bootstrap) UCL	354.8
95% KM (z) UCL	336.5	95% KM Bootstrap t UCL	572.8
90% KM Chebyshev UCL	445.6	95% KM Chebyshev UCL	555
97.5% KM Chebyshev UCL	706.9	99% KM Chebyshev UCL	1005

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.947	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.788	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.176	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.193	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.687	k star (bias corrected MLE)	0.623
Theta hat (MLE)	498.8	Theta star (bias corrected MLE)	549.5
nu hat (MLE)	30.21	nu star (bias corrected)	27.43
MLE Mean (bias corrected)	342.5	MLE Sd (bias corrected)	433.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.172	nu hat (KM)	13.45
Approximate Chi Square Value (13.45, α)	6.199	Adjusted Chi Square Value (13.45, β)	6.004
95% Gamma Approximate KM-UCL (use when n>=50)	442.8	95% Gamma Adjusted KM-UCL (use when n<50)	457.1

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	193.2
Maximum	3000	Median	35
SD	501.8	CV	2.597
k hat (MLE)	0.169	k star (bias corrected MLE)	0.173
Theta hat (MLE)	1145	Theta star (bias corrected MLE)	1118
nu hat (MLE)	13.16	nu star (bias corrected)	13.48
MLE Mean (bias corrected)	193.2	MLE Sd (bias corrected)	464.8
		Adjusted Level of Significance (β)	0.0437
Approximate Chi Square Value (13.48, α)	6.218	Adjusted Chi Square Value (13.48, β)	6.023
95% Gamma Approximate UCL (use when n>=50)	419	95% Gamma Adjusted UCL (use when n<50)	432.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	200	Mean in Log Scale	3.897
SD in Original Scale	499.2	SD in Log Scale	1.621
95% t UCL (assumes normality of ROS data)	334.7	95% Percentile Bootstrap UCL	347.4
95% BCA Bootstrap UCL	443.2	95% Bootstrap t UCL	550.1
95% H-UCL (Log ROS)	426.4		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.185	95% H-UCL (KM -Log)	273.8
KM SD (logged)	1.299	95% Critical H Value (KM-Log)	2.77
KM Standard Error of Mean (logged)	0.22		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	201.1	Mean in Log Scale	4.057
SD in Original Scale	498.7	SD in Log Scale	1.414
95% t UCL (Assumes normality)	335.8	95% H-Stat UCL	307

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	362.4	95% GROS Adjusted Gamma UCL	432.5
95% Adjusted Gamma KM-UCL	457.1		

Appendix C-15

ProUCL Output - Future Surface Soil - Matteo Property, exclude Outliers (RHA-SS-10 or SB-107)

Matteo Sons, Inc. Site

Thorofare, New Jersey

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.

Appendix C-16a
Outlier Test
Current/Future Surface Soil - Scrapyard Area (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Outlier Tests for Selected Variables excluding nondetects

User Selected Options

Date/Time of Computation 4/5/2016 9:11:28 PM

From File ProUCL_Input_Organic.xls

Full Precision OFF

Dixon's Outlier Test for Aroclor 1260

Total N = 7

Number NDs = 2

Number Detects = 5

10% critical value: 0.557

5% critical value: 0.642

1% critical value: 0.78

Note: NDs excluded from Outlier Test

1. Data Value 200000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.999

For 10% significance level, 200000 is an outlier.

For 5% significance level, 200000 is an outlier.

For 1% significance level, 200000 is an outlier.

2. Data Value 20 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 20 is not an outlier.

For 5% significance level, 20 is not an outlier.

For 1% significance level, 20 is not an outlier.

Appendix C-16b
Outlier Test
Current/Future Surface Soil - Scrapyard Area (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation 4/5/2016 9:16:44 PM

From File ProUCL_Input_Organic.xls

Full Precision OFF

Dixon's Outlier Test for Aroclor 1260

Total N = 7

Number NDs = 2

Number Detects = 5

Number Data (n) = 7

10% critical value: 0.434

5% critical value: 0.507

1% critical value: 0.637

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 200000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.999

For 10% significance level, 200000 is an outlier.

For 5% significance level, 200000 is an outlier.

For 1% significance level, 200000 is an outlier.

2. Data Value 17.5 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 17.5 is not an outlier.

For 5% significance level, 17.5 is not an outlier.

For 1% significance level, 17.5 is not an outlier.

Appendix C-17a
Outlier Test
Current Surface Soil - Rental Home Area (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Outlier Tests for Selected Variables excluding nondetects

User Selected Options

Date/Time of Computation 4/5/2016 9:16:02 PM

From File ProUCL_Input_Organic_b.xls

Full Precision OFF

Dixon's Outlier Test for Benzo(a)anthracene

Total N = 10

Number NDs = 1

Number Detects = 9

10% critical value: 0.441

5% critical value: 0.512

1% critical value: 0.635

Note: NDs excluded from Outlier Test

1. Data Value 130000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 130000 is an outlier.

For 5% significance level, 130000 is an outlier.

For 1% significance level, 130000 is an outlier.

2. Data Value 27 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.009

For 10% significance level, 27 is not an outlier.

For 5% significance level, 27 is not an outlier.

For 1% significance level, 27 is not an outlier.

Dixon's Outlier Test for Benzo(a)pyrene

Total N = 10

Number NDs = 1

Number Detects = 9

10% critical value: 0.441

5% critical value: 0.512

1% critical value: 0.635

Note: NDs excluded from Outlier Test

Appendix C-17a
Outlier Test
Current Surface Soil - Rental Home Area (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

1. Data Value 79000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 79000 is an outlier.
For 5% significance level, 79000 is an outlier.
For 1% significance level, 79000 is an outlier.

2. Data Value 29 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.033

For 10% significance level, 29 is not an outlier.
For 5% significance level, 29 is not an outlier.
For 1% significance level, 29 is not an outlier.

Dixon's Outlier Test for Benzo(b)fluoranthene

Total N = 10
Number NDs = 1
Number Detects = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs excluded from Outlier Test

1. Data Value 110000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.997

For 10% significance level, 110000 is an outlier.
For 5% significance level, 110000 is an outlier.
For 1% significance level, 110000 is an outlier.

2. Data Value 41 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.037

For 10% significance level, 41 is not an outlier.
For 5% significance level, 41 is not an outlier.
For 1% significance level, 41 is not an outlier.

Appendix C-17a
Outlier Test
Current Surface Soil - Rental Home Area (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Dixon's Outlier Test for Benzo(k)fluoranthene

Total N = 10
Number NDs = 4
Number Detects = 6
10% critical value: 0.482
5% critical value: 0.56
1% critical value: 0.698
Note: NDs excluded from Outlier Test

1. Data Value 63000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 63000 is an outlier.
For 5% significance level, 63000 is an outlier.
For 1% significance level, 63000 is an outlier.

2. Data Value 50 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 50 is not an outlier.
For 5% significance level, 50 is not an outlier.
For 1% significance level, 50 is not an outlier.

Dixon's Outlier Test for Chrysene

Total N = 10
Number NDs = 1
Number Detects = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs excluded from Outlier Test

1. Data Value 110000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 110000 is an outlier.
For 5% significance level, 110000 is an outlier.
For 1% significance level, 110000 is an outlier.

2. Data Value 35 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.020

For 10% significance level, 35 is not an outlier.
For 5% significance level, 35 is not an outlier.
For 1% significance level, 35 is not an outlier.

Dixon's Outlier Test for Dibenzo(a,h)anthracene

Total N = 10
Number NDs = 7
Number Detects = 3
10% critical value: 0.886
5% critical value: 0.941
1% critical value: 0.988
Note: NDs excluded from Outlier Test

1. Data Value 23000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.999

For 10% significance level, 23000 is an outlier.
For 5% significance level, 23000 is an outlier.
For 1% significance level, 23000 is an outlier.

2. Data Value 40 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.001

For 10% significance level, 40 is not an outlier.
For 5% significance level, 40 is not an outlier.
For 1% significance level, 40 is not an outlier.

Dixon's Outlier Test for Indeno(1,2,3-cd)pyrene

Total N = 10
Number NDs = 4
Number Detects = 6
10% critical value: 0.482
5% critical value: 0.56

Appendix C-17a
Outlier Test
Current Surface Soil - Rental Home Area (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

1% critical value: 0.698
Note: NDs excluded from Outlier Test

1. Data Value 35000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.997

For 10% significance level, 35000 is an outlier.
For 5% significance level, 35000 is an outlier.
For 1% significance level, 35000 is an outlier.

2. Data Value 45 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 45 is not an outlier.
For 5% significance level, 45 is not an outlier.
For 1% significance level, 45 is not an outlier.

Dixon's Outlier Test for Pyrene

Total N = 10
Number NDs = 0
Number Detects = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs excluded from Outlier Test

1. Data Value 180000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 180000 is an outlier.
For 5% significance level, 180000 is an outlier.
For 1% significance level, 180000 is an outlier.

2. Data Value 41 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.053

For 10% significance level, 41 is not an outlier.
For 5% significance level, 41 is not an outlier.

Appendix C-17a
Outlier Test
Current Surface Soil - Rental Home Area (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

For 1% significance level, 41 is not an outlier.

Appendix C-17b
Outlier Test
Current Surface Soil - Rental Home Area (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation 4/5/2016 9:29:58 PM
From File ProUCL_Input_Organic_b.xls
Full Precision OFF

Dixon's Outlier Test for Benzo(a)anthracene

Total N = 10
Number NDs = 1
Number Detects = 9
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 130000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 130000 is an outlier.
For 5% significance level, 130000 is an outlier.
For 1% significance level, 130000 is an outlier.

2. Data Value 27 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.009

For 10% significance level, 27 is not an outlier.
For 5% significance level, 27 is not an outlier.
For 1% significance level, 27 is not an outlier.

Dixon's Outlier Test for Benzo(a)pyrene

Total N = 10
Number NDs = 1
Number Detects = 9
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

Appendix C-17b
Outlier Test
Current Surface Soil - Rental Home Area (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 79000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 79000 is an outlier.
For 5% significance level, 79000 is an outlier.
For 1% significance level, 79000 is an outlier.

2. Data Value 29 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.033

For 10% significance level, 29 is not an outlier.
For 5% significance level, 29 is not an outlier.
For 1% significance level, 29 is not an outlier.

Dixon's Outlier Test for Benzo(b)fluoranthene

Total N = 10
Number NDs = 1
Number Detects = 9
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 110000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.997

For 10% significance level, 110000 is an outlier.
For 5% significance level, 110000 is an outlier.
For 1% significance level, 110000 is an outlier.

2. Data Value 41 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.037

For 10% significance level, 41 is not an outlier.
For 5% significance level, 41 is not an outlier.

For 1% significance level, 41 is not an outlier.

Dixon's Outlier Test for Benzo(k)fluoranthene

Total N = 10
Number NDs = 4
Number Detects = 6
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 63000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 63000 is an outlier.
For 5% significance level, 63000 is an outlier.
For 1% significance level, 63000 is an outlier.

2. Data Value 50 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.169

For 10% significance level, 50 is not an outlier.
For 5% significance level, 50 is not an outlier.
For 1% significance level, 50 is not an outlier.

Dixon's Outlier Test for Chrysene

Total N = 10
Number NDs = 1
Number Detects = 9
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 110000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 110000 is an outlier.
For 5% significance level, 110000 is an outlier.
For 1% significance level, 110000 is an outlier.

2. Data Value 35 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.020

For 10% significance level, 35 is not an outlier.
For 5% significance level, 35 is not an outlier.
For 1% significance level, 35 is not an outlier.

Dixon's Outlier Test for Dibenzo(a,h)anthracene

Total N = 10
Number NDs = 7
Number Detects = 3
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 23000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.999

For 10% significance level, 23000 is an outlier.
For 5% significance level, 23000 is an outlier.
For 1% significance level, 23000 is an outlier.

2. Data Value 40 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.483

For 10% significance level, 40 is an outlier.
For 5% significance level, 40 is an outlier.
For 1% significance level, 40 is not an outlier.

Dixon's Outlier Test for Indeno(1,2,3-cd)pyrene

Appendix C-17b
Outlier Test
Current Surface Soil - Rental Home Area (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Total N = 10
Number NDs = 4
Number Detects = 6
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 35000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 35000 is an outlier.
For 5% significance level, 35000 is an outlier.
For 1% significance level, 35000 is an outlier.

2. Data Value 45 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.084

For 10% significance level, 45 is not an outlier.
For 5% significance level, 45 is not an outlier.
For 1% significance level, 45 is not an outlier.

Dixon's Outlier Test for Pyrene

Total N = 10
Number NDs = 0
Number Detects = 10
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 180000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.998

For 10% significance level, 180000 is an outlier.
For 5% significance level, 180000 is an outlier.

Appendix C-17b
Outlier Test
Current Surface Soil - Rental Home Area (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

For 1% significance level, 180000 is an outlier.

2. Data Value 41 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.053

For 10% significance level, 41 is not an outlier.
For 5% significance level, 41 is not an outlier.
For 1% significance level, 41 is not an outlier.

Appendix C-18a
Outlier Test
Future Surface Soil - Matteo Property (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Outlier Tests for Selected Variables excluding nondetects

User Selected Options

Date/Time of Computation 4/5/2016 9:39:17 PM

From File ProUCL_Input_Organic_d.xls

Full Precision OFF

Dixon's Outlier Test for Benzo(a)anthracene

Total N = 24

Number NDs = 5

Number Detects = 19

10% critical value: 0.412

5% critical value: 0.462

1% critical value: 0.547

Note: NDs excluded from Outlier Test

1. Data Value 130000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.996

For 10% significance level, 130000 is an outlier.

For 5% significance level, 130000 is an outlier.

For 1% significance level, 130000 is an outlier.

2. Data Value 19 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.017

For 10% significance level, 19 is not an outlier.

For 5% significance level, 19 is not an outlier.

For 1% significance level, 19 is not an outlier.

Dixon's Outlier Test for Benzo(a)pyrene

Total N = 24

Number NDs = 8

Number Detects = 16

10% critical value: 0.454

5% critical value: 0.507

1% critical value: 0.595

Note: NDs excluded from Outlier Test

Appendix C-18a
Outlier Test
Future Surface Soil - Matteo Property (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

1. Data Value 79000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.993

For 10% significance level, 79000 is an outlier.
For 5% significance level, 79000 is an outlier.
For 1% significance level, 79000 is an outlier.

2. Data Value 29 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.011

For 10% significance level, 29 is not an outlier.
For 5% significance level, 29 is not an outlier.
For 1% significance level, 29 is not an outlier.

Dixon's Outlier Test for Benzo(b)fluoranthene

Total N = 24
Number NDs = 5
Number Detects = 19
10% critical value: 0.412
5% critical value: 0.462
1% critical value: 0.547
Note: NDs excluded from Outlier Test

1. Data Value 110000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.993

For 10% significance level, 110000 is an outlier.
For 5% significance level, 110000 is an outlier.
For 1% significance level, 110000 is an outlier.

2. Data Value 23 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.023

For 10% significance level, 23 is not an outlier.
For 5% significance level, 23 is not an outlier.
For 1% significance level, 23 is not an outlier.

Appendix C-18a
Outlier Test
Future Surface Soil - Matteo Property (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Dixon's Outlier Test for Benzo(k)fluoranthene

Total N = 24
Number NDs = 11
Number Detects = 13
10% critical value: 0.467
5% critical value: 0.521
1% critical value: 0.615
Note: NDs excluded from Outlier Test

1. Data Value 63000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.990

For 10% significance level, 63000 is an outlier.
For 5% significance level, 63000 is an outlier.
For 1% significance level, 63000 is an outlier.

2. Data Value 50 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.027

For 10% significance level, 50 is not an outlier.
For 5% significance level, 50 is not an outlier.
For 1% significance level, 50 is not an outlier.

Dixon's Outlier Test for Chrysene

Total N = 24
Number NDs = 5
Number Detects = 19
10% critical value: 0.412
5% critical value: 0.462
1% critical value: 0.547
Note: NDs excluded from Outlier Test

1. Data Value 110000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.992

For 10% significance level, 110000 is an outlier.
For 5% significance level, 110000 is an outlier.
For 1% significance level, 110000 is an outlier.

Appendix C-18a
Outlier Test
Future Surface Soil - Matteo Property (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

2. Data Value 27 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.015

For 10% significance level, 27 is not an outlier.
For 5% significance level, 27 is not an outlier.
For 1% significance level, 27 is not an outlier.

Dixon's Outlier Test for Dibenzo(a,h)anthracene

Total N = 24
Number NDs = 15
Number Detects = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs excluded from Outlier Test

1. Data Value 23000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.992

For 10% significance level, 23000 is an outlier.
For 5% significance level, 23000 is an outlier.
For 1% significance level, 23000 is an outlier.

2. Data Value 40 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 40 is not an outlier.
For 5% significance level, 40 is not an outlier.
For 1% significance level, 40 is not an outlier.

Dixon's Outlier Test for Indeno(1,2,3-cd)pyrene

Total N = 24
Number NDs = 11
Number Detects = 13
10% critical value: 0.467
5% critical value: 0.521

Appendix C-18a
Outlier Test
Future Surface Soil - Matteo Property (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

1% critical value: 0.615
Note: NDs excluded from Outlier Test

1. Data Value 35000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.987

For 10% significance level, 35000 is an outlier.
For 5% significance level, 35000 is an outlier.
For 1% significance level, 35000 is an outlier.

2. Data Value 45 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.016

For 10% significance level, 45 is not an outlier.
For 5% significance level, 45 is not an outlier.
For 1% significance level, 45 is not an outlier.

Dixon's Outlier Test for Pyrene

Total N = 24
Number NDs = 4
Number Detects = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535
Note: NDs excluded from Outlier Test

1. Data Value 180000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.994

For 10% significance level, 180000 is an outlier.
For 5% significance level, 180000 is an outlier.
For 1% significance level, 180000 is an outlier.

2. Data Value 27 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.013

For 10% significance level, 27 is not an outlier.
For 5% significance level, 27 is not an outlier.

For 1% significance level, 27 is not an outlier.

Dixon's Outlier Test for Dioxin

Total N = 14
Number NDs = 0
Number Detects = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641
Note: NDs excluded from Outlier Test

1. Data Value 48.3667 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.382

For 10% significance level, 48.3667 is not an outlier.
For 5% significance level, 48.3667 is not an outlier.
For 1% significance level, 48.3667 is not an outlier.

2. Data Value 0.735306 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.009

For 10% significance level, 0.735306 is not an outlier.
For 5% significance level, 0.735306 is not an outlier.
For 1% significance level, 0.735306 is not an outlier.

Dixon's Outlier Test for 4,4'-DDT

Total N = 25
Number NDs = 15
Number Detects = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs excluded from Outlier Test

1. Data Value 32000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.992

Appendix C-18a
Outlier Test
Future Surface Soil - Matteo Property (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

For 10% significance level, 32000 is an outlier.
For 5% significance level, 32000 is an outlier.
For 1% significance level, 32000 is an outlier.

2. Data Value 4.6 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 4.6 is not an outlier.
For 5% significance level, 4.6 is not an outlier.
For 1% significance level, 4.6 is not an outlier.

No Outlier Test for Delta-BHC

Dixon's Outlier Test for Dieldrin

Total N = 24
Number NDs = 18
Number Detects = 6
10% critical value: 0.482
5% critical value: 0.56
1% critical value: 0.698
Note: NDs excluded from Outlier Test

1. Data Value 2400 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.988

For 10% significance level, 2400 is an outlier.
For 5% significance level, 2400 is an outlier.
For 1% significance level, 2400 is an outlier.

2. Data Value 3.6 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 3.6 is not an outlier.
For 5% significance level, 3.6 is not an outlier.
For 1% significance level, 3.6 is not an outlier.

Dixon's Outlier Test for Heptachlor Epoxide

Appendix C-18a
Outlier Test
Future Surface Soil - Matteo Property (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Total N = 25
Number NDs = 18
Number Detects = 7
10% critical value: 0.434
5% critical value: 0.507
1% critical value: 0.637
Note: NDs excluded from Outlier Test

1. Data Value 1600 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.926

For 10% significance level, 1600 is an outlier.
For 5% significance level, 1600 is an outlier.
For 1% significance level, 1600 is an outlier.

2. Data Value 2.5 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.001

For 10% significance level, 2.5 is not an outlier.
For 5% significance level, 2.5 is not an outlier.
For 1% significance level, 2.5 is not an outlier.

Dixon's Outlier Test for Aroclor 1254

Total N = 42
Number NDs = 29
Number Detects = 13
10% critical value: 0.467
5% critical value: 0.521
1% critical value: 0.615
Note: NDs excluded from Outlier Test

1. Data Value 1200 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.620

For 10% significance level, 1200 is an outlier.
For 5% significance level, 1200 is an outlier.
For 1% significance level, 1200 is an outlier.

2. Data Value 36 is a Potential Outlier (Lower Tail)?

Appendix C-18a
Outlier Test
Future Surface Soil - Matteo Property (Excluding Nondetects)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Test Statistic: 0.005

For 10% significance level, 36 is not an outlier.
For 5% significance level, 36 is not an outlier.
For 1% significance level, 36 is not an outlier.

Dixon's Outlier Test for Aroclor 1260

Total N = 40
Number NDs = 17
Number Detects = 23
10% critical value: 0.374
5% critical value: 0.421
1% critical value: 0.505
Note: NDs excluded from Outlier Test

1. Data Value 200000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.996

For 10% significance level, 200000 is an outlier.
For 5% significance level, 200000 is an outlier.
For 1% significance level, 200000 is an outlier.

2. Data Value 20 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.018

For 10% significance level, 20 is not an outlier.
For 5% significance level, 20 is not an outlier.
For 1% significance level, 20 is not an outlier.

Appendix C-18b
Outlier Test
Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation 4/5/2016 9:40:23 PM

From File ProUCL_Input_Organic_d.xls

Full Precision OFF

Dixon's Outlier Test for Benzo(a)anthracene

Total N = 24

Number NDs = 5

Number Detects = 19

Number Data (n) = 24

10% critical value: 0.367

5% critical value: 0.413

1% critical value: 0.497

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 130000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.996

For 10% significance level, 130000 is an outlier.

For 5% significance level, 130000 is an outlier.

For 1% significance level, 130000 is an outlier.

2. Data Value 19 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.017

For 10% significance level, 19 is not an outlier.

For 5% significance level, 19 is not an outlier.

For 1% significance level, 19 is not an outlier.

Dixon's Outlier Test for Benzo(a)pyrene

Total N = 24

Number NDs = 8

Number Detects = 16

Number Data (n) = 24

10% critical value: 0.367

5% critical value: 0.413

1% critical value: 0.497

Appendix C-18b
Outlier Test
Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 79000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.993

For 10% significance level, 79000 is an outlier.
For 5% significance level, 79000 is an outlier.
For 1% significance level, 79000 is an outlier.

2. Data Value 29 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.011

For 10% significance level, 29 is not an outlier.
For 5% significance level, 29 is not an outlier.
For 1% significance level, 29 is not an outlier.

Dixon's Outlier Test for Benzo(b)fluoranthene

Total N = 24
Number NDs = 5
Number Detects = 19
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 110000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.993

For 10% significance level, 110000 is an outlier.
For 5% significance level, 110000 is an outlier.
For 1% significance level, 110000 is an outlier.

2. Data Value 23 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.023

For 10% significance level, 23 is not an outlier.
For 5% significance level, 23 is not an outlier.

For 1% significance level, 23 is not an outlier.

Dixon's Outlier Test for Benzo(k)fluoranthene

Total N = 24
Number NDs = 11
Number Detects = 13
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 63000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.990

For 10% significance level, 63000 is an outlier.
For 5% significance level, 63000 is an outlier.
For 1% significance level, 63000 is an outlier.

2. Data Value 50 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.034

For 10% significance level, 50 is not an outlier.
For 5% significance level, 50 is not an outlier.
For 1% significance level, 50 is not an outlier.

Dixon's Outlier Test for Chrysene

Total N = 24
Number NDs = 5
Number Detects = 19
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 110000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.992

For 10% significance level, 110000 is an outlier.
For 5% significance level, 110000 is an outlier.
For 1% significance level, 110000 is an outlier.

2. Data Value 27 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.015

For 10% significance level, 27 is not an outlier.
For 5% significance level, 27 is not an outlier.
For 1% significance level, 27 is not an outlier.

Dixon's Outlier Test for Dibenzo(a,h)anthracene

Total N = 24
Number NDs = 15
Number Detects = 9
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 23000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.994

For 10% significance level, 23000 is an outlier.
For 5% significance level, 23000 is an outlier.
For 1% significance level, 23000 is an outlier.

2. Data Value 40 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.171

For 10% significance level, 40 is not an outlier.
For 5% significance level, 40 is not an outlier.
For 1% significance level, 40 is not an outlier.

Dixon's Outlier Test for Indeno(1,2,3-cd)pyrene

Appendix C-18b
Outlier Test
Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Total N = 24
Number NDs = 11
Number Detects = 13
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 35000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.987

For 10% significance level, 35000 is an outlier.
For 5% significance level, 35000 is an outlier.
For 1% significance level, 35000 is an outlier.

2. Data Value 45 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.017

For 10% significance level, 45 is not an outlier.
For 5% significance level, 45 is not an outlier.
For 1% significance level, 45 is not an outlier.

Dixon's Outlier Test for Pyrene

Total N = 24
Number NDs = 4
Number Detects = 20
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 180000 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.994

For 10% significance level, 180000 is an outlier.
For 5% significance level, 180000 is an outlier.

Appendix C-18b
Outlier Test
Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

For 1% significance level, 180000 is an outlier.

2. Data Value 27 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.013

For 10% significance level, 27 is not an outlier.
For 5% significance level, 27 is not an outlier.
For 1% significance level, 27 is not an outlier.

Dixon's Outlier Test for Dioxin

Total N = 14
Number NDs = 0
Number Detects = 14
Number Data (n) = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 48.3667 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.382

For 10% significance level, 48.3667 is not an outlier.
For 5% significance level, 48.3667 is not an outlier.
For 1% significance level, 48.3667 is not an outlier.

2. Data Value 0.735306 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.009

For 10% significance level, 0.735306 is not an outlier.
For 5% significance level, 0.735306 is not an outlier.
For 1% significance level, 0.735306 is not an outlier.

Rosner's Outlier Test for 1 Outliers in 4,4'-DDT

Total N	**25**
Number NDs	**15**

Appendix C-18b
Outlier Test
Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Number Detects	**25**
Mean with NDs=DL/2	**1301**
SD with NDs=DL/2	**6396**
Number of data	**25**
Number of suspected outliers	**1**
NDs replaced with half value.	

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical alue (5%)	Critical alue (1%)
1	1301	6267	32000	17	4.899	2.82	3.14

For 5% Significance Level, there is 1 Potential Outlier
Therefore, Observation 32000 is a Potential Statistical Outlier

For 1% Significance Level, there is 1 Potential Outlier

Dixon's Outlier Test for Delta-BHC

Total N = 24
Number NDs = 22
Number Detects = 2
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 690 is a Potential Outlier (Upper Tail)?

Test Statistic: 1.000

For 10% significance level, 690 is an outlier.
For 5% significance level, 690 is an outlier.
For 1% significance level, 690 is an outlier.

2. Data Value 0.85 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.167

For 10% significance level, 0.85 is not an outlier.
For 5% significance level, 0.85 is not an outlier.
For 1% significance level, 0.85 is not an outlier.

Appendix C-18b
Outlier Test
Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

Dixon's Outlier Test for Dieldrin

Total N = 24
Number NDs = 18
Number Detects = 6
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 2400 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.996

For 10% significance level, 2400 is an outlier.
For 5% significance level, 2400 is an outlier.
For 1% significance level, 2400 is an outlier.

2. Data Value 1.75 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 1.75 is not an outlier.
For 5% significance level, 1.75 is not an outlier.
For 1% significance level, 1.75 is not an outlier.

Rosner's Outlier Test for 1 Outliers in Heptachlor Epoxide

Total N	**25**
Number NDs	**18**
Number Detects	**25**
Mean with NDs=DL/2	**71.25**
SD with NDs=DL/2	**319.4**
Number of data	**25**
Number of suspected outliers	**1**
NDs replaced with half value.	

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical alue (5%)	Critical alue (1%)
1	71.25	312.9	1600	17	4.885	2.82	3.14

Appendix C-18b
Outlier Test
Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

For 5% Significance Level, there is 1 Potential Outlier
Therefore, Observation 1600 is a Potential Statistical Outlier

For 1% Significance Level, there is 1 Potential Outlier

Rosner's Outlier Test for 1 Outliers in Aroclor 1254

Total N	**42**
Number NDs	**29**
Number Detects	**42**
Mean with NDs=DL/2	**120.2**
SD with NDs=DL/2	**258.9**
Number of data	**42**
Number of suspected outliers	**1**
NDs replaced with half value.	

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	120.2	255.8	1200	27	4.222	3.06	3.4

For 5% Significance Level, there is 1 Potential Outlier
Therefore, Observation 1200 is a Potential Statistical Outlier

For 1% Significance Level, there is 1 Potential Outlier

Rosner's Outlier Test for 1 Outliers in Aroclor 1260

Total N	**40**
Number NDs	**17**
Number Detects	**40**
Mean with NDs=DL/2	**5196**
SD with NDs=DL/2	**31595**
Number of data	**40**
Number of suspected outliers	**1**
NDs replaced with half value.	

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	5196	31197	200000	16	6.244	3.04	3.38

Appendix C-18b
Outlier Test
Future Surface Soil - Matteo Property (Replacing Nondetects with 1/2 the Detection Limit)
Matteo Sons, Inc. Site
Thorofare, New Jersey

For 5% Significance Level, there is 1 Potential Outlier

Therefore, Observation 200000 is a Potential Statistical Outlier

For 1% Significance Level, there is 1 Potential Outlier

Appendix D

Appendix D

Shower Model

Appendix D Contents
Matteo & Sons, Inc. Site
Thorofare, New Jersey

D-1 Values Used for Shower Model - Adult
D-2 Values Used for Shower Model - Child (0-6 years)
D-3 Medium-Specific Exposure Point Concentration Summary - Groundwater (Adult)
D-4 Medium-Specific Exposure Point Concentration Summary - Groundwater (Child [0-6 years])

TABLE D-1
VALUES USED FOR SHOWER MODEL
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Air
Receptor Population:	Resident
Receptor Age:	Adult

Exposure Route	Parameter Code	Parameter Definition	Unit	Reasonable Maximum Exposure		Central Tendency Exposure		Intake Equation/ Model Name
				Value	Reference	Value	Reference	
Inhalation	CW	Chemical Concentration in Water	µg/L	Table B-3.3	Table B-3.3	Table B-3.3	Table B-3.3	Maximum air concentration in bathroom (C_{aMax}) (µg/m^3) =
	f	Fraction volatilized [1]	--	chem-specific	Schaum et al.	chem-specific	Schaum et al.	
	F_w	Flow Rate	L/hr	1000	Schaum et al.	500	Schaum et al.	CW x f x Fw x t_1 x 1/Va
	t_1	Time of shower	hr	0.25	EPA 2004	0.10	EPA 2004	
	V_a	Bathroom volume	m^3	6	Schaum et al.	16	Schaum et al.	EPC (µg/m^3) =
	t_2	Time after shower in bathroom	hr	0.33	EPA 2004	0.15	EPA 2004	(((C_{aMax}/2) x t_1) + (C_{aMax} x t_2)) / (t_1 + t_2)

µg = microgram
L = liter
hr = hour
m = meter
EPC = Exposure Point Concentration, the mean air concentration in the bathroom during and after shower
Note:
[1] applies only to volatile chemicals. Volatile chemicals are defined as chemicals with a Henry's Law constant of 1×10^{-5} atm-m^3/mole or greater and with a molecular weight of less than 200 g/mole.
Sources:
EPA 2004: Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R/99/005. July.
Schaum et al. 1994. Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water. Water Contamination and Health, edited by Rhoda G.M. Wang. New York: Marcel Dekker, Inc.

TABLE D-2
VALUES USED FOR SHOWER MODEL
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Groundwater or Surface Water
Exposure Medium:	Air
Receptor Population:	Resident
Receptor Age:	Child (0-6 years)

Exposure Route	Parameter Code	Parameter Definition	Unit	Reasonable Maximum Exposure		Central Tendency Exposure		Intake Equation/ Model Name
				Value	Reference	Value	Reference	
Inhalation	CW	Chemical Concentration in Water	µg/L	Table B-3.3	Table B-3.3	Table B-3.3	Table B-3.3	Maximum air concentration in bathroom (C_{aMax}) (µg/m^3) =
	f	Fraction volatilized [1]	--	chem-specific	Schaum et al.	chem-specific	Schaum et al.	
	F_w	Flow Rate	L/hr	1000	Schaum et al.	500	Schaum et al.	CW x f x Fw x t_1 x 1/Va
	t_1	Time of shower	hr	0.45	EPA 2004	0.14	EPA 2004	
	V_a	Bathroom volume	m^3	6	Schaum et al.	16	Schaum et al.	EPC (µg/m^3) =
	t_2	Time after shower in bathroom	hr	0.55	EPA 2004	0.19	EPA 2004	(((C_{aMax}/2) x t_1) + (C_{aMax} x t_2)) / (t_1 + t_2)

µg = microgram
L = liter
hr = hour
m = meter
EPC = Exposure Point Concentration, the mean air concentration in the bathroom during and after shower
Note:
[1] applies only to volatile chemicals. Volatile chemicals are defined as chemicals with a Henry's Law constant of 1×10^{-5} atm-m^3/mole or greater and with a molecular weight of less than 200 g/mole.
Sources:
EPA 2004: Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R/99/005. July.
Schaum et al. 1994. Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water. Water Contamination and Health, edited by Rhoda G.M. Wang. New York: Marcel Dekker, Inc.

TABLE D-3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Air
Receptor Population:	Resident
Receptor Age:	Adult

Exposure Point	CAS No.	Chemical of Potential Concern	Groundwater Exposure Point Concentration (EPC) (µg/L)	Fraction Volatilized	Reasonable Maximum Exposure		Central Tendency Exposure	
					C_{aMax} (µg/m^3)	Air EPC (µg/m^3)	C_{aMax} (µg/m^3)	Air EPC (µg/m^3)
Water Vapor at Showerhead		**Volatile Organic Compounds**						
	123-91-1	1,4-Dioxane	1.1E+00	5.4E-01	2.5E+01	1.9E+01	1.8E+00	1.5E+00
	156-59-2	cis-1,2-Dichloroethene	3.7E+00	5.6E-01	8.7E+01	6.8E+01	6.5E+00	5.2E+00
	79-01-6	Trichloroethene	2.0E-01	5.3E-01	4.3E+00	3.4E+00	3.3E-01	2.6E-01
	75-01-4	Vinyl Chloride	7.0E+00	5.9E-01	1.7E+02	1.3E+02	1.3E+01	1.0E+01

EPC = Exposure Point Concentration, the mean air concentration in the bathroom during and after shower

µg/L = microgram per liter

µg/m^3 = microgram per cubic meter

TABLE D-4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Air
Receptor Population:	Resident
Receptor Age:	Child (0-6 years)

Exposure Point	CAS No.	Chemical of Potential Concern	Groundwater Exposure Point Concentration (EPC) (µg/L)	Fraction Volatilized	Reasonable Maximum Exposure		Central Tendency Exposure	
					C_{aMax} (µg/m^3)	Air EPC (µg/m^3)	C_{aMax} (µg/m^3)	Air EPC (µg/m^3)
Water Vapor at Showerhead		**Volatile Organic Compounds**						
	123-91-1	1,4-Dioxane	1.1E+00	5.4E-01	4.4E+01	3.4E+01	2.6E+00	2.0E+00
	156-59-2	cis-1,2-Dichloroethene	3.7E+00	5.6E-01	1.6E+02	1.2E+02	9.1E+00	7.2E+00
	79-01-6	Trichloroethene	2.0E-01	5.3E-01	7.8E+00	6.1E+00	4.6E-01	3.6E-01
	75-01-4	Vinyl Chloride	7.0E+00	5.9E-01	3.1E+02	2.4E+02	1.8E+01	1.4E+01

EPC = Exposure Point Concentration, the average air concentration in the bathroom during and after shower

µg/L = microgram per liter

µg/m^3 = microgram per cubic meter

Appendix E

Appendix E

RAGS D Tables for CTE Scenario

Appendix E Contents
Matteo & Sons, Inc. Site
Thorofare, New Jersey

E-1 Calculation of Chemical Cancer Risks and Noncancer Hazards - Central Tendency Exposure
- E-0.0.1 Trichloroethene - Surface Soil for Current/Future Trespasser (Adolescent [6-18 years]) at Open Field/Waste Disposal Area
- E-0.0.2 Trichloroethene - Surface Soil for Future Resident at Matteo Property
- E-0.0.3 Trichloroethene - Groundwater for Current/Future Resident
- E-1.1 Current/Future Site Worker - Scrapyard Area
- E-1.2 Current/Future Trespasser (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
- E-1.3 Current Residents (Adults and Children [0-6 years]) - Matteo Property
- E-1.4 Future Residents (Adults and Children [0-6 years]) - Matteo Property
- E-1.5a Current/Future Angler (Adult) - Woodbury Creek/Hessian Run
- E-1.5b Current/Future Angler (Child [0-6 years]) - Woodbury Creek/Hessian Run

E-2 Summary of Receptor Risks and Hazards for Chemical of Potential Concerns - Central Tendency Exposure
- E-2.1 Current/Future Site Worker - Scrapyard Area
- E-2.2 Current/Future Trespasser (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
- E-2.3 Current Residents (Adults and Children [0-6 years]) - Matteo Property
- E-2.4 Future Residents (Adults and Children [0-6 years]) - Matteo Property
- E-2.5a Current/Future Angler (Adult) - Woodbury Creek/Hessian Run
- E-2.5b Current/Future Angler (Child [0-6 years]) - Woodbury Creek/Hessian Run

E-3 Risk Assessment Summary - Central Tendency Exposure
- E-3.1 Current/Future Site Worker - Scrapyard Area
- E-3.2 Current/Future Trespasser (Adolescent [6-18 years]) - Open Field/Waste Disposal Area
- E-3.3 Current Residents (Adults and Children [0-6 years]) - Matteo Property
- E-3.4 Future Residents (Adults and Children [0-6 years]) - Matteo Property
- E-3.5a Current/Future Angler (Adult) - Woodbury Creek/Hessian Run
- E-3.5b Current/Future Angler (Child [0-6 years]) - Woodbury Creek/Hessian Run

TABLE E-0.0.1

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

SURFACE SOIL FOR CURRENT/FUTURE TRESPASSER (ADOLESCENT [6 - 18 YEARS] AT OPEN FIELD/ WASTE DISPOSAL AREA

CENTRAL TENDENCY EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Common Exposure Parameters

Soil Concentration (CS)	7.0E-03	mg/kg
Exposure Frequency (EF)	50	days

Ingestion

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	mg/day	mg/kg	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	CS	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2 x 10^{-6} kg/mg)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2 x 10^{-6} kg/mg)*	*(C9 + C12)*
Age group	Body Weight	Ingestion Rate	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
6 to <16 years	44	50	7.0E-03	10	2.0E-02	9.3E-03	3	**4.3E-12**	4.6E-02	3.7E-02	**5.7E-12**	**1.0E-11**
16 to <18 years	44	50	7.0E-03	2	3.9E-03	9.3E-03	1	**2.9E-13**	4.6E-02	3.7E-02	**1.1E-12**	**1.4E-12**
											Total Ingestion Risk	**1.1E-11**

Inhalation

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	hr/day	m^3/kg	$\mu g/m^3$	yr	-	$(\mu g/m^3)^{-1}$	-	-	$(\mu g/m^3)^{-1}$	$(\mu g/m^3)^{-1}$	-	-
Equation	-	-	*(CS / C3 x 1000 µg/mg)*	-	*(C5 / 70 yr x C2 / 24 hrs x EF / 365 days)*	-	-	*(C4 x C6 x C7 x C8)*	-	*(C10 − C7)*	*(C4 x C6 x C11)*	*(C9 + C12)*
Age group	Exposure Time	Volatilization Factor	Chemical Concentration in Air	Age Group Duration	Duration Adjustment	Kidney Unit Risk	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Unit Risk	NHL+Liver Unit Risk	**NHL+Liver Partial Risk**	**Total Partial Risk**
6 to <16 years	1	3.3E+03	2.1E-03	10	8.2E-04	1.0E-06	3	**5.2E-12**	4.1E-06	3.1E-06	**5.3E-12**	**1.1E-11**
16 to <18 years	1	3.3E+03	2.1E-03	2	1.6E-04	1.0E-06	1	**3.4E-13**	4.1E-06	3.1E-06	**1.1E-12**	**1.4E-12**
											Total Inhalation Risk	**1.2E-11**

ADAF = age-dependent adjustment factors

Source:

(1) EPA 2011. Toxicological Review of Trichloroethylene (CAS No. 79-01-6) in Support of Summary Information on the Integrated Risk Information System (IRIS). September

TABLE E-0.0.2

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

SURFACE SOIL FOR FUTURE RESIDENT AT MATTEO PROPERTY

CENTRAL TENDENCY EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Common Exposure Parameters

Soil Concentration (CS)	7.0E-03	mg/kg
Exposure Frequency (EF)	350	days

Ingestion

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	mg/day	mg/kg	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	CS	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2 x 10^{-6} kg/mg)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2 x 10^{-6} kg/mg)*	*(C9 + C12)*
Age group	Body Weight	Ingestion Rate	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	15	100	7.0E-03	2	2.7E-02	9.3E-03	10	**1.2E-10**	4.6E-02	3.7E-02	**4.7E-11**	**1.7E-10**
2 to <6 years	15	100	7.0E-03	4	5.5E-02	9.3E-03	3	**7.1E-11**	4.6E-02	3.7E-02	**9.4E-11**	**1.7E-10**
16 to <25 years	70	50	7.0E-03	9	1.2E-01	9.3E-03	1	**5.7E-12**	4.6E-02	3.7E-02	**2.3E-11**	**2.8E-11**
											Total Ingestion Risk	**3.6E-10**

Inhalation

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	hr/day	m^3/kg	$\mu g/m^3$	yr	-	$(\mu g/m^3)^{-1}$	-	-	$(\mu g/m^3)^{-1}$	$(\mu g/m^3)^{-1}$	-	-
Equation	-	-	*(CS / C3 x 1000 µg/mg)*	-	*(C5 / 70 yr x C2 / 24 hrs x EF / 365 days)*	-	-	*(C4 x C6 x C7 x C8)*	-	*(C10 − C7)*	*(C4 x C6 x C11)*	*(C9 + C12)*
Age group	Exposure Time	Volatilization Factor	Chemical Concentration in Air	Age Group Duration	Duration Adjustment	Kidney Unit Risk	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Unit Risk	NHL+Liver Unit Risk	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	24	3.3E+03	2.1E-03	2	2.7E-02	1.0E-06	10	**5.8E-10**	4.1E-06	3.1E-06	**1.8E-10**	**7.6E-10**
2 to <6 years	24	3.3E+03	2.1E-03	4	5.5E-02	1.0E-06	3	**3.5E-10**	4.1E-06	3.1E-06	**3.6E-10**	**7.1E-10**
16 to <25 years	24	3.3E+03	2.1E-03	9	1.2E-01	1.0E-06	1	**2.6E-10**	4.1E-06	3.1E-06	**8.1E-10**	**1.1E-09**
											Total Inhalation Risk	**2.5E-09**

ADAF = age-dependent adjustment factors

Source:

(1) EPA 2011. Toxicological Review of Trichloroethylene (CAS No. 79-01-6) in Support of Summary Information on the Integrated Risk Information System (IRIS). September

TABLE E-0.0.3

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

GROUNDWATER FOR FUTURE RESIDENT

CENTRAL TENDENCY EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Common Exposure Parameters

Groundwater Concentration (CW)	0.20	µg/L	
Exposure Frequency	350	days	(Table B-4.2)
Permeability Coefficient	0.012	cm/hr	(Table B-4.6)
Fraction Absorbed Water	1		(Table B-4.6)
Lag time	0.58	hr/day	(Table B-4.6)
Exposure Time - child	0.14	hr/day	(Table B-4.2)
Exposure Time - adult	0.10	hr/day	(Table B-4.2)

Ingestion

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	L/day	mg/L	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	CW/1000	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2)*	*(C9 + C12)*
Age group	Body Weight	Ingestion Rate	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	15	0.3	0.00020	2	2.7E-02	9.3E-03	10	**1.0E-08**	4.6E-02	3.7E-02	**4.0E-09**	**1.4E-08**
2 to <6 years	15	0.3	0.00020	4	5.5E-02	9.3E-03	3	**6.1E-09**	4.6E-02	3.7E-02	**8.0E-09**	**1.4E-08**
16 to <25 years	70	1	0.00020	9	1.2E-01	9.3E-03	1	**3.2E-09**	4.6E-02	3.7E-02	**1.3E-08**	**1.6E-08**
										Total Ingestion Risk		**4.4E-08**

Dermal Contact

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	kg	cm^2/day	mg/cm^2	yr	-	$(mg/kg/d)^{-1}$	-	-	$(mg/kg/d)^{-1}$	$(mg/kg/d)^{-1}$	-	-
Equation	-	-	*Table B-4.6*	-	*(C5 / 70 yr x EF / 365 days)*	-	-	*(C3 x C4 x C6 x C7 x C8 / C2)*	-	*(C10 − C7)*	*(C3 x C4 x C6 x C11 / C2)*	*(C9 + C12)*
Age group	Body Weight	Skin Surface Area	Dermal Absorbed (DA_{event})	Age Group Duration	Duration Adjustment	Kidney Slope Factor	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Slope Factor	NHL+Liver Slope Factor	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	15	6,600	1.9E-09	2	2.7E-02	9.3E-03	10	**2.1E-09**	4.6E-02	3.7E-02	**8.3E-10**	**2.9E-09**
2 to <6 years	15	6,600	1.9E-09	4	5.5E-02	9.3E-03	3	**1.3E-09**	4.6E-02	3.7E-02	**1.7E-09**	**2.9E-09**
16 to <25 years	70	18,000	1.6E-09	9	1.2E-01	9.3E-03	1	**4.7E-10**	4.6E-02	3.7E-02	**1.8E-09**	**2.3E-09**
										Total Dermal Risk		**8.1E-09**

TABLE E-0.0.3

CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS - TRICHLOROETHYLENE

GROUNDWATER FOR FUTURE RESIDENT

CENTRAL TENDENCY EXPOSURE

Matteo & Sons, Inc. Site

Thorofare, New Jersey

Inhalation of Volatile Chemicals

	Exposure Parameters					Cancer Risk Calculations						
C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*	*C12*	*C13*
Unit	hr/day	$\mu g/m^3$	$\mu g/m^3$	yr	-	$(\mu g/m^3)^{-1}$	-	-	$(\mu g/m^3)^{-1}$	$(\mu g/m^3)^{-1}$	-	-
Equation	-	Table D-3/D-4	*C3*	-	*(C5 / 70 yr x C2 / 24 hrs x EF / 365 days)*	-	-	*(C4 x C6 x C7 x C8)*	-	*(C10 − C7)*	*(C4 x C6 x C11)*	*(C9 + C12)*
Age group	Exposure Time	Chemical Concentration in Air	Exposure Concentration	Age Group Duration	Duration Adjustment	Kidney Unit Risk	Kidney Cancer ADAF	**Kidney ADAF-Adjusted Partial Risk**	Kidney+NHL+ Liver Unit Risk	NHL+Liver Unit Risk	**NHL+Liver Partial Risk**	**Total Partial Risk**
0 to <2 years	0.14	3.6E-01	3.6E-01	2	1.6E-04	1.0E-06	10	**5.7E-10**	4.1E-06	3.1E-06	**1.8E-10**	**7.5E-10**
2 to <6 years	0.14	3.6E-01	3.6E-01	4	3.2E-04	1.0E-06	3	**3.4E-10**	4.1E-06	3.1E-06	**3.6E-10**	**7.0E-10**
16 to <25 years	0.1	2.6E-01	2.6E-01	9	5.1E-04	1.0E-06	1	**1.3E-10**	4.1E-06	3.1E-06	**4.1E-10**	**5.5E-10**
											Total Inhalation Risk	**2.0E-09**

ADAF = age-dependent adjustment factors

Source:

(1) EPA 2011. Toxicological Review of Trichloroethylene (CAS No. 79-01-6) in Support of Summary Information on the Integrated Risk Information System (IRIS). September

TABLE E-1.1
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Scrapyard Area	Ingestion	**Volatile Organic Compounds**												
				Trichloroethene	2.40E-03	mg/kg	1.32E-10	mg/kg-day	4.60E-02	$(mg/kg-day)^{-1}$	6.08E-12	1.03E-09	mg/kg-day	5.00E-04	mg/kg-day	2.06E-06
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.25E-01	mg/kg	2.89E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.11E-08	2.25E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	4.96E-01	mg/kg	2.73E-08	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	2.00E-07	2.13E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	6.59E-01	mg/kg	3.63E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.65E-08	2.83E-07	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.75E-01	mg/kg	9.66E-09	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	7.05E-08	7.51E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.12E-01	mg/kg	2.27E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.66E-08	1.76E-07	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.92E-05	mg/kg	1.61E-12	mg/kg-day	1.30E+05	$(mg/kg-day)^{-1}$	2.09E-07	1.25E-11	mg/kg-day	7.00E-10	mg/kg-day	1.79E-02
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.41E+01	mg/kg	7.76E-07	mg/kg-day	3.40E-01	$(mg/kg-day)^{-1}$	2.64E-07	6.03E-06	mg/kg-day	5.00E-04	mg/kg-day	1.21E-02
				Aroclor 1248	4.80E-01	mg/kg	2.64E-08	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	5.29E-08	2.06E-07	mg/kg-day	NA	NA	NA
				Aroclor 1260	2.00E+02	mg/kg	1.10E-05	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	2.20E-05	8.57E-05	mg/kg-day	2.00E-05	mg/kg-day	4.29E+00
				Delta-BHC	6.90E-01	mg/kg	3.80E-08	mg/kg-day	1.80E+00	$(mg/kg-day)^{-1}$	6.84E-08	2.96E-07	mg/kg-day	NA	NA	NA
				Dieldrin	2.40E+00	mg/kg	1.32E-07	mg/kg-day	1.60E+01	$(mg/kg-day)^{-1}$	2.12E-06	1.03E-06	mg/kg-day	5.00E-05	mg/kg-day	2.06E-02
				Heptachlor Epoxide	1.60E+00	mg/kg	8.82E-08	mg/kg-day	9.10E+00	$(mg/kg-day)^{-1}$	8.02E-07	6.86E-07	mg/kg-day	1.30E-05	mg/kg-day	5.27E-02
				Inorganics												
				Aluminum	9.68E+03	mg/kg	5.33E-04	mg/kg-day	NA	NA	NA	4.15E-03	mg/kg-day	1.00E+00	mg/kg-day	4.15E-03
				Antimony	1.20E+01	mg/kg	6.60E-07	mg/kg-day	NA	NA	NA	5.13E-06	mg/kg-day	4.00E-04	mg/kg-day	1.28E-02
				Arsenic	4.69E+00	mg/kg	1.55E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	2.32E-07	1.21E-06	mg/kg-day	3.00E-04	mg/kg-day	4.02E-03
				Cadmium	5.96E+00	mg/kg	3.28E-07	mg/kg-day	NA	NA	NA	2.55E-06	mg/kg-day	1.00E-03	mg/kg-day	2.55E-03
				Chromium	1.53E+02	mg/kg	8.43E-06	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	4.22E-06	6.56E-05	mg/kg-day	3.00E-03	mg/kg-day	2.19E-02
				Cobalt	6.32E+00	mg/kg	3.48E-07	mg/kg-day	NA	NA	NA	2.71E-06	mg/kg-day	3.00E-04	mg/kg-day	9.03E-03
				Copper	4.07E+03	mg/kg	2.24E-04	mg/kg-day	NA	NA	NA	1.74E-03	mg/kg-day	4.00E-02	mg/kg-day	4.36E-02
				Cyanide	5.90E-01	mg/kg	3.25E-08	mg/kg-day	NA	NA	NA	2.53E-07	mg/kg-day	6.00E-04	mg/kg-day	4.21E-04
				Iron	4.53E+04	mg/kg	2.50E-03	mg/kg-day	NA	NA	NA	1.94E-02	mg/kg-day	7.00E-01	mg/kg-day	2.78E-02
				Manganese	4.04E+02	mg/kg	2.23E-05	mg/kg-day	NA	NA	NA	1.73E-04	mg/kg-day	1.40E-01	mg/kg-day	1.24E-03
				Mercury	1.41E+00	mg/kg	7.77E-08	mg/kg-day	NA	NA	NA	6.04E-07	mg/kg-day	3.00E-04	mg/kg-day	2.01E-03
				Nickel	2.18E+02	mg/kg	1.20E-05	mg/kg-day	NA	NA	NA	9.34E-05	mg/kg-day	2.00E-02	mg/kg-day	4.67E-03
				Zinc	8.76E+03	mg/kg	4.83E-04	mg/kg-day	NA	NA	NA	3.75E-03	mg/kg-day	3.00E-01	mg/kg-day	1.25E-02
			Exp. Route Total								3.03E-05					4.54E+00

TABLE E-1.1
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Scrapyard Area	Dermal Contact	**Volatile Organic Compounds**												
				Trichloroethene	2.40E-03	mg/kg	NA	NA	4.60E-02	$(mg/kg-day)^{-1}$	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.25E-01	mg/kg	4.97E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	3.62E-09	3.86E-08	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	4.96E-01	mg/kg	4.69E-09	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	3.42E-08	3.65E-08	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	6.59E-01	mg/kg	6.23E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	4.55E-09	4.85E-08	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.75E-01	mg/kg	1.66E-09	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.21E-08	1.29E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.12E-01	mg/kg	3.89E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.84E-09	3.03E-08	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.92E-05	mg/kg	6.37E-14	mg/kg-day	1.30E+05	$(mg/kg-day)^{-1}$	8.29E-09	4.96E-13	mg/kg-day	7.00E-10	mg/kg-day	7.08E-04
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.41E+01	mg/kg	3.07E-08	mg/kg-day	3.40E-01	$(mg/kg-day)^{-1}$	1.04E-08	2.39E-07	mg/kg-day	5.00E-04	mg/kg-day	4.78E-04
				Aroclor 1248	4.80E-01	mg/kg	4.89E-09	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	9.78E-09	3.80E-08	mg/kg-day	NA	NA	NA
				Aroclor 1260	2.00E+02	mg/kg	2.04E-06	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	4.07E-06	1.58E-05	mg/kg-day	2.00E-05	mg/kg-day	7.92E-01
				Delta-BHC	6.90E-01	mg/kg	5.02E-09	mg/kg-day	1.80E+00	$(mg/kg-day)^{-1}$	9.03E-09	3.90E-08	mg/kg-day	NA	NA	NA
				Dieldrin	2.40E+00	mg/kg	1.75E-08	mg/kg-day	1.60E+01	$(mg/kg-day)^{-1}$	2.79E-07	1.36E-07	mg/kg-day	5.00E-05	mg/kg-day	2.72E-03
				Heptachlor Epoxide	1.60E+00	mg/kg	1.16E-08	mg/kg-day	9.10E+00	$(mg/kg-day)^{-1}$	1.06E-07	9.05E-08	mg/kg-day	1.30E-05	mg/kg-day	6.96E-03
				Inorganics												
				Aluminum	9.68E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	1.20E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	4.69E+00	mg/kg	1.02E-08	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	1.53E-08	7.95E-08	mg/kg-day	3.00E-04	mg/kg-day	2.65E-04
				Cadmium	5.96E+00	mg/kg	4.33E-10	mg/kg-day	NA	NA	NA	3.37E-09	mg/kg-day	2.50E-05	mg/kg-day	1.35E-04
				Chromium	1.53E+02	mg/kg	NA	NA	5.00E-01	$(mg/kg-day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	6.32E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Copper	4.07E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	4.00E-02	mg/kg-day	NA
				Cyanide	5.90E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	4.53E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Manganese	4.04E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Mercury	1.41E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	2.10E-05	mg/kg-day	NA
				Nickel	2.18E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	8.00E-04	mg/kg-day	NA
				Zinc	8.76E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-01	mg/kg-day	NA
			Exp. Route Total								4.57E-06					8.03E-01

TABLE E-1.1
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Scrapyard Area	Inhalation	**Volatile Organic Compounds**												
				Trichloroethene	2.40E-03	mg/kg	2.86E-12	µg/m^3	4.10E-06	(µg/m^3)$^{-1}$	1.17E-17	2.23E-14	mg/m^3	2.00E-03	mg/m^3	1.11E-11
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.25E-01	mg/kg	6.26E-10	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	6.89E-14	4.87E-12	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	4.96E-01	mg/kg	5.92E-10	µg/m^3	1.10E-03	(µg/m^3)$^{-1}$	6.51E-13	4.60E-12	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	6.59E-01	mg/kg	7.86E-10	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	8.65E-14	6.11E-12	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	1.75E-01	mg/kg	2.09E-10	µg/m^3	1.20E-03	(µg/m^3)$^{-1}$	2.51E-13	1.63E-12	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.12E-01	mg/kg	4.91E-10	µg/m^3	1.10E-04	(µg/m^3)$^{-1}$	5.40E-14	3.82E-12	mg/m^3	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.92E-05	mg/kg	3.48E-14	µg/m^3	3.80E+01	(µg/m^3)$^{-1}$	1.32E-12	2.71E-16	mg/m^3	4.00E-08	mg/m^3	6.77E-09
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.41E+01	mg/kg	1.68E-08	µg/m^3	9.70E-05	(µg/m^3)$^{-1}$	1.63E-12	1.31E-10	mg/m^3	NA	NA	NA
				Aroclor 1248	4.80E-01	mg/kg	5.72E-10	µg/m^3	5.70E-04	(µg/m^3)$^{-1}$	3.26E-13	4.45E-12	mg/m^3	NA	NA	NA
				Aroclor 1260	2.00E+02	mg/kg	2.38E-07	µg/m^3	5.70E-04	(µg/m^3)$^{-1}$	1.36E-10	1.85E-09	mg/m^3	NA	NA	NA
				Delta-BHC	6.90E-01	mg/kg	8.23E-10	µg/m^3	5.10E-04	(µg/m^3)$^{-1}$	4.20E-13	6.40E-12	mg/m^3	NA	NA	NA
				Dieldrin	2.40E+00	mg/kg	2.86E-09	µg/m^3	4.60E-03	(µg/m^3)$^{-1}$	1.32E-11	2.23E-11	mg/m^3	NA	NA	NA
				Heptachlor Epoxide	1.60E+00	mg/kg	1.91E-09	µg/m^3	2.60E-03	(µg/m^3)$^{-1}$	4.96E-12	1.48E-11	mg/m^3	NA	NA	NA
				Inorganics												
				Aluminum	9.68E+03	mg/kg	1.15E-05	µg/m^3	NA	NA	NA	8.98E-08	mg/m^3	5.00E-03	mg/m^3	1.80E-05
				Antimony	1.20E+01	mg/kg	1.43E-08	µg/m^3	NA	NA	NA	1.11E-10	mg/m^3	NA	NA	NA
				Arsenic	4.69E+00	mg/kg	5.59E-09	µg/m^3	4.30E-03	(µg/m^3)$^{-1}$	2.40E-11	4.35E-11	mg/m^3	1.50E-05	mg/m^3	2.90E-06
				Cadmium	5.96E+00	mg/kg	7.10E-09	µg/m^3	1.80E-03	(µg/m^3)$^{-1}$	1.28E-11	5.52E-11	mg/m^3	1.00E-05	mg/m^3	5.52E-06
				Chromium	1.53E+02	mg/kg	1.82E-07	µg/m^3	1.20E-02	(µg/m^3)$^{-1}$	2.19E-09	1.42E-09	mg/m^3	1.00E-04	mg/m^3	1.42E-05
				Cobalt	6.32E+00	mg/kg	7.54E-09	µg/m^3	9.00E-03	(µg/m^3)$^{-1}$	6.78E-11	5.86E-11	mg/m^3	6.00E-06	mg/m^3	9.77E-06
				Copper	4.07E+03	mg/kg	4.85E-06	µg/m^3	NA	NA	NA	3.77E-08	mg/m^3	NA	NA	NA
				Cyanide	5.90E-01	mg/kg	7.04E-10	µg/m^3	NA	NA	NA	5.47E-12	mg/m^3	NA	NA	NA
				Iron	4.53E+04	mg/kg	5.41E-05	µg/m^3	NA	NA	NA	4.20E-07	mg/m^3	NA	NA	NA
				Manganese	4.04E+02	mg/kg	4.82E-07	µg/m^3	NA	NA	NA	3.75E-09	mg/m^3	5.00E-05	mg/m^3	7.49E-05
				Mercury	1.41E+00	mg/kg	1.68E-09	µg/m^3	NA	NA	NA	1.31E-11	mg/m^3	3.00E-04	mg/m^3	4.36E-08
				Nickel	2.18E+02	mg/kg	2.60E-07	µg/m^3	2.60E-04	(µg/m^3)$^{-1}$	6.76E-11	2.02E-09	mg/m^3	9.00E-05	mg/m^3	2.25E-05
				Zinc	8.76E+03	mg/kg	1.04E-05	µg/m^3	NA	NA	NA	8.12E-08	mg/m^3	NA	NA	NA
			Exp. Route Total								2.52E-09					1.48E-04
		Exposure Point Total									3.49E-05					5.34E+00

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
µg/m^3 = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE E-1.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Ingestion	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table E-0.0.1	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	1.15E-11	1.09E-09	mg/kg-day	5.00E-04	mg/kg-day	2.18E-06
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	1.62E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.18E-08	9.45E-08	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	6.46E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	4.72E-08	3.77E-08	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	1.52E-08	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.11E-08	8.86E-08	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	3.74E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	2.73E-08	2.18E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	9.07E-09	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	6.62E-09	5.29E-08	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	4.91E-13	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	6.38E-08	2.86E-12	mg/kg-day	7.00E-10	mg/kg-day	4.09E-03
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	8.14E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.63E-08	4.75E-08	mg/kg-day	2.00E-05	mg/kg-day	2.37E-03
				Aroclor 1260	8.51E-01	mg/kg	2.27E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	4.54E-08	1.33E-07	mg/kg-day	2.00E-05	mg/kg-day	6.63E-03
				Heptachlor Epoxide	1.20E-01	mg/kg	3.20E-09	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	2.91E-08	1.87E-08	mg/kg-day	1.30E-05	mg/kg-day	1.44E-03
				Inorganics												
				Aluminum	3.44E+03	mg/kg	9.19E-05	mg/kg-day	NA	NA	NA	5.36E-04	mg/kg-day	1.00E+00	mg/kg-day	5.36E-04
				Antimony	7.77E+00	mg/kg	2.07E-07	mg/kg-day	NA	NA	NA	1.21E-06	mg/kg-day	4.00E-04	mg/kg-day	3.02E-03
				Arsenic	4.20E+00	mg/kg	6.72E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.01E-07	3.92E-07	mg/kg-day	3.00E-04	mg/kg-day	1.31E-03
				Cadmium	1.77E+00	mg/kg	4.73E-08	mg/kg-day	NA	NA	NA	2.76E-07	mg/kg-day	1.00E-03	mg/kg-day	2.76E-04
				Chromium	1.78E+01	mg/kg	4.75E-07	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	2.37E-07	2.77E-06	mg/kg-day	3.00E-03	mg/kg-day	9.23E-04
				Cobalt	2.61E+00	mg/kg	6.95E-08	mg/kg-day	NA	NA	NA	4.06E-07	mg/kg-day	3.00E-04	mg/kg-day	1.35E-03
				Cyanide	8.50E-01	mg/kg	2.27E-08	mg/kg-day	NA	NA	NA	1.32E-07	mg/kg-day	6.00E-04	mg/kg-day	2.21E-04
				Iron	3.70E+04	mg/kg	9.87E-04	mg/kg-day	NA	NA	NA	5.76E-03	mg/kg-day	7.00E-01	mg/kg-day	8.22E-03
				Lead	1.15E+03	mg/kg	3.08E-05	mg/kg-day	NA	NA	NA	1.79E-04	mg/kg-day	NA	NA	NA
				Manganese	2.16E+02	mg/kg	5.77E-06	mg/kg-day	NA	NA	NA	3.37E-05	mg/kg-day	1.40E-01	mg/kg-day	2.41E-04
				Vanadium	4.62E+01	mg/kg	1.23E-06	mg/kg-day	NA	NA	NA	7.20E-06	mg/kg-day	7.00E-05	mg/kg-day	1.03E-01
				Zinc	7.82E+03	mg/kg	2.09E-04	mg/kg-day	NA	NA	NA	1.22E-03	mg/kg-day	3.00E-01	mg/kg-day	4.06E-03
			Exp. Route Total								5.97E-07					1.37E-01

TABLE E-1.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Dermal Contact	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	NA	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	7.08E-09	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	5.17E-09	4.13E-08	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	2.82E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	2.06E-08	1.65E-08	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	6.63E-09	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	4.84E-09	3.87E-08	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	1.63E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.19E-08	9.52E-09	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	3.96E-09	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.89E-09	2.31E-08	mg/kg-day	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	4.95E-14	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	6.43E-09	2.89E-13	mg/kg-day	7.00E-10	mg/kg-day	4.12E-04
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	3.83E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	7.66E-09	2.23E-08	mg/kg-day	2.00E-05	mg/kg-day	1.12E-03
				Aroclor 1260	8.51E-01	mg/kg	1.07E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.14E-08	6.23E-08	mg/kg-day	2.00E-05	mg/kg-day	3.12E-03
				Heptachlor Epoxide	1.20E-01	mg/kg	1.08E-09	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	9.79E-09	6.28E-09	mg/kg-day	1.30E-05	mg/kg-day	4.83E-04
				Inorganics												
				Aluminum	3.44E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	7.77E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	4.20E+00	mg/kg	1.13E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.69E-08	6.59E-08	mg/kg-day	3.00E-04	mg/kg-day	2.20E-04
				Cadmium	1.77E+00	mg/kg	1.59E-10	mg/kg-day	NA	NA	NA	9.26E-10	mg/kg-day	2.50E-05	mg/kg-day	3.71E-05
				Chromium	1.78E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	2.61E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Cyanide	8.50E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	3.70E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Lead	1.15E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.16E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Vanadium	4.62E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
				Zinc	7.82E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-01	mg/kg-day	NA
			Exp. Route Total								1.08E-07					5.39E-03

TABLE E-1.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Inhalation	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table E-0.0.1	NA	4.10E-06	$(\mu g/m^3)^{-1}$	1.19E-11	3.23E-13	mg/m^3	2.15E-03	mg/m^3	1.50E-10
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	6.07E-01	mg/kg	2.74E-11	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	3.01E-15	2.80E-11	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	2.42E-01	mg/kg	1.09E-11	$\mu g/m^3$	1.10E-03	$(\mu g/m^3)^{-1}$	1.20E-14	1.12E-11	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	5.69E-01	mg/kg	2.57E-11	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	2.82E-15	2.62E-11	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	1.40E-01	mg/kg	6.31E-12	$\mu g/m^3$	1.20E-03	$(\mu g/m^3)^{-1}$	7.58E-15	6.45E-12	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.40E-01	mg/kg	1.53E-11	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.69E-15	1.57E-11	mg/m^3	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	1.84E-05	mg/kg	8.29E-16	$\mu g/m^3$	3.80E+01	$(\mu g/m^3)^{-1}$	3.15E-14	8.47E-16	mg/m^3	4.00E-08	mg/m^3	2.12E-08
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	3.05E-01	mg/kg	1.38E-11	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	7.84E-15	1.41E-11	mg/m^3	NA	NA	NA
				Aroclor 1260	8.51E-01	mg/kg	3.84E-11	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	2.19E-14	3.92E-11	mg/m^3	NA	NA	NA
				Heptachlor Epoxide	1.20E-01	mg/kg	5.41E-12	$\mu g/m^3$	2.60E-03	$(\mu g/m^3)^{-1}$	1.41E-14	5.53E-12	mg/m^3	NA	NA	NA
				Inorganics												
				Aluminum	3.44E+03	mg/kg	1.55E-07	$\mu g/m^3$	NA	NA	NA	1.59E-07	mg/m^3	5.00E-03	mg/m^3	3.17E-05
				Antimony	7.77E+00	mg/kg	3.50E-10	$\mu g/m^3$	NA	NA	NA	3.58E-10	mg/m^3	NA	NA	NA
				Arsenic	4.20E+00	mg/kg	1.89E-10	$\mu g/m^3$	4.30E-03	$(\mu g/m^3)^{-1}$	8.14E-13	1.94E-10	mg/m^3	2.00E-04	mg/m^3	9.68E-07
				Cadmium	1.77E+00	mg/kg	7.99E-11	$\mu g/m^3$	1.80E-03	$(\mu g/m^3)^{-1}$	1.44E-13	8.16E-11	mg/m^3	3.00E-05	mg/m^3	2.72E-06
				Chromium	1.78E+01	mg/kg	8.02E-10	$\mu g/m^3$	1.20E-02	$(\mu g/m^3)^{-1}$	9.63E-12	8.20E-10	mg/m^3	3.00E-04	mg/m^3	2.73E-06
				Cobalt	2.61E+00	mg/kg	1.17E-10	$\mu g/m^3$	9.00E-03	$(\mu g/m^3)^{-1}$	1.06E-12	1.20E-10	mg/m^3	2.00E-05	mg/m^3	6.00E-06
				Cyanide	8.50E-01	mg/kg	3.83E-11	$\mu g/m^3$	NA	NA	NA	3.92E-11	mg/m^3	NA	NA	NA
				Iron	3.70E+04	mg/kg	1.67E-06	$\mu g/m^3$	NA	NA	NA	1.70E-06	mg/m^3	NA	NA	NA
				Lead	1.15E+03	mg/kg	5.20E-08	$\mu g/m^3$	NA	NA	NA	5.31E-08	mg/m^3	NA	NA	NA
				Manganese	2.16E+02	mg/kg	9.75E-09	$\mu g/m^3$	NA	NA	NA	9.97E-09	mg/m^3	1.70E-04	mg/m^3	5.86E-05
				Vanadium	4.62E+01	mg/kg	2.08E-09	$\mu g/m^3$	8.30E-03	$(\mu g/m^3)^{-1}$	1.73E-11	2.13E-09	mg/m^3	3.00E-02	mg/m^3	7.10E-08
				Zinc	7.82E+03	mg/kg	3.53E-07	$\mu g/m^3$	NA	NA	NA	3.60E-07	mg/m^3	NA	NA	NA
			Exp. Route Total								4.10E-11					1.03E-04
		Exposure Point Total									7.05E-07					1.43E-01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE E-1.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Water	Surface Water	Woodbury Creek / Hessian Run	Ingestion	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.80E-01	µg/L	9.41E-10	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	6.87E-10	5.49E-09	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.20E-01	µg/L	1.67E-09	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.22E-08	9.76E-09	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	3.80E-01	µg/L	1.99E-09	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.45E-09	1.16E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.50E-01	µg/L	7.85E-10	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	5.73E-10	4.58E-09	mg/kg-day	NA	NA	NA
				Pentachlorophenol	7.72E-01	µg/L	4.04E-09	mg/kg-day	4.00E-01	$(mg/kg\text{-}day)^{-1}$	1.62E-09	2.36E-08	mg/kg-day	5.00E-03	mg/kg-day	4.71E-06
				Inorganics												
				Aluminum	7.93E+03	µg/L	4.15E-05	mg/kg-day	NA	NA	NA	2.42E-04	mg/kg-day	1.00E+00	mg/kg-day	2.42E-04
				Antimony	7.10E+00	µg/L	3.71E-08	mg/kg-day	NA	NA	NA	2.17E-07	mg/kg-day	4.00E-04	mg/kg-day	5.42E-04
				Arsenic	1.30E+01	µg/L	6.82E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.02E-07	3.98E-07	mg/kg-day	3.00E-04	mg/kg-day	1.33E-03
				Barium	2.97E+02	µg/L	1.55E-06	mg/kg-day	NA	NA	NA	9.06E-06	mg/kg-day	2.00E-01	mg/kg-day	4.53E-05
				Beryllium	1.14E+01	µg/L	5.96E-08	mg/kg-day	NA	NA	NA	3.48E-07	mg/kg-day	2.00E-03	mg/kg-day	1.74E-04
				Cadmium	3.51E+00	µg/L	1.84E-08	mg/kg-day	NA	NA	NA	1.07E-07	mg/kg-day	1.00E-03	mg/kg-day	1.07E-04
				Chromium	3.86E+01	µg/L	2.02E-07	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	1.01E-07	1.18E-06	mg/kg-day	3.00E-03	mg/kg-day	3.93E-04
				Cobalt	1.85E+01	µg/L	9.67E-08	mg/kg-day	NA	NA	NA	5.64E-07	mg/kg-day	3.00E-04	mg/kg-day	1.88E-03
				Copper	3.17E+01	µg/L	1.66E-07	mg/kg-day	NA	NA	NA	9.67E-07	mg/kg-day	4.00E-02	mg/kg-day	2.42E-05
				Cyanide	3.50E+00	µg/L	1.83E-08	mg/kg-day	NA	NA	NA	1.07E-07	mg/kg-day	6.00E-04	mg/kg-day	1.78E-04
				Iron	1.27E+05	µg/L	6.66E-04	mg/kg-day	NA	NA	NA	3.89E-03	mg/kg-day	7.00E-01	mg/kg-day	5.55E-03
				Lead	2.74E+01	µg/L	1.43E-07	mg/kg-day	NA	NA	NA	8.36E-07	mg/kg-day	NA	NA	NA
				Manganese	3.06E+02	µg/L	1.60E-06	mg/kg-day	NA	NA	NA	9.33E-06	mg/kg-day	1.40E-01	mg/kg-day	6.67E-05
				Mercury	2.87E-01	µg/L	1.50E-09	mg/kg-day	NA	NA	NA	8.76E-09	mg/kg-day	3.00E-04	mg/kg-day	2.92E-05
				Nickel	6.65E+01	µg/L	3.48E-07	mg/kg-day	NA	NA	NA	2.03E-06	mg/kg-day	2.00E-02	mg/kg-day	1.01E-04
				Vanadium	1.55E+02	µg/L	8.11E-07	mg/kg-day	NA	NA	NA	4.73E-06	mg/kg-day	7.00E-05	mg/kg-day	6.76E-02
				Zinc	4.49E+02	µg/L	2.35E-06	mg/kg-day	NA	NA	NA	1.37E-05	mg/kg-day	3.00E-01	mg/kg-day	4.57E-05
			Exp. Route Total								2.20E-07					7.83E-02

TABLE E-1.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Water	Surface Water	Woodbury Creek / Hessian Run	Dermal Contact	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.80E-01	µg/L	9.25E-07	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	6.75E-07	5.39E-06	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.20E-01	µg/L	2.82E-06	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	2.06E-05	1.64E-05	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	3.80E-01	µg/L	3.40E-06	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.48E-06	1.98E-05	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.50E-01	µg/L	1.34E-06	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	9.80E-07	7.83E-06	mg/kg-day	NA	NA	NA
				Pentachlorophenol	7.72E-01	µg/L	3.79E-06	mg/kg-day	4.00E-01	mg/kg-day	1.52E-06	2.21E-05	mg/kg-day	5.00E-03	mg/kg-day	4.43E-03
				Inorganics												
				Aluminum	7.93E+03	µg/L	2.20E-05	mg/kg-day	NA	NA	NA	1.28E-04	mg/kg-day	1.00E+00	mg/kg-day	1.28E-04
				Antimony	7.10E+00	µg/L	1.97E-08	mg/kg-day	NA	NA	NA	1.15E-07	mg/kg-day	6.00E-05	mg/kg-day	1.92E-03
				Arsenic	1.30E+01	µg/L	3.62E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	5.43E-08	2.11E-07	mg/kg-day	3.00E-04	mg/kg-day	7.04E-04
				Barium	2.97E+02	µg/L	8.24E-07	mg/kg-day	NA	NA	NA	4.81E-06	mg/kg-day	1.40E-02	mg/kg-day	3.43E-04
				Beryllium	1.14E+01	µg/L	3.16E-08	mg/kg-day	NA	NA	NA	1.85E-07	mg/kg-day	1.40E-05	mg/kg-day	1.32E-02
				Cadmium	3.51E+00	µg/L	9.75E-09	mg/kg-day	NA	NA	NA	5.69E-08	mg/kg-day	2.50E-05	mg/kg-day	2.27E-03
				Chromium	3.86E+01	µg/L	1.07E-07	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	5.36E-08	6.25E-07	mg/kg-day	7.50E-05	mg/kg-day	8.33E-03
				Cobalt	1.85E+01	µg/L	2.05E-08	mg/kg-day	NA	NA	NA	1.20E-07	mg/kg-day	3.00E-04	mg/kg-day	3.99E-04
				Copper	3.17E+01	µg/L	8.79E-08	mg/kg-day	NA	NA	NA	5.13E-07	mg/kg-day	4.00E-02	mg/kg-day	1.28E-05
				Cyanide	3.50E+00	µg/L	9.71E-09	mg/kg-day	NA	NA	NA	5.67E-08	mg/kg-day	6.00E-04	mg/kg-day	9.44E-05
				Iron	1.27E+05	µg/L	3.53E-04	mg/kg-day	NA	NA	NA	2.06E-03	mg/kg-day	7.00E-01	mg/kg-day	2.95E-03
				Lead	2.74E+01	µg/L	7.61E-09	mg/kg-day	NA	NA	NA	4.44E-08	mg/kg-day	NA	NA	NA
				Manganese	3.06E+02	µg/L	8.49E-07	mg/kg-day	NA	NA	NA	4.95E-06	mg/kg-day	5.60E-03	mg/kg-day	8.84E-04
				Mercury	2.87E-01	µg/L	7.97E-10	mg/kg-day	NA	NA	NA	4.65E-09	mg/kg-day	2.10E-05	mg/kg-day	2.21E-04
				Nickel	6.65E+01	µg/L	3.69E-08	mg/kg-day	NA	NA	NA	2.15E-07	mg/kg-day	8.00E-04	mg/kg-day	2.69E-04
				Vanadium	1.55E+02	µg/L	4.30E-07	mg/kg-day	NA	NA	NA	2.51E-06	mg/kg-day	7.00E-05	mg/kg-day	3.58E-02
				Zinc	4.49E+02	µg/L	7.48E-07	mg/kg-day	NA	NA	NA	4.36E-06	mg/kg-day	3.00E-01	mg/kg-day	1.45E-05
			Exp. Route Total								2.63E-05					7.20E-02
		Exposure Point Total									2.66E-05					1.50E-01

NA = not applicable
RfC= reference concentration
RfD = reference dose
µg/L = microgram per liter
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day

TABLE E-1.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Sediment	Sediment	Woodbury	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
		Creek /		Aroclor 1248	4.15E-02	mg/kg	1.11E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.21E-09	6.46E-09	mg/kg-day	NA	NA	NA
		Hessian Run		Aroclor 1254	2.30E-01	mg/kg	6.14E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.23E-08	3.58E-08	mg/kg-day	2.00E-05	mg/kg-day	1.79E-03
				Aroclor 1268	3.37E-02	mg/kg	9.00E-10	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.80E-09	5.25E-09	mg/kg-day	2.00E-05	mg/kg-day	2.62E-04
				Inorganics												
				Aluminum	1.30E+04	mg/kg	3.47E-04	mg/kg-day	NA	NA	NA	2.02E-03	mg/kg-day	1.00E+00	mg/kg-day	2.02E-03
				Antimony	3.32E+00	mg/kg	8.86E-08	mg/kg-day	NA	NA	NA	5.17E-07	mg/kg-day	4.00E-04	mg/kg-day	1.29E-03
				Arsenic	1.72E+01	mg/kg	2.76E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.14E-07	2.68E-06	mg/kg-day	3.00E-04	mg/kg-day	8.95E-03
				Cadmium	3.41E+00	mg/kg	9.11E-08	mg/kg-day	NA	NA	NA	5.31E-07	mg/kg-day	1.00E-03	mg/kg-day	5.31E-04
				Chromium	9.10E+01	mg/kg	2.43E-06	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	1.21E-06	1.42E-05	mg/kg-day	3.00E-03	mg/kg-day	4.72E-03
				Cobalt	1.34E+01	mg/kg	3.58E-07	mg/kg-day	NA	NA	NA	2.09E-06	mg/kg-day	3.00E-04	mg/kg-day	6.97E-03
				Cyanide	4.84E-01	mg/kg	1.29E-08	mg/kg-day	NA	NA	NA	7.53E-08	mg/kg-day	6.00E-04	mg/kg-day	1.26E-04
				Iron	2.59E+04	mg/kg	6.90E-04	mg/kg-day	NA	NA	NA	4.03E-03	mg/kg-day	7.00E-01	mg/kg-day	5.75E-03
				Manganese	3.63E+02	mg/kg	9.69E-06	mg/kg-day	NA	NA	NA	5.65E-05	mg/kg-day	1.40E-01	mg/kg-day	4.04E-04
				Thallium	1.85E-01	mg/kg	4.94E-09	mg/kg-day	NA	NA	NA	2.88E-08	mg/kg-day	1.00E-05	mg/kg-day	2.88E-03
				Vanadium	9.03E+01	mg/kg	2.41E-06	mg/kg-day	NA	NA	NA	1.41E-05	mg/kg-day	7.00E-05	mg/kg-day	2.01E-01
			Exp. Route Total								1.64E-06					2.37E-01
Sediment	Sediment	Woodbury	Dermal	**Pesticides/Polychlorinated Biphenyls**												
		Creek /	Contact	Aroclor 1248	4.15E-02	mg/kg	3.22E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	6.45E-09	1.88E-08	mg/kg-day	NA	NA	NA
		Hessian Run		Aroclor 1254	2.30E-01	mg/kg	1.79E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.57E-08	1.04E-07	mg/kg-day	2.00E-05	mg/kg-day	5.21E-03
				Aroclor 1268	3.37E-02	mg/kg	2.62E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	5.24E-09	1.53E-08	mg/kg-day	2.00E-05	mg/kg-day	7.64E-04
				Inorganics												
				Aluminum	1.30E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	3.32E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	1.72E+01	mg/kg	2.87E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.31E-07	1.67E-06	mg/kg-day	3.00E-04	mg/kg-day	5.58E-03
				Cadmium	3.41E+00	mg/kg	1.89E-09	mg/kg-day	NA	NA	NA	1.11E-08	mg/kg-day	2.50E-05	mg/kg-day	4.42E-04
				Chromium	9.10E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	1.34E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Cyanide	4.84E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	2.59E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Manganese	3.63E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Thallium	1.85E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
				Vanadium	9.03E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
			Exp. Route Total								4.78E-07					1.20E-02
		Exposure Point Total									2.12E-06					2.49E-01

NA = not applicable
RfD = reference dose
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day

TABLE E-1.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Rental Home Area	Ingestion	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.30E+02	mg/kg	4.14E-04	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	3.02E-04	8.31E-04	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	7.90E+01	mg/kg	2.52E-04	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.84E-03	5.05E-04	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	1.10E+02	mg/kg	3.51E-04	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	2.56E-04	7.03E-04	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	6.30E+01	mg/kg	2.01E-04	mg/kg-day	7.30E-02	$(mg/kg-day)^{-1}$	1.47E-05	4.03E-04	mg/kg-day	NA	NA	NA
				Chrysene	1.10E+02	mg/kg	3.51E-04	mg/kg-day	7.30E-03	$(mg/kg-day)^{-1}$	2.56E-06	7.03E-04	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	2.30E+01	mg/kg	7.33E-05	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	5.35E-04	1.47E-04	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.50E+01	mg/kg	1.12E-04	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	8.14E-05	2.24E-04	mg/kg-day	NA	NA	NA
				Pyrene	1.80E+02	mg/kg	1.14E-04	mg/kg-day	NA	NA	NA	1.15E-03	mg/kg-day	3.00E-02	mg/kg-day	3.84E-02
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	2.10E-01	mg/kg	1.34E-07	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	2.67E-07	1.34E-06	mg/kg-day	2.00E-05	mg/kg-day	6.71E-02
				Inorganics												
				Antimony	1.69E+00	mg/kg	1.07E-06	mg/kg-day	NA	NA	NA	1.08E-05	mg/kg-day	4.00E-04	mg/kg-day	2.69E-02
				Arsenic	2.62E+00	mg/kg	1.00E-06	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	1.50E-06	1.00E-05	mg/kg-day	3.00E-04	mg/kg-day	3.35E-02
				Chromium	2.58E+01	mg/kg	1.64E-05	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	8.22E-06	1.65E-04	mg/kg-day	3.00E-03	mg/kg-day	5.51E-02
				Cobalt	1.98E+00	mg/kg	1.26E-06	mg/kg-day	NA	NA	NA	1.27E-05	mg/kg-day	3.00E-04	mg/kg-day	4.23E-02
				Iron	1.08E+04	mg/kg	6.86E-03	mg/kg-day	NA	NA	NA	6.90E-02	mg/kg-day	7.00E-01	mg/kg-day	9.85E-02
				Manganese	4.32E+02	mg/kg	2.75E-04	mg/kg-day	NA	NA	NA	2.76E-03	mg/kg-day	1.40E-01	mg/kg-day	1.97E-02
				Thallium	5.76E-02	mg/kg	3.66E-08	mg/kg-day	NA	NA	NA	3.68E-07	mg/kg-day	1.00E-05	mg/kg-day	3.68E-02
			Exp. Route Total								3.04E-03					4.18E-01
Surface Soil	Surface Soil	Rental Home Area	Dermal Contact	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.30E+02	mg/kg	6.04E-05	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	4.41E-05	1.21E-04	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	7.90E+01	mg/kg	3.67E-05	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	2.68E-04	7.35E-05	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	1.10E+02	mg/kg	5.11E-05	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	3.73E-05	1.02E-04	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	6.30E+01	mg/kg	2.93E-05	mg/kg-day	7.30E-02	$(mg/kg-day)^{-1}$	2.14E-06	5.86E-05	mg/kg-day	NA	NA	NA
				Chrysene	1.10E+02	mg/kg	5.11E-05	mg/kg-day	7.30E-03	$(mg/kg-day)^{-1}$	3.73E-07	1.02E-04	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	2.30E+01	mg/kg	1.07E-05	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	7.80E-05	2.14E-05	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.50E+01	mg/kg	1.63E-05	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.19E-05	3.26E-05	mg/kg-day	NA	NA	NA
				Pyrene	1.80E+02	mg/kg	1.67E-05	mg/kg-day	NA	NA	NA	1.68E-04	mg/kg-day	3.00E-02	mg/kg-day	5.58E-03
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	2.10E-01	mg/kg	2.10E-08	mg/kg-day	2.00E+00	$(mg/kg-day)^{-1}$	4.20E-08	2.10E-07	mg/kg-day	2.00E-05	mg/kg-day	1.05E-02
				Inorganics												
				Antimony	1.69E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	2.62E+00	mg/kg	5.61E-08	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	8.42E-08	5.63E-07	mg/kg-day	3.00E-04	mg/kg-day	1.88E-03
				Chromium	2.58E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg-day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	1.98E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Iron	1.08E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Manganese	4.32E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Thallium	5.76E-02	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
			Exp. Route Total								4.42E-04					1.80E-02

TABLE E-1.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Rental Home Area	Inhalation	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.30E+02	mg/kg	3.19E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	3.51E-10	3.78E-09	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	7.90E+01	mg/kg	1.94E-06	$\mu g/m^3$	1.10E-03	$(\mu g/m^3)^{-1}$	2.13E-09	2.30E-09	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	1.10E+02	mg/kg	2.70E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	2.97E-10	3.20E-09	mg/m^3	NA	NA	NA
				Benzo(k)fluoranthene	6.30E+01	mg/kg	1.55E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.70E-10	1.83E-09	mg/m^3	NA	NA	NA
				Chrysene	1.10E+02	mg/kg	2.70E-06	$\mu g/m^3$	1.10E-05	$(\mu g/m^3)^{-1}$	2.97E-11	3.20E-09	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	2.30E+01	mg/kg	5.64E-07	$\mu g/m^3$	1.20E-03	$(\mu g/m^3)^{-1}$	6.77E-10	6.69E-10	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.50E+01	mg/kg	8.58E-07	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	9.44E-11	1.02E-09	mg/m^3	NA	NA	NA
				Pyrene	1.80E+02	mg/kg	1.12E-06	$\mu g/m^3$	NA	NA	NA	5.24E-09	mg/m^3	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls												
				Aroclor 1254	2.10E-01	mg/kg	1.31E-09	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	7.46E-13	6.11E-12	mg/m^3	NA	NA	NA
				Inorganics												
				Antimony	1.69E+00	mg/kg	1.05E-08	$\mu g/m^3$	NA	NA	NA	4.90E-11	mg/m^3	NA	NA	NA
				Arsenic	2.62E+00	mg/kg	1.63E-08	$\mu g/m^3$	4.30E-03	$(\mu g/m^3)^{-1}$	7.03E-11	7.62E-11	mg/m^3	1.50E-05	mg/m^3	5.08E-06
				Chromium	2.58E+01	mg/kg	1.61E-07	$\mu g/m^3$	1.20E-02	$(\mu g/m^3)^{-1}$	1.93E-09	7.52E-10	mg/m^3	1.00E-04	mg/m^3	7.52E-06
				Cobalt	1.98E+00	mg/kg	1.24E-08	$\mu g/m^3$	9.00E-03	$(\mu g/m^3)^{-1}$	1.11E-10	5.77E-11	mg/m^3	6.00E-06	mg/m^3	9.62E-06
				Iron	1.08E+04	mg/kg	6.73E-05	$\mu g/m^3$	NA	NA	NA	3.14E-07	mg/m^3	NA	NA	NA
				Manganese	4.32E+02	mg/kg	2.69E-06	$\mu g/m^3$	NA	NA	NA	1.26E-08	mg/m^3	5.00E-05	mg/m^3	2.51E-04
				Thallium	5.76E-02	mg/kg	3.59E-10	$\mu g/m^3$	NA	NA	NA	1.68E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								5.87E-09					2.74E-04
		Exposure Point Total									3.48E-03					4.37E-01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE E-1.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Groundwater	Groundwater	Tap Water	Ingestion	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	3.74E-06	mg/kg-day	1.00E-01	$(mg/kg-day)^{-1}$	3.74E-07
				cis-1,2-Dichloroethene	3.71E+00	µg/L	1.26E-05	mg/kg-day	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table E-0.0.3	NA	4.60E-02	$(mg/kg-day)^{-1}$	4.41E-08
				Vinyl Chloride	7.04E+00	µg/L	1.65E-04	mg/kg-day	7.20E-01	$(mg/kg-day)^{-1}$	1.19E-04
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	2.49E-08	mg/kg-day	1.60E+01	$(mg/kg-day)^{-1}$	3.98E-07
				Inorganics							
				Antimony	9.02E+01	µg/L	3.07E-04	mg/kg-day	NA	NA	NA
				Arsenic	2.67E+01	µg/L	9.09E-05	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	1.36E-04
				Cadmium	4.18E-01	µg/L	1.42E-06	mg/kg-day	NA	NA	NA
				Chromium	2.40E+00	µg/L	8.17E-06	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	4.09E-06
				Cobalt	1.61E+00	µg/L	5.49E-06	mg/kg-day	NA	NA	NA
				Cyanide	3.19E+00	µg/L	1.09E-05	mg/kg-day	NA	NA	NA
				Iron	1.95E+04	µg/L	6.64E-02	mg/kg-day	NA	NA	NA
				Lead	1.85E+01	µg/L	6.30E-05	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	8.26E-04	mg/kg-day	NA	NA	NA
				Vanadium	3.86E+00	µg/L	1.31E-05	mg/kg-day	NA	NA	NA
				Zinc	6.21E+02	µg/L	2.11E-03	mg/kg-day	NA	NA	NA
			Exp. Route Total								2.60E-04

TABLE E-1.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Groundwater	Groundwater	Tap Water	Dermal	**Volatile Organic Compounds**							
			Contact	1,4-Dioxane	1.10E+00	µg/L	1.35E-08	mg/kg-day	1.00E-01	$(mg/kg\text{-}day)^{-1}$	1.35E-09
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table E-0.0.3	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	8.15E-09
				Vinyl Chloride	7.04E+00	µg/L	7.43E-06	mg/kg-day	7.20E-01	$(mg/kg\text{-}day)^{-1}$	5.35E-06
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	1.74E-08	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	2.79E-07
				Inorganics							
				Antimony	9.02E+01	µg/L	7.43E-07	mg/kg-day	NA	NA	NA
				Arsenic	2.67E+01	µg/L	2.20E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.30E-07
				Cadmium	4.18E-01	µg/L	3.44E-09	mg/kg-day	NA	NA	NA
				Chromium	2.40E+00	µg/L	1.98E-08	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	9.88E-09
				Cobalt	1.61E+00	µg/L	5.31E-09	mg/kg-day	NA	NA	NA
				Cyanide	3.19E+00	µg/L	2.62E-08	mg/kg-day	NA	NA	NA
				Iron	1.95E+04	µg/L	1.61E-04	mg/kg-day	NA	NA	NA
				Lead	1.85E+01	µg/L	1.52E-08	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	2.00E-06	mg/kg-day	NA	NA	NA
				Vanadium	3.86E+00	µg/L	3.18E-08	mg/kg-day	NA	NA	NA
				Zinc	6.21E+02	µg/L	3.07E-06	mg/kg-day	NA	NA	NA
			Exp. Route Total								5.98E-06

TABLE E-1.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Groundwater	Groundwater	Tap Water	Inhalation	**Volatile Organic Compounds**							
			at Showerhead	1,4-Dioxane	1.10E+00	µg/L	4.18E-06	µg/m^3	5.00E-06	(µg/m^3)$^{-1}$	2.09E-11
				cis-1,2-Dichloroethene	3.71E+00	µg/L	1.49E-05	µg/m^3	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table E-0.0.3	NA	4.10E-06	(µg/m^3)$^{-1}$	2.00E-09
				Vinyl Chloride	7.04E+00	µg/L	1.03E-03	µg/m^3	4.40E-06	(µg/m^3)$^{-1}$	4.53E-09
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	NA	NA	4.60E-03	(µg/m^3)$^{-1}$	NA
				Inorganics							
				Antimony	9.02E+01	µg/L	NA	NA	NA	NA	NA
				Arsenic	2.67E+01	µg/L	NA	NA	4.30E-03	(µg/m^3)$^{-1}$	NA
				Cadmium	4.18E-01	µg/L	NA	NA	1.80E-03	(µg/m^3)$^{-1}$	NA
				Chromium	2.40E+00	µg/L	NA	NA	1.20E-02	(µg/m^3)$^{-1}$	NA
				Cobalt	1.61E+00	µg/L	NA	NA	9.00E-03	(µg/m^3)$^{-1}$	NA
				Cyanide	3.19E+00	µg/L	NA	NA	NA	NA	NA
				Iron	1.95E+04	µg/L	NA	NA	NA	NA	NA
				Lead	1.85E+01	µg/L	NA	NA	NA	NA	NA
				Manganese	2.43E+02	µg/L	NA	NA	NA	NA	NA
				Vanadium	3.86E+00	µg/L	NA	NA	8.30E-03	(µg/m^3)$^{-1}$	NA
				Zinc	6.21E+02	µg/L	NA	NA	NA	NA	NA
			Exp. Route Total								6.55E-09
		Exposure Point Total									2.66E-04

NA = not applicable
µg/L = microgram per liter
µg/m^3 = microgram per cubic meter
mg/kg-day = milligram per kilogram per day

TABLE E-1.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern			Noncancer Hazard Calculation - Adult					Noncancer Hazard Calculation - Child				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Tap Water	Ingestion	**Volatile Organic Compounds**												
				1,4-Dioxane	1.10E+00	µg/L	1.50E-05	mg/kg-day	3.00E-02	mg/kg-day	5.01E-04	2.11E-05	mg/kg-day	3.00E-02	mg/kg-day	7.02E-04
				cis-1,2-Dichloroethene	3.71E+00	µg/L	5.09E-05	mg/kg-day	2.00E-03	mg/kg-day	2.54E-02	7.12E-05	mg/kg-day	2.00E-03	mg/kg-day	3.56E-02
				Trichloroethene	1.98E-01	µg/L	2.71E-06	mg/kg-day	5.00E-04	mg/kg-day	5.42E-03	3.80E-06	mg/kg-day	5.00E-04	mg/kg-day	7.59E-03
				Vinyl Chloride	7.04E+00	µg/L	9.64E-05	mg/kg-day	3.00E-03	mg/kg-day	3.21E-02	1.35E-04	mg/kg-day	3.00E-03	mg/kg-day	4.50E-02
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	1.00E-07	mg/kg-day	5.00E-05	mg/kg-day	2.00E-03	1.40E-07	mg/kg-day	5.00E-05	mg/kg-day	2.80E-03
				Inorganics												
				Antimony	9.02E+01	µg/L	1.24E-03	mg/kg-day	4.00E-04	mg/kg-day	3.09E+00	1.73E-03	mg/kg-day	4.00E-04	mg/kg-day	4.33E+00
				Arsenic	2.67E+01	µg/L	3.66E-04	mg/kg-day	3.00E-04	mg/kg-day	1.22E+00	5.12E-04	mg/kg-day	3.00E-04	mg/kg-day	1.71E+00
				Cadmium	4.18E-01	µg/L	5.73E-06	mg/kg-day	1.00E-03	mg/kg-day	5.73E-03	8.02E-06	mg/kg-day	1.00E-03	mg/kg-day	8.02E-03
				Chromium	2.40E+00	µg/L	3.29E-05	mg/kg-day	3.00E-03	mg/kg-day	1.10E-02	4.60E-05	mg/kg-day	3.00E-03	mg/kg-day	1.53E-02
				Cobalt	1.61E+00	µg/L	2.21E-05	mg/kg-day	3.00E-04	mg/kg-day	7.36E-02	3.09E-05	mg/kg-day	3.00E-04	mg/kg-day	1.03E-01
				Cyanide	3.19E+00	µg/L	4.37E-05	mg/kg-day	6.00E-04	mg/kg-day	7.28E-02	6.11E-05	mg/kg-day	6.00E-04	mg/kg-day	1.02E-01
				Iron	1.95E+04	µg/L	2.67E-01	mg/kg-day	7.00E-01	mg/kg-day	3.82E-01	3.74E-01	mg/kg-day	7.00E-01	mg/kg-day	5.34E-01
				Lead	1.85E+01	µg/L	2.53E-04	mg/kg-day	NA	NA	NA	3.55E-04	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	3.32E-03	mg/kg-day	1.40E-01	mg/kg-day	2.37E-02	4.65E-03	mg/kg-day	1.40E-01	mg/kg-day	3.32E-02
				Vanadium	3.86E+00	µg/L	5.29E-05	mg/kg-day	7.00E-05	mg/kg-day	7.55E-01	7.40E-05	mg/kg-day	7.00E-05	mg/kg-day	1.06E+00
				Zinc	6.21E+02	µg/L	8.50E-03	mg/kg-day	3.00E-01	mg/kg-day	2.83E-02	1.19E-02	mg/kg-day	3.00E-01	mg/kg-day	3.97E-02
			Exp. Route Total								5.73E+00					8.02E+00
Groundwater	Groundwater	Tap Water	Dermal	**Volatile Organic Compounds**												
			Contact	1,4-Dioxane	1.10E+00	µg/L	4.47E-08	mg/kg-day	3.00E-02	mg/kg-day	1.49E-06	9.05E-08	mg/kg-day	3.00E-02	mg/kg-day	3.02E-06
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	2.00E-03	mg/kg-day	NA	NA	NA	2.00E-03	mg/kg-day	NA
				Trichloroethene	1.98E-01	µg/L	3.90E-07	mg/kg-day	5.00E-04	mg/kg-day	7.80E-04	7.90E-07	mg/kg-day	5.00E-04	mg/kg-day	1.58E-03
				Vinyl Chloride	7.04E+00	µg/L	4.16E-06	mg/kg-day	3.00E-03	mg/kg-day	1.39E-03	8.43E-06	mg/kg-day	3.00E-03	mg/kg-day	2.81E-03
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	5.77E-08	mg/kg-day	5.00E-05	mg/kg-day	1.15E-03	1.17E-07	mg/kg-day	5.00E-05	mg/kg-day	2.34E-03
				Inorganics												
				Antimony	9.02E+01	µg/L	2.22E-06	mg/kg-day	6.00E-05	mg/kg-day	3.71E-02	5.33E-06	mg/kg-day	6.00E-05	mg/kg-day	8.88E-02
				Arsenic	2.67E+01	µg/L	6.58E-07	mg/kg-day	3.00E-04	mg/kg-day	2.19E-03	1.58E-06	mg/kg-day	3.00E-04	mg/kg-day	5.26E-03
				Cadmium	4.18E-01	µg/L	1.03E-08	mg/kg-day	2.50E-05	mg/kg-day	4.12E-04	2.47E-08	mg/kg-day	2.50E-05	mg/kg-day	9.88E-04
				Chromium	2.40E+00	µg/L	5.92E-08	mg/kg-day	7.50E-05	mg/kg-day	7.89E-04	1.42E-07	mg/kg-day	7.50E-05	mg/kg-day	1.89E-03
				Cobalt	1.61E+00	µg/L	1.59E-08	mg/kg-day	3.00E-04	mg/kg-day	5.30E-05	3.81E-08	mg/kg-day	3.00E-04	mg/kg-day	1.27E-04
				Cyanide	3.19E+00	µg/L	7.86E-08	mg/kg-day	6.00E-04	mg/kg-day	1.31E-04	1.88E-07	mg/kg-day	6.00E-04	mg/kg-day	3.14E-04
				Iron	1.95E+04	µg/L	4.81E-04	mg/kg-day	7.00E-01	mg/kg-day	6.87E-04	1.15E-03	mg/kg-day	7.00E-01	mg/kg-day	1.65E-03
				Lead	1.85E+01	µg/L	4.56E-08	mg/kg-day	NA	NA	NA	1.09E-07	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	5.98E-06	mg/kg-day	5.60E-03	mg/kg-day	1.07E-03	1.43E-05	mg/kg-day	5.60E-03	mg/kg-day	2.56E-03
				Vanadium	3.86E+00	µg/L	9.52E-08	mg/kg-day	7.00E-05	mg/kg-day	1.36E-03	2.28E-07	mg/kg-day	7.00E-05	mg/kg-day	3.26E-03
				Zinc	6.21E+02	µg/L	9.18E-06	mg/kg-day	3.00E-01	mg/kg-day	3.06E-05	2.20E-05	mg/kg-day	3.00E-01	mg/kg-day	7.33E-05
			Exp. Route Total								4.71E-02					1.12E-01

TABLE E-1.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation - Adult					Noncancer Hazard Calculation - Child				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Tap Water	Inhalation	**Volatile Organic Compounds**												
			at Showerhead	1,4-Dioxane	1.10E+00	µg/L	1.47E-05	mg/m^3	3.00E-02	mg/m^3	4.90E-04	2.67E-05	mg/m^3	3.00E-02	mg/m^3	8.92E-04
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	2.60E-06	mg/m^3	2.00E-03	mg/m^3	1.30E-03	4.73E-06	mg/m^3	2.00E-03	mg/m^3	2.37E-03
				Vinyl Chloride	7.04E+00	µg/L	1.03E-04	mg/m^3	1.00E-01	mg/m^3	1.03E-03	1.88E-04	mg/m^3	1.00E-01	mg/m^3	1.88E-03
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Inorganics												
				Antimony	9.02E+01	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Arsenic	2.67E+01	µg/L	NA	NA	1.50E-05	mg/m^3	NA	NA	NA	1.50E-05	mg/m^3	NA
				Cadmium	4.18E-01	µg/L	NA	NA	1.00E-05	mg/m^3	NA	NA	NA	1.00E-05	mg/m^3	NA
				Chromium	2.40E+00	µg/L	NA	NA	1.00E-04	mg/m^3	NA	NA	NA	1.00E-04	mg/m^3	NA
				Cobalt	1.61E+00	µg/L	NA	NA	6.00E-06	mg/m^3	NA	NA	NA	6.00E-06	mg/m^3	NA
				Cyanide	3.19E+00	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Iron	1.95E+04	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Lead	1.85E+01	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.43E+02	µg/L	NA	NA	5.00E-05	mg/m^3	NA	NA	NA	5.00E-05	mg/m^3	NA
				Vanadium	3.86E+00	µg/L	NA	NA	1.00E-04	mg/m^3	NA	NA	NA	1.00E-04	mg/m^3	NA
				Zinc	6.21E+02	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Exp. Route Total								2.82E-03					5.13E-03
		Exposure Point Total									5.78E+00					8.13E+00

NA = not applicable
RfC= reference concentration
RfD = reference dose
mg/kg-day = milligram per kilogram per day
µg/L = microgram per liter
mg/m^3 = milligram per cubic meter

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Matteo Property	Ingestion	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table E-0.0.2	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	3.59E-10	4.47E-08	mg/kg-day	5.00E-04	mg/kg-day	8.95E-05
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.97E+01	mg/kg	1.90E-04	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.39E-04	3.82E-04	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.65E+01	mg/kg	1.16E-04	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	8.49E-04	2.33E-04	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.06E+01	mg/kg	1.61E-04	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.18E-04	3.23E-04	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	2.93E+01	mg/kg	9.35E-05	mg/kg-day	7.30E-02	$(mg/kg\text{-}day)^{-1}$	6.83E-06	1.88E-04	mg/kg-day	NA	NA	NA
				Chrysene	5.06E+01	mg/kg	1.61E-04	mg/kg-day	7.30E-03	$(mg/kg\text{-}day)^{-1}$	1.18E-06	3.23E-04	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	7.23E+00	mg/kg	2.30E-05	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.68E-04	4.62E-05	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.63E+01	mg/kg	5.20E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	3.80E-05	1.04E-04	mg/kg-day	NA	NA	NA
				Pyrene	8.26E+01	mg/kg	5.25E-05	mg/kg-day	NA	NA	NA	5.28E-04	mg/kg-day	3.00E-02	mg/kg-day	1.76E-02
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	1.72E-11	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	2.23E-06	1.73E-10	mg/kg-day	7.00E-10	mg/kg-day	2.46E-01
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.44E+01	mg/kg	9.19E-06	mg/kg-day	3.40E-01	$(mg/kg\text{-}day)^{-1}$	3.12E-06	9.24E-05	mg/kg-day	5.00E-04	mg/kg-day	1.85E-01
				Aroclor 1254	1.99E-01	mg/kg	1.27E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.54E-07	1.27E-06	mg/kg-day	2.00E-05	mg/kg-day	6.37E-02
				Aroclor 1260	3.67E+01	mg/kg	2.33E-05	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	4.67E-05	2.35E-04	mg/kg-day	2.00E-05	mg/kg-day	1.17E+01
				Delta-BHC	6.90E-01	mg/kg	4.39E-07	mg/kg-day	1.80E+00	$(mg/kg\text{-}day)^{-1}$	7.90E-07	4.41E-06	mg/kg-day	NA	NA	NA
				Dieldrin	1.17E+00	mg/kg	7.44E-07	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	1.19E-05	7.48E-06	mg/kg-day	5.00E-05	mg/kg-day	1.50E-01
				Heptachlor Epoxide	7.44E-01	mg/kg	4.73E-07	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	4.31E-06	4.76E-06	mg/kg-day	1.30E-05	mg/kg-day	3.66E-01
				Inorganics												
				Aluminum	4.83E+03	mg/kg	3.07E-03	mg/kg-day	NA	NA	NA	3.09E-02	mg/kg-day	1.00E+00	mg/kg-day	3.09E-02
				Antimony	4.51E+00	mg/kg	2.87E-06	mg/kg-day	NA	NA	NA	2.88E-05	mg/kg-day	4.00E-04	mg/kg-day	7.21E-02
				Arsenic	3.51E+00	mg/kg	1.34E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.01E-06	1.35E-05	mg/kg-day	3.00E-04	mg/kg-day	4.49E-02
				Cadmium	3.69E+00	mg/kg	2.34E-06	mg/kg-day	NA	NA	NA	2.36E-05	mg/kg-day	1.00E-03	mg/kg-day	2.36E-02
				Chromium	3.38E+01	mg/kg	2.15E-05	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	1.07E-05	2.16E-04	mg/kg-day	3.00E-03	mg/kg-day	7.20E-02
				Cobalt	3.34E+00	mg/kg	2.12E-06	mg/kg-day	NA	NA	NA	2.14E-05	mg/kg-day	3.00E-04	mg/kg-day	7.12E-02
				Copper	6.70E+02	mg/kg	4.26E-04	mg/kg-day	NA	NA	NA	4.28E-03	mg/kg-day	4.00E-02	mg/kg-day	1.07E-01
				Cyanide	8.50E-01	mg/kg	5.41E-07	mg/kg-day	NA	NA	NA	5.43E-06	mg/kg-day	6.00E-04	mg/kg-day	9.06E-03
				Iron	2.99E+04	mg/kg	1.90E-02	mg/kg-day	NA	NA	NA	1.91E-01	mg/kg-day	7.00E-01	mg/kg-day	2.73E-01
				Lead	7.67E+02	mg/kg	4.88E-04	mg/kg-day	NA	NA	NA	4.91E-03	mg/kg-day	NA	NA	NA
				Manganese	2.65E+02	mg/kg	1.68E-04	mg/kg-day	NA	NA	NA	1.69E-03	mg/kg-day	1.40E-01	mg/kg-day	1.21E-02
				Mercury	7.20E-01	mg/kg	4.58E-07	mg/kg-day	NA	NA	NA	4.60E-06	mg/kg-day	3.00E-04	mg/kg-day	1.53E-02
				Nickel	4.26E+01	mg/kg	2.71E-05	mg/kg-day	NA	NA	NA	2.72E-04	mg/kg-day	2.00E-02	mg/kg-day	1.36E-02
				Thallium	5.46E-02	mg/kg	3.47E-08	mg/kg-day	NA	NA	NA	3.49E-07	mg/kg-day	1.00E-05	mg/kg-day	3.49E-02
				Vanadium	2.93E+01	mg/kg	1.86E-05	mg/kg-day	NA	NA	NA	1.87E-04	mg/kg-day	7.00E-05	mg/kg-day	2.67E+00
				Zinc	2.64E+03	mg/kg	1.68E-03	mg/kg-day	NA	NA	NA	1.69E-02	mg/kg-day	3.00E-01	mg/kg-day	5.62E-02
			Exp. Route Total								1.40E-03					1.63E+01

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Matteo Property	Dermal Contact	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	NA	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.97E+01	mg/kg	2.78E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.03E-05	5.56E-05	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.65E+01	mg/kg	1.70E-05	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	1.24E-04	3.40E-05	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	5.06E+01	mg/kg	2.35E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.72E-05	4.71E-05	mg/kg-day	NA	NA	NA
				Benzo(k)fluoranthene	2.93E+01	mg/kg	1.36E-05	mg/kg-day	7.30E-02	$(mg/kg\text{-}day)^{-1}$	9.95E-07	2.73E-05	mg/kg-day	NA	NA	NA
				Chrysene	5.06E+01	mg/kg	2.35E-05	mg/kg-day	7.30E-03	$(mg/kg\text{-}day)^{-1}$	1.72E-07	4.71E-05	mg/kg-day	NA	NA	NA
				Dibenzo(a,h)anthracene	7.23E+00	mg/kg	3.36E-06	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	2.45E-05	6.73E-06	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.63E+01	mg/kg	7.59E-06	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	5.54E-06	1.52E-05	mg/kg-day	NA	NA	NA
				Pyrene	8.26E+01	mg/kg	7.67E-06	mg/kg-day	NA	NA	NA	7.69E-05	mg/kg-day	3.00E-02	mg/kg-day	2.56E-03
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	5.78E-13	mg/kg-day	1.30E+05	$(mg/kg\text{-}day)^{-1}$	7.52E-08	5.80E-12	mg/kg-day	7.00E-10	mg/kg-day	8.28E-03
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.44E+01	mg/kg	3.09E-07	mg/kg-day	3.40E-01	$(mg/kg\text{-}day)^{-1}$	1.05E-07	3.10E-06	mg/kg-day	5.00E-04	mg/kg-day	6.21E-03
				Aroclor 1254	1.99E-01	mg/kg	1.99E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.99E-08	2.00E-07	mg/kg-day	2.00E-05	mg/kg-day	9.99E-03
				Aroclor 1260	3.67E+01	mg/kg	3.67E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	7.34E-06	3.68E-05	mg/kg-day	2.00E-05	mg/kg-day	1.84E+00
				Delta-BHC	6.90E-01	mg/kg	4.93E-08	mg/kg-day	1.80E+00	$(mg/kg\text{-}day)^{-1}$	8.87E-08	4.94E-07	mg/kg-day	NA	NA	NA
				Dieldrin	1.17E+00	mg/kg	8.35E-08	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	1.34E-06	8.38E-07	mg/kg-day	5.00E-05	mg/kg-day	1.68E-02
				Heptachlor Epoxide	7.44E-01	mg/kg	5.31E-08	mg/kg-day	9.10E+00	$(mg/kg\text{-}day)^{-1}$	4.84E-07	5.33E-07	mg/kg-day	1.30E-05	mg/kg-day	4.10E-02
				Inorganics												
				Aluminum	4.83E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	4.51E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	3.51E+00	mg/kg	7.52E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.13E-07	7.54E-07	mg/kg-day	3.00E-04	mg/kg-day	2.51E-03
				Cadmium	3.69E+00	mg/kg	2.63E-09	mg/kg-day	NA	NA	NA	2.64E-08	mg/kg-day	2.50E-05	mg/kg-day	1.06E-03
				Chromium	3.38E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	3.34E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Copper	6.70E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	4.00E-02	mg/kg-day	NA
				Cyanide	8.50E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	2.99E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Lead	7.67E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.65E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Mercury	7.20E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	2.10E-05	mg/kg-day	NA
				Nickel	4.26E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	8.00E-04	mg/kg-day	NA
				Thallium	5.46E-02	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
				Vanadium	2.93E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
				Zinc	2.64E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-01	mg/kg-day	NA
			Exp. Route Total								2.02E-04					1.93E+00

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Matteo Property	Inhalation	**Volatile Organic Compounds**												
				Trichloroethene	7.00E-03	mg/kg	See Table E-0.0.2	NA	4.10E-06	$(\mu g/m^3)^{-1}$	2.53E-09	3.96E-13	mg/m^3	2.00E-03	mg/m^3	1.98E-10
				Semi-volatile Organic Compounds												
				Benzo(a)anthracene	5.97E+01	mg/kg	2.85E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	3.13E-10	3.38E-09	mg/m^3	NA	NA	NA
				Benzo(a)pyrene	3.65E+01	mg/kg	1.74E-06	$\mu g/m^3$	1.10E-03	$(\mu g/m^3)^{-1}$	1.91E-09	2.06E-09	mg/m^3	NA	NA	NA
				Benzo(b)fluoranthene	5.06E+01	mg/kg	2.41E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	2.65E-10	2.86E-09	mg/m^3	NA	NA	NA
				Benzo(k)fluoranthene	2.93E+01	mg/kg	1.40E-06	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	1.54E-10	1.66E-09	mg/m^3	NA	NA	NA
				Chrysene	5.06E+01	mg/kg	2.41E-06	$\mu g/m^3$	1.10E-05	$(\mu g/m^3)^{-1}$	2.65E-11	2.86E-09	mg/m^3	NA	NA	NA
				Dibenzo(a,h)anthracene	7.23E+00	mg/kg	3.44E-07	$\mu g/m^3$	1.20E-03	$(\mu g/m^3)^{-1}$	4.13E-10	4.09E-10	mg/m^3	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.63E+01	mg/kg	7.77E-07	$\mu g/m^3$	1.10E-04	$(\mu g/m^3)^{-1}$	8.55E-11	9.22E-10	mg/m^3	NA	NA	NA
				Pyrene	8.26E+01	mg/kg	1.00E-06	$\mu g/m^3$	NA	NA	NA	4.67E-09	mg/m^3	NA	NA	NA
				Dioxins/Furans												
				Dioxin/Furan TEQ	2.70E-05	mg/kg	3.27E-13	$\mu g/m^3$	3.80E+01	$(\mu g/m^3)^{-1}$	1.24E-11	1.53E-15	mg/m^3	4.00E-08	mg/m^3	3.81E-08
				Pesticides/Polychlorinated Biphenyls												
				4,4'-DDT	1.44E+01	mg/kg	1.75E-07	$\mu g/m^3$	9.70E-05	$(\mu g/m^3)^{-1}$	1.70E-11	8.16E-10	mg/m^3	NA	NA	NA
				Aroclor 1254	1.99E-01	mg/kg	2.41E-09	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	1.38E-12	1.13E-11	mg/m^3	NA	NA	NA
				Aroclor 1260	3.67E+01	mg/kg	4.44E-07	$\mu g/m^3$	5.70E-04	$(\mu g/m^3)^{-1}$	2.53E-10	2.07E-09	mg/m^3	NA	NA	NA
				Delta-BHC	6.90E-01	mg/kg	8.35E-09	$\mu g/m^3$	5.10E-04	$(\mu g/m^3)^{-1}$	4.26E-12	3.90E-11	mg/m^3	NA	NA	NA
				Dieldrin	1.17E+00	mg/kg	1.42E-08	$\mu g/m^3$	4.60E-03	$(\mu g/m^3)^{-1}$	6.52E-11	6.61E-11	mg/m^3	NA	NA	NA
				Heptachlor Epoxide	7.44E-01	mg/kg	9.01E-09	$\mu g/m^3$	2.60E-03	$(\mu g/m^3)^{-1}$	2.34E-11	4.21E-11	mg/m^3	NA	NA	NA
				Inorganics												
				Aluminum	4.83E+03	mg/kg	5.85E-05	$\mu g/m^3$	NA	NA	NA	2.73E-07	mg/m^3	5.00E-03	mg/m^3	5.46E-05
				Antimony	4.51E+00	mg/kg	5.46E-08	$\mu g/m^3$	NA	NA	NA	2.55E-10	mg/m^3	NA	mg/m^3	NA
				Arsenic	3.51E+00	mg/kg	4.25E-08	$\mu g/m^3$	4.30E-03	$(\mu g/m^3)^{-1}$	1.83E-10	1.98E-10	mg/m^3	1.50E-05	mg/m^3	1.32E-05
				Cadmium	3.69E+00	mg/kg	4.46E-08	$\mu g/m^3$	1.80E-03	$(\mu g/m^3)^{-1}$	8.03E-11	2.08E-10	mg/m^3	1.00E-05	mg/m^3	2.08E-05
				Chromium	3.38E+01	mg/kg	4.09E-07	$\mu g/m^3$	1.20E-02	$(\mu g/m^3)^{-1}$	4.91E-09	1.91E-09	mg/m^3	1.00E-04	mg/m^3	1.91E-05
				Cobalt	3.34E+00	mg/kg	4.05E-08	$\mu g/m^3$	9.00E-03	$(\mu g/m^3)^{-1}$	3.64E-10	1.89E-10	mg/m^3	6.00E-06	mg/m^3	3.15E-05
				Copper	6.70E+02	mg/kg	8.11E-06	$\mu g/m^3$	NA	NA	NA	3.79E-08	mg/m^3	NA	NA	NA
				Cyanide	8.50E-01	mg/kg	1.03E-08	$\mu g/m^3$	NA	NA	NA	4.80E-11	mg/m^3	NA	NA	NA
				Iron	2.99E+04	mg/kg	3.62E-04	$\mu g/m^3$	NA	NA	NA	1.69E-06	mg/m^3	NA	NA	NA
				Lead	7.67E+02	mg/kg	9.29E-06	$\mu g/m^3$	NA	NA	NA	4.34E-08	mg/m^3	NA	NA	NA
				Manganese	2.65E+02	mg/kg	3.20E-06	$\mu g/m^3$	NA	NA	NA	1.50E-08	mg/m^3	5.00E-05	mg/m^3	2.99E-04
				Mercury	7.20E-01	mg/kg	8.72E-09	$\mu g/m^3$	NA	NA	NA	4.07E-11	mg/m^3	3.00E-04	mg/m^3	1.36E-07
				Nickel	4.26E+01	mg/kg	5.16E-07	$\mu g/m^3$	2.60E-04	$(\mu g/m^3)^{-1}$	1.34E-10	2.41E-09	mg/m^3	9.00E-05	mg/m^3	2.68E-05
				Thallium	5.46E-02	mg/kg	6.61E-10	$\mu g/m^3$	NA	NA	NA	3.09E-12	mg/m^3	NA	NA	NA
				Vanadium	2.93E+01	mg/kg	3.55E-07	$\mu g/m^3$	8.30E-03	$(\mu g/m^3)^{-1}$	2.94E-09	1.66E-09	mg/m^3	1.00E-04	mg/m^3	1.66E-05
				Zinc	2.64E+03	mg/kg	3.19E-05	$\mu g/m^3$	NA	NA	NA	1.49E-07	mg/m^3	NA	NA	NA
			Exp. Route Total								1.47E-08					4.82E-04
		Exposure Point Total									1.60E-03					1.82E+01

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligram per cubic meter

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Groundwater	Groundwater	Tap Water	Ingestion	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	3.74E-06	mg/kg-day	1.00E-01	$(mg/kg\text{-}day)^{-1}$	3.74E-07
				cis-1,2-Dichloroethene	3.71E+00	µg/L	1.26E-05	mg/kg-day	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table E-0.0.3	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	4.41E-08
				Vinyl Chloride	7.04E+00	µg/L	1.65E-04	mg/kg-day	7.20E-01	$(mg/kg\text{-}day)^{-1}$	1.19E-04
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	2.49E-08	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	3.98E-07
				Inorganics							
				Antimony	9.02E+01	µg/L	3.07E-04	mg/kg-day	NA	NA	NA
				Arsenic	2.67E+01	µg/L	9.09E-05	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.36E-04
				Cadmium	4.18E-01	µg/L	1.42E-06	mg/kg-day	NA	NA	NA
				Chromium	2.40E+00	µg/L	8.17E-06	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	4.09E-06
				Cobalt	1.61E+00	µg/L	5.49E-06	mg/kg-day	NA	NA	NA
				Cyanide	3.19E+00	µg/L	1.09E-05	mg/kg-day	NA	NA	NA
				Iron	1.95E+04	µg/L	6.64E-02	mg/kg-day	NA	NA	NA
				Lead	1.85E+01	µg/L	6.30E-05	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	8.26E-04	mg/kg-day	NA	NA	NA
				Vanadium	3.86E+00	µg/L	1.31E-05	mg/kg-day	NA	NA	NA
				Zinc	6.21E+02	µg/L	2.11E-03	mg/kg-day	NA	NA	NA
			Exp. Route Total								2.60E-04

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Groundwater	Groundwater	Tap Water	Dermal Contact	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	1.35E-08	mg/kg-day	1.00E-01	$(mg/kg\text{-}day)^{-1}$	1.35E-09
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table E-0.0.3	NA	4.60E-02	$(mg/kg\text{-}day)^{-1}$	8.15E-09
				Vinyl Chloride	7.04E+00	µg/L	7.43E-06	mg/kg-day	7.20E-01	$(mg/kg\text{-}day)^{-1}$	5.35E-06
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	1.74E-08	mg/kg-day	1.60E+01	$(mg/kg\text{-}day)^{-1}$	2.79E-07
				Inorganics							
				Antimony	9.02E+01	µg/L	7.43E-07	mg/kg-day	NA	NA	NA
				Arsenic	2.67E+01	µg/L	2.20E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.30E-07
				Cadmium	4.18E-01	µg/L	3.44E-09	mg/kg-day	NA	NA	NA
				Chromium	2.40E+00	µg/L	1.98E-08	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	9.88E-09
				Cobalt	1.61E+00	µg/L	5.31E-09	mg/kg-day	NA	NA	NA
				Cyanide	3.19E+00	µg/L	2.62E-08	mg/kg-day	NA	NA	NA
				Iron	1.95E+04	µg/L	1.61E-04	mg/kg-day	NA	NA	NA
				Lead	1.85E+01	µg/L	1.52E-08	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	2.00E-06	mg/kg-day	NA	NA	NA
				Vanadium	3.86E+00	µg/L	3.18E-08	mg/kg-day	NA	NA	NA
				Zinc	6.21E+02	µg/L	3.07E-06	mg/kg-day	NA	NA	NA
			Exp. Route Total								5.98E-06

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk
					Value	Unit	Value	Unit	Value	Unit	
Groundwater	Groundwater	Tap Water	Inhalation at Showerhead	**Volatile Organic Compounds**							
				1,4-Dioxane	1.10E+00	µg/L	4.18E-06	µg/m^3	5.00E-06	(µg/m^3)$^{-1}$	2.09E-11
				cis-1,2-Dichloroethene	3.71E+00	µg/L	1.49E-05	µg/m^3	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	See Table E-0.0.3	NA	4.10E-06	(µg/m^3)$^{-1}$	2.00E-09
				Vinyl Chloride	7.04E+00	µg/L	1.03E-03	µg/m^3	4.40E-06	(µg/m^3)$^{-1}$	4.53E-09
				Pesticides/Polychlorinated Biphenyls							
				Dieldrin	7.30E-03	µg/L	NA	NA	4.60E-03	(µg/m^3)$^{-1}$	NA
				Inorganics							
				Antimony	9.02E+01	µg/L	NA	NA	NA	NA	NA
				Arsenic	2.67E+01	µg/L	NA	NA	4.30E-03	(µg/m^3)$^{-1}$	NA
				Cadmium	4.18E-01	µg/L	NA	NA	1.80E-03	(µg/m^3)$^{-1}$	NA
				Chromium	2.40E+00	µg/L	NA	NA	1.20E-02	(µg/m^3)$^{-1}$	NA
				Cobalt	1.61E+00	µg/L	NA	NA	9.00E-03	(µg/m^3)$^{-1}$	NA
				Cyanide	3.19E+00	µg/L	NA	NA	NA	NA	NA
				Iron	1.95E+04	µg/L	NA	NA	NA	NA	NA
				Lead	1.85E+01	µg/L	NA	NA	NA	NA	NA
				Manganese	2.43E+02	µg/L	NA	NA	NA	NA	NA
				Vanadium	3.86E+00	µg/L	NA	NA	8.30E-03	(µg/m^3)$^{-1}$	NA
				Zinc	6.21E+02	µg/L	NA	NA	NA	NA	NA
			Exp. Route Total								6.55E-09
		Exposure Point Total									2.66E-04

NA = not applicable
µg/L = microgram per liter
µg/m^3 = microgram per cubic meter
mg/kg-day = milligram per kilogram per day

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation - Adult					Noncancer Hazard Calculation - Child				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Tap Water	Ingestion	**Volatile Organic Compounds**												
				1,4-Dioxane	1.10E+00	µg/L	1.50E-05	mg/kg-day	3.00E-02	mg/kg-day	5.01E-04	2.11E-05	mg/kg-day	3.00E-02	mg/kg-day	7.02E-04
				cis-1,2-Dichloroethene	3.71E+00	µg/L	5.09E-05	mg/kg-day	2.00E-03	mg/kg-day	2.54E-02	7.12E-05	mg/kg-day	2.00E-03	mg/kg-day	3.56E-02
				Trichloroethene	1.98E-01	µg/L	2.71E-06	mg/kg-day	5.00E-04	mg/kg-day	5.42E-03	3.80E-06	mg/kg-day	5.00E-04	mg/kg-day	7.59E-03
				Vinyl Chloride	7.04E+00	µg/L	9.64E-05	mg/kg-day	3.00E-03	mg/kg-day	3.21E-02	1.35E-04	mg/kg-day	3.00E-03	mg/kg-day	4.50E-02
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	1.00E-07	mg/kg-day	5.00E-05	mg/kg-day	2.00E-03	1.40E-07	mg/kg-day	5.00E-05	mg/kg-day	2.80E-03
				Inorganics												
				Antimony	9.02E+01	µg/L	1.24E-03	mg/kg-day	4.00E-04	mg/kg-day	3.09E+00	1.73E-03	mg/kg-day	4.00E-04	mg/kg-day	4.33E+00
				Arsenic	2.67E+01	µg/L	3.66E-04	mg/kg-day	3.00E-04	mg/kg-day	1.22E+00	5.12E-04	mg/kg-day	3.00E-04	mg/kg-day	1.71E+00
				Cadmium	4.18E-01	µg/L	5.73E-06	mg/kg-day	1.00E-03	mg/kg-day	5.73E-03	8.02E-06	mg/kg-day	1.00E-03	mg/kg-day	8.02E-03
				Chromium	2.40E+00	µg/L	3.29E-05	mg/kg-day	3.00E-03	mg/kg-day	1.10E-02	4.60E-05	mg/kg-day	3.00E-03	mg/kg-day	1.53E-02
				Cobalt	1.61E+00	µg/L	2.21E-05	mg/kg-day	3.00E-04	mg/kg-day	7.36E-02	3.09E-05	mg/kg-day	3.00E-04	mg/kg-day	1.03E-01
				Cyanide	3.19E+00	µg/L	4.37E-05	mg/kg-day	6.00E-04	mg/kg-day	7.28E-02	6.11E-05	mg/kg-day	6.00E-04	mg/kg-day	1.02E-01
				Iron	1.95E+04	µg/L	2.67E-01	mg/kg-day	7.00E-01	mg/kg-day	3.82E-01	3.74E-01	mg/kg-day	7.00E-01	mg/kg-day	5.34E-01
				Lead	1.85E+01	µg/L	2.53E-04	mg/kg-day	NA	NA	NA	3.55E-04	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	3.32E-03	mg/kg-day	1.40E-01	mg/kg-day	2.37E-02	4.65E-03	mg/kg-day	1.40E-01	mg/kg-day	3.32E-02
				Vanadium	3.86E+00	µg/L	5.29E-05	mg/kg-day	7.00E-05	mg/kg-day	7.55E-01	7.40E-05	mg/kg-day	7.00E-05	mg/kg-day	1.06E+00
				Zinc	6.21E+02	µg/L	8.50E-03	mg/kg-day	3.00E-01	mg/kg-day	2.83E-02	1.19E-02	mg/kg-day	3.00E-01	mg/kg-day	3.97E-02
			Exp. Route Total								5.73E+00					8.02E+00
Groundwater	Groundwater	Tap Water	Dermal Contact	**Volatile Organic Compounds**												
				1,4-Dioxane	1.10E+00	µg/L	4.47E-08	mg/kg-day	3.00E-02	mg/kg-day	1.49E-06	9.05E-08	mg/kg-day	3.00E-02	mg/kg-day	3.02E-06
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	2.00E-03	mg/kg-day	NA	NA	NA	2.00E-03	mg/kg-day	NA
				Trichloroethene	1.98E-01	µg/L	3.90E-07	mg/kg-day	5.00E-04	mg/kg-day	7.80E-04	7.90E-07	mg/kg-day	5.00E-04	mg/kg-day	1.58E-03
				Vinyl Chloride	7.04E+00	µg/L	4.16E-06	mg/kg-day	3.00E-03	mg/kg-day	1.39E-03	8.43E-06	mg/kg-day	3.00E-03	mg/kg-day	2.81E-03
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	5.77E-08	mg/kg-day	5.00E-05	mg/kg-day	1.15E-03	1.17E-07	mg/kg-day	5.00E-05	mg/kg-day	2.34E-03
				Inorganics												
				Antimony	9.02E+01	µg/L	2.22E-06	mg/kg-day	6.00E-05	mg/kg-day	3.71E-02	5.33E-06	mg/kg-day	6.00E-05	mg/kg-day	8.88E-02
				Arsenic	2.67E+01	µg/L	6.58E-07	mg/kg-day	3.00E-04	mg/kg-day	2.19E-03	1.58E-06	mg/kg-day	3.00E-04	mg/kg-day	5.26E-03
				Cadmium	4.18E-01	µg/L	1.03E-08	mg/kg-day	2.50E-05	mg/kg-day	4.12E-04	2.47E-08	mg/kg-day	2.50E-05	mg/kg-day	9.88E-04
				Chromium	2.40E+00	µg/L	5.92E-08	mg/kg-day	7.50E-05	mg/kg-day	7.89E-04	1.42E-07	mg/kg-day	7.50E-05	mg/kg-day	1.89E-03
				Cobalt	1.61E+00	µg/L	1.59E-08	mg/kg-day	3.00E-04	mg/kg-day	5.30E-05	3.81E-08	mg/kg-day	3.00E-04	mg/kg-day	1.27E-04
				Cyanide	3.19E+00	µg/L	7.86E-08	mg/kg-day	6.00E-04	mg/kg-day	1.31E-04	1.88E-07	mg/kg-day	6.00E-04	mg/kg-day	3.14E-04
				Iron	1.95E+04	µg/L	4.81E-04	mg/kg-day	7.00E-01	mg/kg-day	6.87E-04	1.15E-03	mg/kg-day	7.00E-01	mg/kg-day	1.65E-03
				Lead	1.85E+01	µg/L	4.56E-08	mg/kg-day	NA	NA	NA	1.09E-07	mg/kg-day	NA	NA	NA
				Manganese	2.43E+02	µg/L	5.98E-06	mg/kg-day	5.60E-03	mg/kg-day	1.07E-03	1.43E-05	mg/kg-day	5.60E-03	mg/kg-day	2.56E-03
				Vanadium	3.86E+00	µg/L	9.52E-08	mg/kg-day	7.00E-05	mg/kg-day	1.36E-03	2.28E-07	mg/kg-day	7.00E-05	mg/kg-day	3.26E-03
				Zinc	6.21E+02	µg/L	9.18E-06	mg/kg-day	3.00E-01	mg/kg-day	3.06E-05	2.20E-05	mg/kg-day	3.00E-01	mg/kg-day	7.33E-05
			Exp. Route Total								4.71E-02					1.12E-01

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation - Adult					Noncancer Hazard Calculation - Child				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Groundwater	Groundwater	Tap Water	Inhalation at Showerhead	**Volatile Organic Compounds**												
				1,4-Dioxane	1.10E+00	µg/L	1.47E-05	mg/m^3	3.00E-02	mg/m^3	4.90E-04	2.67E-05	mg/m^3	3.00E-02	mg/m^3	8.92E-04
				cis-1,2-Dichloroethene	3.71E+00	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Trichloroethene	1.98E-01	µg/L	2.60E-06	mg/m^3	2.00E-03	mg/m^3	1.30E-03	4.73E-06	mg/m^3	2.00E-03	mg/m^3	2.37E-03
				Vinyl Chloride	7.04E+00	µg/L	1.03E-04	mg/m^3	1.00E-01	mg/m^3	1.03E-03	1.88E-04	mg/m^3	1.00E-01	mg/m^3	1.88E-03
				Pesticides/Polychlorinated Biphenyls												
				Dieldrin	7.30E-03	µg/L	NA	NA	NA	mg/m^3	NA	NA	NA	NA	NA	NA
				Inorganics												
				Antimony	9.02E+01	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Arsenic	2.67E+01	µg/L	NA	NA	1.50E-05	mg/m^3	NA	NA	NA	1.50E-05	mg/m^3	NA
				Cadmium	4.18E-01	µg/L	NA	NA	1.00E-05	mg/m^3	NA	NA	NA	1.00E-05	mg/m^3	NA
				Chromium	2.40E+00	µg/L	NA	NA	1.00E-04	mg/m^3	NA	NA	NA	1.00E-04	mg/m^3	NA
				Cobalt	1.61E+00	µg/L	NA	NA	6.00E-06	mg/m^3	NA	NA	NA	6.00E-06	mg/m^3	NA
				Cyanide	3.19E+00	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Iron	1.95E+04	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Lead	1.85E+01	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.43E+02	µg/L	NA	NA	5.00E-05	mg/m^3	NA	NA	NA	5.00E-05	mg/m^3	NA
				Vanadium	3.86E+00	µg/L	NA	NA	1.00E-04	mg/m^3	NA	NA	NA	1.00E-04	mg/m^3	NA
				Zinc	6.21E+02	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Exp. Route Total								2.82E-03					5.13E-03
		Exposure Point Total									5.78E+00					8.13E+00

NA = not applicable
RfC= reference concentration
RfD = reference dose
mg/kg-day = milligram per kilogram per day
µg/L = microgram per liter
mg/m^3 = milligram per cubic meter

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Water	Surface Water	Woodbury Creek / Hessian Run	Ingestion	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.80E-01	µg/L	7.94E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	5.79E-09	1.61E-08	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.20E-01	µg/L	1.41E-08	mg/kg-day	7.30E+00	$(mg/kg-day)^{-1}$	1.03E-07	2.86E-08	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	3.80E-01	µg/L	1.68E-08	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	1.22E-08	3.40E-08	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.50E-01	µg/L	6.61E-09	mg/kg-day	7.30E-01	$(mg/kg-day)^{-1}$	4.83E-09	1.34E-08	mg/kg-day	NA	NA	NA
				Pentachlorophenol	7.72E-01	µg/L	6.74E-09	mg/kg-day	4.00E-01	$(mg/kg-day)^{-1}$	2.70E-09	6.91E-08	mg/kg-day	5.00E-03	mg/kg-day	1.38E-05
				Inorganics												
				Aluminum	7.93E+03	µg/L	6.92E-05	mg/kg-day	NA	NA	NA	7.10E-04	mg/kg-day	1.00E+00	mg/kg-day	7.10E-04
				Antimony	7.10E+00	µg/L	6.20E-08	mg/kg-day	NA	NA	NA	6.35E-07	mg/kg-day	4.00E-04	mg/kg-day	1.59E-03
				Arsenic	1.30E+01	µg/L	1.14E-07	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	1.71E-07	1.17E-06	mg/kg-day	3.00E-04	mg/kg-day	3.89E-03
				Barium	2.97E+02	µg/L	2.59E-06	mg/kg-day	NA	NA	NA	2.66E-05	mg/kg-day	2.00E-01	mg/kg-day	1.33E-04
				Beryllium	1.14E+01	µg/L	9.95E-08	mg/kg-day	NA	NA	NA	1.02E-06	mg/kg-day	2.00E-03	mg/kg-day	5.10E-04
				Cadmium	3.51E+00	µg/L	3.07E-08	mg/kg-day	NA	NA	NA	3.14E-07	mg/kg-day	1.00E-03	mg/kg-day	3.14E-04
				Chromium	3.86E+01	µg/L	3.37E-07	mg/kg-day	5.00E-01	$(mg/kg-day)^{-1}$	1.68E-07	3.46E-06	mg/kg-day	3.00E-03	mg/kg-day	1.15E-03
				Cobalt	1.85E+01	µg/L	1.61E-07	mg/kg-day	NA	NA	NA	1.65E-06	mg/kg-day	3.00E-04	mg/kg-day	5.52E-03
				Copper	3.17E+01	µg/L	2.77E-07	mg/kg-day	NA	NA	NA	2.84E-06	mg/kg-day	4.00E-02	mg/kg-day	7.09E-05
				Cyanide	3.50E+00	µg/L	3.05E-08	mg/kg-day	NA	NA	NA	3.13E-07	mg/kg-day	6.00E-04	mg/kg-day	5.22E-04
				Iron	1.27E+05	µg/L	1.11E-03	mg/kg-day	NA	NA	NA	1.14E-02	mg/kg-day	7.00E-01	mg/kg-day	1.63E-02
				Lead	2.74E+01	µg/L	2.39E-07	mg/kg-day	NA	NA	NA	2.45E-06	mg/kg-day	NA	NA	NA
				Manganese	3.06E+02	µg/L	2.67E-06	mg/kg-day	NA	NA	NA	2.74E-05	mg/kg-day	1.40E-01	mg/kg-day	1.96E-04
				Mercury	2.87E-01	µg/L	2.50E-09	mg/kg-day	NA	NA	NA	2.57E-08	mg/kg-day	3.00E-04	mg/kg-day	8.56E-05
				Nickel	6.65E+01	µg/L	5.80E-07	mg/kg-day	NA	NA	NA	5.95E-06	mg/kg-day	2.00E-02	mg/kg-day	2.98E-04
				Vanadium	1.55E+02	µg/L	1.35E-06	mg/kg-day	NA	NA	NA	1.39E-05	mg/kg-day	7.00E-05	mg/kg-day	1.98E-01
				Zinc	4.49E+02	µg/L	3.92E-06	mg/kg-day	NA	NA	NA	4.02E-05	mg/kg-day	3.00E-01	mg/kg-day	1.34E-04
			Exp. Route Total								4.68E-07					2.30E-01

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Water	Surface Water	Woodbury Creek / Hessian Run	Dermal Contact	**Semi-volatile Organic Compounds**												
				Benzo(a)anthracene	1.80E-01	µg/L	1.08E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	7.87E-06	8.52E-06	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	3.20E-01	µg/L	3.29E-05	mg/kg-day	7.30E+00	$(mg/kg\text{-}day)^{-1}$	2.40E-04	2.60E-05	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	3.80E-01	µg/L	3.96E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	2.89E-05	3.13E-05	mg/kg-day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.50E-01	µg/L	1.56E-05	mg/kg-day	7.30E-01	$(mg/kg\text{-}day)^{-1}$	1.14E-05	1.24E-05	mg/kg-day	NA	NA	NA
				Pentachlorophenol	7.72E-01	µg/L	5.38E-06	mg/kg-day	4.00E-01	mg/kg-day	2.15E-06	3.49E-05	mg/kg-day	5.00E-03	mg/kg-day	6.99E-03
				Inorganics												
				Aluminum	7.93E+03	µg/L	3.12E-05	mg/kg-day	NA	NA	NA	2.03E-04	mg/kg-day	1.00E+00	mg/kg-day	2.03E-04
				Antimony	7.10E+00	µg/L	2.79E-08	mg/kg-day	NA	NA	NA	1.82E-07	mg/kg-day	6.00E-05	mg/kg-day	3.03E-03
				Arsenic	1.30E+01	µg/L	5.13E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.70E-08	3.33E-07	mg/kg-day	3.00E-04	mg/kg-day	1.11E-03
				Barium	2.97E+02	µg/L	1.17E-06	mg/kg-day	NA	NA	NA	7.59E-06	mg/kg-day	1.40E-02	mg/kg-day	5.42E-04
				Beryllium	1.14E+01	µg/L	4.48E-08	mg/kg-day	NA	NA	NA	2.92E-07	mg/kg-day	1.40E-05	mg/kg-day	2.08E-02
				Cadmium	3.51E+00	µg/L	1.38E-08	mg/kg-day	NA	NA	NA	8.98E-08	mg/kg-day	2.50E-05	mg/kg-day	3.59E-03
				Chromium	3.86E+01	µg/L	1.52E-07	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	7.59E-08	9.87E-07	mg/kg-day	7.50E-05	mg/kg-day	1.32E-02
				Cobalt	1.85E+01	µg/L	2.91E-08	mg/kg-day	NA	NA	NA	1.89E-07	mg/kg-day	3.00E-04	mg/kg-day	6.30E-04
				Copper	3.17E+01	µg/L	1.25E-07	mg/kg-day	NA	NA	NA	8.10E-07	mg/kg-day	4.00E-02	mg/kg-day	2.03E-05
				Cyanide	3.50E+00	µg/L	1.38E-08	mg/kg-day	NA	NA	NA	8.95E-08	mg/kg-day	6.00E-04	mg/kg-day	1.49E-04
				Iron	1.27E+05	µg/L	5.01E-04	mg/kg-day	NA	NA	NA	3.26E-03	mg/kg-day	7.00E-01	mg/kg-day	4.65E-03
				Lead	2.74E+01	µg/L	1.08E-08	mg/kg-day	NA	NA	NA	7.01E-08	mg/kg-day	NA	NA	NA
				Manganese	3.06E+02	µg/L	1.20E-06	mg/kg-day	NA	NA	NA	7.82E-06	mg/kg-day	5.60E-03	mg/kg-day	1.40E-03
				Mercury	2.87E-01	µg/L	1.13E-09	mg/kg-day	NA	NA	NA	7.34E-09	mg/kg-day	2.10E-05	mg/kg-day	3.49E-04
				Nickel	6.65E+01	µg/L	5.23E-08	mg/kg-day	NA	NA	NA	3.40E-07	mg/kg-day	8.00E-04	mg/kg-day	4.25E-04
				Vanadium	1.55E+02	µg/L	6.10E-07	mg/kg-day	NA	NA	NA	3.96E-06	mg/kg-day	7.00E-05	mg/kg-day	5.66E-02
				Zinc	4.49E+02	µg/L	1.06E-06	mg/kg-day	NA	NA	NA	6.89E-06	mg/kg-day	3.00E-01	mg/kg-day	2.30E-05
			Exp. Route Total								2.90E-04					1.14E-01
		Exposure Point Total									2.91E-04					3.43E-01

NA = not applicable
RfC= reference concentration
RfD = reference dose
µg/L = microgram per liter
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Sediment	Sediment	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	4.15E-02	mg/kg	3.77E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	7.54E-09	3.79E-08	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.30E-01	mg/kg	2.09E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	4.18E-08	2.10E-07	mg/kg-day	2.00E-05	mg/kg-day	1.05E-02
				Aroclor 1268	3.37E-02	mg/kg	3.06E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	6.13E-09	3.08E-08	mg/kg-day	2.00E-05	mg/kg-day	1.54E-03
				Inorganics												
				Aluminum	1.30E+04	mg/kg	1.18E-03	mg/kg-day	NA	NA	NA	1.19E-02	mg/kg-day	1.00E+00	mg/kg-day	1.19E-02
				Antimony	3.32E+00	mg/kg	3.02E-07	mg/kg-day	NA	NA	NA	3.03E-06	mg/kg-day	4.00E-04	mg/kg-day	7.58E-03
				Arsenic	1.72E+01	mg/kg	9.40E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.41E-06	1.57E-05	mg/kg-day	3.00E-04	mg/kg-day	5.25E-02
				Cadmium	3.41E+00	mg/kg	3.10E-07	mg/kg-day	NA	NA	NA	3.12E-06	mg/kg-day	1.00E-03	mg/kg-day	3.12E-03
				Chromium	9.10E+01	mg/kg	8.27E-06	mg/kg-day	5.00E-01	$(mg/kg\text{-}day)^{-1}$	4.13E-06	8.31E-05	mg/kg-day	3.00E-03	mg/kg-day	2.77E-02
				Cobalt	1.34E+01	mg/kg	1.22E-06	mg/kg-day	NA	NA	NA	1.23E-05	mg/kg-day	3.00E-04	mg/kg-day	4.09E-02
				Cyanide	4.84E-01	mg/kg	4.40E-08	mg/kg-day	NA	NA	NA	4.42E-07	mg/kg-day	6.00E-04	mg/kg-day	7.37E-04
				Iron	2.59E+04	mg/kg	2.35E-03	mg/kg-day	NA	NA	NA	2.36E-02	mg/kg-day	7.00E-01	mg/kg-day	3.38E-02
				Manganese	3.63E+02	mg/kg	3.30E-05	mg/kg-day	NA	NA	NA	3.32E-04	mg/kg-day	1.40E-01	mg/kg-day	2.37E-03
				Thallium	1.85E-01	mg/kg	1.68E-08	mg/kg-day	NA	NA	NA	1.69E-07	mg/kg-day	1.00E-05	mg/kg-day	1.69E-02
				Vanadium	9.03E+01	mg/kg	8.21E-06	mg/kg-day	NA	NA	NA	8.25E-05	mg/kg-day	7.00E-05	mg/kg-day	1.18E+00
			Exp. Route Total								5.60E-06					1.39E+00
Sediment	Sediment	Woodbury Creek / Hessian Run	Dermal Contact	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	4.15E-02	mg/kg	3.25E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	6.51E-09	2.97E-08	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.30E-01	mg/kg	1.80E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.61E-08	1.65E-07	mg/kg-day	2.00E-05	mg/kg-day	8.23E-03
				Aroclor 1268	3.37E-02	mg/kg	2.65E-09	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	5.29E-09	2.41E-08	mg/kg-day	2.00E-05	mg/kg-day	1.21E-03
				Inorganics												
				Aluminum	1.30E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E+00	mg/kg-day	NA
				Antimony	3.32E+00	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-05	mg/kg-day	NA
				Arsenic	1.72E+01	mg/kg	2.90E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.35E-07	2.65E-06	mg/kg-day	3.00E-04	mg/kg-day	8.82E-03
				Cadmium	3.41E+00	mg/kg	1.91E-09	mg/kg-day	NA	NA	NA	1.75E-08	mg/kg-day	2.50E-05	mg/kg-day	6.98E-04
				Chromium	9.10E+01	mg/kg	NA	NA	5.00E-01	$(mg/kg\text{-}day)^{-1}$	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Cobalt	1.34E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	3.00E-04	mg/kg-day	NA
				Cyanide	4.84E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	6.00E-04	mg/kg-day	NA
				Iron	2.59E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA
				Manganese	3.63E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Thallium	1.85E-01	mg/kg	NA	NA	NA	NA	NA	NA	NA	1.00E-05	mg/kg-day	NA
				Vanadium	9.03E+01	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-05	mg/kg-day	NA
			Exp. Route Total								4.83E-07					1.90E-02
		Exposure Point Total									6.08E-06					1.41E+00

NA = not applicable
RfD = reference dose
RfC= reference concentration
mg/kg = milligram per kilogram
mg/kg-day = milligram per kilogram per day

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult and child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer
					Value	Unit	Value	Unit	Value	Unit	Risk
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**							
				Aroclor 1248	1.01E-01	mg/kg-ww	1.45E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.91E-06
				Aroclor 1254	2.63E-01	mg/kg-ww	3.79E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	7.58E-06
				Aroclor 1260	1.90E-01	mg/kg-ww	2.74E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	5.47E-06
				Inorganics							
				Lead	4.42E-01	mg/kg-ww	6.37E-06	mg/kg-day	NA	NA	NA
			Exp. Route Total								1.60E-05
		Exposure Point Total									1.60E-05

NA = not applicable
mg/kg-ww = milligram per kilogram wet weight
mg/kg-day = milligram per kilogram per day
RfD = reference dose
RfC= reference concentration

TABLE E-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult and child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Noncancer Hazard Calculation (Adult)					Noncancer Hazard Calculation (Child)				
							Intake/ Exposure Concentration		RfD/RfC		Hazard	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Quotient	Value	Unit	Value	Unit	Quotient
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	1.01E-01	mg/kg-ww	5.56E-06	mg/kg-day	NA	NA	NA	8.64E-06	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.63E-01	mg/kg-ww	1.45E-05	mg/kg-day	2.00E-05	mg/kg-day	7.23E-01	2.25E-05	mg/kg-day	2.00E-05	mg/kg-day	1.13E+00
				Aroclor 1260	1.90E-01	mg/kg-ww	1.05E-05	mg/kg-day	2.00E-05	mg/kg-day	5.23E-01	1.63E-05	mg/kg-day	2.00E-05	mg/kg-day	8.13E-01
				Inorganics												
				Lead	4.42E-01	mg/kg-ww	2.43E-05	mg/kg-day	NA	NA	NA	3.78E-05	mg/kg-day	NA	NA	NA
			Exp. Route Total								1.25E+00					1.94E+00
		Exposure Point Total									1.25E+00					1.94E+00

NA = not applicable
RfD = reference dose
mg/kg-ww = milligram per kilogram wet weight
RfC= reference concentration
mg/kg-day = milligram per kilogram per day

TABLE E-1.5a
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	1.01E-01	mg/kg-ww	7.14E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.43E-06	5.56E-06	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.63E-01	mg/kg-ww	1.86E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.72E-06	1.45E-05	mg/kg-day	2.00E-05	mg/kg-day	7.23E-01
				Aroclor 1260	1.90E-01	mg/kg-ww	1.34E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.69E-06	1.05E-05	mg/kg-day	2.00E-05	mg/kg-day	5.23E-01
				Inorganics												
				Lead	4.42E-01	mg/kg-ww	3.13E-06	mg/kg-day	NA	NA	NA	2.43E-05	mg/kg-day	NA	NA	NA
			Exp. Route Total								7.84E-06					1.25E+00
		Exposure Point Total									7.84E-06					1.25E+00

NA = not applicable
RfD = reference dose
mg/kg-ww = milligram per kilogram wet weight
RfC= reference concentration
mg/kg-day = milligram per kilogram per day

TABLE E-1.5b
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
							Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	Ingestion	**Pesticides/Polychlorinated Biphenyls**												
				Aroclor 1248	1.01E-01	mg/kg-ww	7.41E-07	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.48E-06	8.64E-06	mg/kg-day	NA	NA	NA
				Aroclor 1254	2.63E-01	mg/kg-ww	1.93E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.86E-06	2.25E-05	mg/kg-day	2.00E-05	mg/kg-day	1.13E+00
				Aroclor 1260	1.90E-01	mg/kg-ww	1.39E-06	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	2.79E-06	1.63E-05	mg/kg-day	2.00E-05	mg/kg-day	8.13E-01
				Inorganics												
				Lead	4.42E-01	mg/kg-ww	3.24E-06	mg/kg-day	NA	NA	NA	3.78E-05	mg/kg-day	NA	NA	NA
			Exp. Route Total								8.13E-06					1.94E+00
		Exposure Point Total									8.13E-06					1.94E+00

NA = not applicable
RfD = reference dose
mg/kg-ww = milligram per kilogram wet weight
RfC= reference concentration
mg/kg-day = milligram per kilogram per day

TABLE E-2.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Scrapyard Area	**Volatile Organic Compounds**									
			Trichloroethene	6E-12	NA	1E-17	6E-12	Heart / Immune System / Developmental / Kidney / Liver	2E-06	NA	1E-11	2E-06
			Semi-volatile Organic Compounds									
			Benzo(a)anthracene	2E-08	4E-09	7E-14	2E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-07	3E-08	7E-13	2E-07	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	3E-08	5E-09	9E-14	3E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	7E-08	1E-08	3E-13	8E-08	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	2E-08	3E-09	5E-14	2E-08	NA	NA	NA	NA	NA
			Dioxins/Furans									
			Dioxin/Furan TEQ	2E-07	8E-09	1E-12	2E-07	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	2E-02	7E-04	7E-09	2E-02
			Pesticides/Polychlorinated Biphenyls									
			4,4'-DDT	3E-07	1E-08	2E-12	3E-07	Liver	1E-02	5E-04	NA	1E-02
			Aroclor 1248	5E-08	1E-08	3E-13	6E-08	NA	NA	NA	NA	NA
			Aroclor 1260	2E-05	4E-06	1E-10	3E-05	Eye / Finger Nail / Immune System	4E+00	8E-01	NA	5E+00
			Delta-BHC	7E-08	9E-09	4E-13	8E-08	NA	NA	NA	NA	NA
			Dieldrin	2E-06	3E-07	1E-11	2E-06	Liver	2E-02	3E-03	NA	2E-02
			Heptachlor Epoxide	8E-07	1E-07	5E-12	9E-07	Liver	5E-02	7E-03	NA	6E-02
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	4E-03	NA	2E-05	4E-03
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E-02	NA	NA	1E-02
			Arsenic	2E-07	2E-08	2E-11	2E-07	Developmental / Cardiovascular System / CNS / Lung / Skin	4E-03	3E-04	3E-06	4E-03
			Cadmium	NA	NA	1E-11	1E-11	Kidney	3E-03	1E-04	6E-06	3E-03
			Chromium	4E-06	NA	2E-09	4E-06	Lung	2E-02	NA	1E-05	2E-02
			Cobalt	NA	NA	7E-11	7E-11	Thyroid / Respiratory System / Lung	9E-03	NA	1E-05	9E-03
			Copper	NA	NA	NA	NA	GI Tract	4E-02	NA	NA	4E-02
			Cyanide	NA	NA	NA	NA	NA	4E-04	NA	NA	4E-04
			Iron	NA	NA	NA	NA	GI Tract	3E-02	NA	NA	3E-02
			Manganese	NA	NA	NA	NA	CNS	1E-03	NA	7E-05	1E-03
			Mercury	NA	NA	NA	NA	Immune System / Nervous System	2E-03	NA	4E-08	2E-03
			Nickel	NA	NA	7E-11	7E-11	Body and Organ Weight / Respiratory	5E-03	NA	2E-05	5E-03
			Zinc	NA	NA	NA	NA	Blood	1E-02	NA	NA	1E-02
			Chemical Total	3E-05	5E-06	3E-09	3E-05	Chemical Total	5E+00	8E-01	1E-04	5E+00
		Exposure Point Total					3E-05					5E+00
	Exposure Medium Total						3E-05					5E+00
Medium Total							3E-05					5E+00
Receptor Total							3E-05					5E+00

Total Excess Cancer Risk Across All Media: 3E-05

Total Hazard Index Across All Media: 5

TABLE E-2.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Blood HI Across All Media =	0.04
Liver HI Across All Media =	0.1
Kidney HI Across All Media =	<0.01
CNS HI Across All Media =	<0.01
Development HI Across All Media =	0.02
Body and Organ Weight HI Across All Media =	<0.01
Respiratory HI Across All Media =	0.03
Lung HI Across All Media =	0.04
Eye HI Across All Media =	5
Longevity HI Across All Media =	0.01
Cardiovascular System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Immune system HI Across All Media =	5
Heart HI Across All Media =	<0.01
Thyroid HI Across All Media =	<0.01
GI Tract HI Across All Media =	0.07
Finger Nail HI Across All Media =	5
Endocrine System HI Across All Media =	0.02
Reproductive HI Across All Media =	0.02
Neurological HI Across All Media =	<0.01
Nervous System HI Across All Media =	<0.01

NA = not applicable
CNS = central nervous system
GI = gastrointestinal

TABLE E-2.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	**Volatile Organic Compounds**									
			Trichloroethene	1E-11	NA	1E-11	2E-11	Heart / Immune System / Developmental / Kidney	2E-06	NA	2E-10	2E-06
			Semi-volatile Organic Compounds									
			Benzo(a)anthracene	1E-08	5E-09	3E-15	2E-08	NA	NA	NA	NA	NA
			Benzo(a)pyrene	5E-08	2E-08	1E-14	7E-08	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	1E-08	5E-09	3E-15	2E-08	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	3E-08	1E-08	8E-15	4E-08	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	7E-09	3E-09	2E-15	1E-08	NA	NA	NA	NA	NA
			Dioxins/Furans									
			Dioxin/Furan TEQ	6E-08	6E-09	3E-14	7E-08	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	4E-03	4E-04	2E-08	5E-03
			Pesticides/Polychlorinated Biphenyls									
			Aroclor 1254	2E-08	8E-09	8E-15	2E-08	Eye / Finger Nail / Immune System	2E-03	1E-03	NA	3E-03
			Aroclor 1260	5E-08	2E-08	2E-14	7E-08	Eye / Finger Nail / Immune System	7E-03	3E-03	NA	1E-02
			Heptachlor Epoxide	3E-08	1E-08	1E-14	4E-08	Liver	1E-03	5E-04	NA	2E-03
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	5E-04	NA	3E-05	6E-04
			Antimony	NA	NA	NA	NA	Longevity / Blood	3E-03	NA	NA	3E-03
			Arsenic	1E-07	2E-08	8E-13	1E-07	Developmental / Cardiovascular System / CNS / Skin	1E-03	2E-04	1E-06	2E-03
			Cadmium	NA	NA	1E-13	1E-13	Kidney / Respiratory System	3E-04	4E-05	3E-06	3E-04
			Chromium	2E-07	NA	1E-11	2E-07	Respiratory	9E-04	NA	3E-06	9E-04
			Cobalt	NA	NA	1E-12	1E-12	Thyroid / Respiratory System / Lung	1E-03	NA	6E-06	1E-03
			Cyanide	NA	NA	NA	NA	NA	2E-04	NA	NA	2E-04
			Iron	NA	NA	NA	NA	GI Tract	8E-03	NA	NA	8E-03
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	2E-04	NA	6E-05	3E-04
			Vanadium	NA	NA	2E-11	2E-11	Kidney / Respiratory System / Eyes	1E-01	NA	7E-08	1E-01
			Zinc	NA	NA	NA	NA	Blood	4E-03	NA	NA	4E-03
			Chemical Total	6E-07	1E-07	4E-11	7E-07	Chemical Total	1E-01	5E-03	1E-04	1E-01
		Exposure Point Total					7E-07					1E-01
	Exposure Medium Total						7E-07					1E-01
Medium Total							7E-07					1E-01

Page 1 of 3

TABLE E-2.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Woodbury Creek / Hessian Run	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	7E-10	7E-07	NA	7E-07	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1E-08	2E-05	NA	2E-05	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	1E-09	2E-06	NA	2E-06	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	6E-10	1E-06	NA	1E-06	NA	NA	NA	NA	NA
			Pentachlorophenol	2E-09	2E-06	NA	2E-06	Liver	5E-06	4E-03	NA	4E-03
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	2E-04	1E-04	NA	4E-04
			Antimony	NA	NA	NA	NA	Longevity / Blood	5E-04	2E-03	NA	2E-03
			Arsenic	1E-07	5E-08	NA	2E-07	Skin	1E-03	7E-04	NA	2E-03
			Barium	NA	NA	NA	NA	Kidney	5E-05	3E-04	NA	4E-04
			Beryllium	NA	NA	NA	NA	Intestine	2E-04	1E-02	NA	1E-02
			Cadmium	NA	NA	NA	NA	Kidney	1E-04	2E-03	NA	2E-03
			Chromium	1E-07	5E-08	NA	2E-07	None reported	4E-04	8E-03	NA	9E-03
			Cobalt	NA	NA	NA	NA	Thyroid	2E-03	4E-04	NA	2E-03
			Copper	NA	NA	NA	NA	GI Tract	2E-05	1E-05	NA	4E-05
			Cyanide	NA	NA	NA	NA	None reported	2E-04	9E-05	NA	3E-04
			Iron	NA	NA	NA	NA	GI Tract	6E-03	3E-03	NA	8E-03
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	7E-05	9E-04	NA	1E-03
			Mercury	NA	NA	NA	NA	Immune System	3E-05	2E-04	NA	3E-04
			Nickel	NA	NA	NA	NA	Body and Organ Weight	1E-04	3E-04	NA	4E-04
			Vanadium	NA	NA	NA	NA	Kidney	7E-02	4E-02	NA	1E-01
			Zinc	NA	NA	NA	NA	Blood	5E-05	1E-05	NA	6E-05
			Chemical Total	2E-07	3E-05	--	3E-05	Chemical Total	8E-02	7E-02	--	2E-01
		Exposure Point Total					3E-05					2E-01
	Exposure Medium Total						3E-05					2E-01
Medium Total							3E-05					2E-01

Page 2 of 3

TABLE E-2.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Sediment	Sediment	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	2E-09	6E-09	NA	9E-09	NA	NA	NA	NA	NA
			Aroclor 1254	1E-08	4E-08	NA	5E-08	Eye / Finger Nail / Immune System	2E-03	5E-03	NA	7E-03
			Aroclor 1268	2E-09	5E-09	NA	7E-09	Eye / Finger Nail / Immune System	3E-04	8E-04	NA	1E-03
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	2E-03	NA	NA	2E-03
			Antimony	NA	NA	NA	NA	Longevity / Blood	1E-03	NA	NA	1E-03
			Arsenic	4E-07	4E-07	NA	8E-07	Skin	9E-03	6E-03	NA	1E-02
			Cadmium	NA	NA	NA	NA	Kidney	5E-04	4E-04	NA	1E-03
			Chromium	1E-06	NA	NA	1E-06	None reported	5E-03	NA	NA	5E-03
			Cobalt	NA	NA	NA	NA	Thyroid	7E-03	NA	NA	7E-03
			Cyanide	NA	NA	NA	NA	None reported	1E-04	NA	NA	1E-04
			Iron	NA	NA	NA	NA	GI Tract	6E-03	NA	NA	6E-03
			Manganese	NA	NA	NA	NA	CNS	4E-04	NA	NA	4E-04
			Thallium	NA	NA	NA	NA	Skin/Hair	3E-03	NA	NA	3E-03
			Vanadium	NA	NA	NA	NA	Kidney	2E-01	NA	NA	2E-01
			Chemical Total	2E-06	5E-07	--	2E-06	Chemical Total	2E-01	1E-02	--	2E-01
		Exposure Point Total					2E-06					2E-01
	Exposure Medium Total						2E-06					2E-01
Medium Total							2E-06					2E-01
Receptor Total							3E-05					5E-01

Total Excess Cancer Risk Across All Media	3E-05
Total Hazard Index Across All Media	0.5

Blood HI Across All Media =	0.02
Liver HI Across All Media =	0.01
Kidney HI Across All Media =	0.4
CNS HI Across All Media =	<0.01
Development HI Across All Media =	<0.01
Body and Organ Weight HI Across All Media =	<0.01
Respiratory HI Across All Media =	0.1
Lung HI Across All Media =	<0.01
Eye HI Across All Media =	0.1
Longevity HI Across All Media =	<0.01
Cardiovascular System HI Across All Media =	<0.01
Skin HI Across All Media =	0.02
Intestine HI Across All Media =	0.01
Immune system HI Across All Media =	0.02
Heart HI Across All Media =	<0.01
Thyroid HI Across All Media =	0.01
GI Tract HI Across All Media =	0.02
Hair HI Across All Media =	<0.01
Finger Nail HI Across All Media =	0.02
Endocrine System HI Across All Media =	<0.01
Reproductive HI Across All Media =	<0.01
Neurological HI Across All Media =	<0.01

NA = not applicable CNS = central nervous system GI = gastrointestinal

Page 3 of 3

TABLE E-2.3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Rental Home Area	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	3E-04	4E-05	4E-10	3E-04	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-03	3E-04	2E-09	2E-03	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	3E-04	4E-05	3E-10	3E-04	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1E-05	2E-06	2E-10	2E-05	NA	NA	NA	NA	NA
			Chrysene	3E-06	4E-07	3E-11	3E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5E-04	8E-05	7E-10	6E-04	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	8E-05	1E-05	9E-11	9E-05	NA	NA	NA	NA	NA
			Pyrene	NA	NA	NA	NA	Kidney	4E-02	6E-03	NA	4E-02
			Pesticides/Polychlorinated Biphenyls									
			Aroclor 1254	3E-07	4E-08	7E-13	3E-07	Eye / Finger Nail / Immune System	7E-02	1E-02	NA	8E-02
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	3E-02	NA	NA	3E-02
			Arsenic	1E-06	8E-08	7E-11	2E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	3E-02	2E-03	5E-06	4E-02
			Chromium	8E-06	NA	2E-09	8E-06	Lung	6E-02	NA	8E-06	6E-02
			Cobalt	NA	NA	1E-10	1E-10	Thyroid / Respiratory System / Lung	4E-02	NA	1E-05	4E-02
			Iron	NA	NA	NA	NA	GI Tract	1E-01	NA	NA	1E-01
			Manganese	NA	NA	NA	NA	CNS	2E-02	NA	3E-04	2E-02
			Thallium	NA	NA	NA	NA	Skin / Hair	4E-02	NA	NA	4E-02
			Chemical Total	3E-03	4E-04	6E-09	3E-03	Chemical Total	4E-01	2E-02	3E-04	4E-01
		Exposure Point Total					3E-03					4E-01
	Exposure Medium Total						3E-03					4E-01
Medium Total							3E-03					4E-01

TABLE E-2.3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	**Volatile Organic Compounds**									
			1,4-Dioxane	4E-07	1E-09	2E-11	4E-07	Liver / Kidney / Respiratory	7E-04	3E-06	9E-04	2E-03
			cis-1,2-Dichloroethene	NA	NA	NA	NA	Kidney	4E-02	NA	NA	4E-02
			Trichloroethene	4E-08	8E-09	2E-09	5E-08	Heart / Immune System / Developmental / Kidney / Liver	8E-03	2E-03	2E-03	1E-02
			Vinyl Chloride	1E-04	5E-06	5E-09	1E-04	Liver	5E-02	3E-03	2E-03	5E-02
			Pesticides/Polychlorinated Biphenyls									
			Dieldrin	4E-07	3E-07	NA	7E-07	Liver	3E-03	2E-03	NA	5E-03
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	4E+00	9E-02	NA	4E+00
			Arsenic	1E-04	3E-07	NA	1E-04	Skin	2E+00	5E-03	NA	2E+00
			Cadmium	NA	NA	NA	NA	Kidney	8E-03	1E-03	NA	9E-03
			Chromium	4E-06	1E-08	NA	4E-06	None reported	2E-02	2E-03	NA	2E-02
			Cobalt	NA	NA	NA	NA	Thyroid	1E-01	1E-04	NA	1E-01
			Cyanide	NA	NA	NA	NA	None reported	1E-01	3E-04	NA	1E-01
			Iron	NA	NA	NA	NA	GI Tract	5E-01	2E-03	NA	5E-01
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	3E-02	3E-03	NA	4E-02
			Vanadium	NA	NA	NA	NA	Kidney	1E+00	3E-03	NA	1E+00
			Zinc	NA	NA	NA	NA	Blood	4E-02	7E-05	NA	4E-02
			Chemical Total	3E-04	6E-06	7E-09	3E-04	Chemical Total	8E+00	1E-01	5E-03	8E+00
		Exposure Point Total					3E-04					8E+00
	Exposure Medium Total						3E-04					8E+00
Medium Total							3E-04					8E+00
Receptor Total							4E-03					9E+00

Total Excess Cancer Risk Across All Media	4E-03
Total Hazard Index Across All Media	9
Blood HI Across All Media =	4
Liver HI Across All Media =	0.07
Kidney HI Across All Media =	1
CNS HI Across All Media =	0.09
Development HI Across All Media =	0.05
Respiratory HI Across All Media =	0.04
Lung HI Across All Media =	0.1
Eye HI Across All Media =	0.08
Longevity HI Across All Media =	4
Cardiovascular System HI Across All Media =	0.04
Skin HI Across All Media =	2
Immune system HI Across All Media =	0.09
Heart HI Across All Media =	0.01
Thyroid HI Across All Media =	0.1
GI Tract HI Across All Media =	0.6
Hair HI Across All Media =	0.04
Finger Nail HI Across All Media =	0.08

NA = not applicable
CNS = central nervous system
GI = gastrointestinal

TABLE E-2.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Matteo Property	**Volatile Organic Compounds**									
			Trichloroethene	4E-10	NA	3E-09	3E-09	Heart / Immune System / Developmental / Kidney / Liver	9E-05	NA	2E-10	9E-05
			Semi-volatile Organic Compounds									
			Benzo(a)anthracene	1E-04	2E-05	3E-10	2E-04	NA	NA	NA	NA	NA
			Benzo(a)pyrene	8E-04	1E-04	2E-09	1E-03	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	1E-04	2E-05	3E-10	1E-04	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	7E-06	1E-06	2E-10	8E-06	NA	NA	NA	NA	NA
			Chrysene	1E-06	2E-07	3E-11	1E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	2E-04	2E-05	4E-10	2E-04	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	4E-05	6E-06	9E-11	4E-05	NA	NA	NA	NA	NA
			Pyrene	NA	NA	NA	NA	Kidney	2E-02	3E-03	NA	2E-02
			Dioxins/Furans									
			Dioxin/Furan TEQ	2E-06	8E-08	1E-11	2E-06	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	2E-01	8E-03	4E-08	3E-01
			Pesticides/Polychlorinated Biphenyls									
			4,4'-DDT	3E-06	1E-07	2E-11	3E-06	Liver	2E-01	6E-03	NA	2E-01
			Aroclor 1254	3E-07	4E-08	1E-12	3E-07	Eye / Finger Nail / Immune System	6E-02	1E-02	NA	7E-02
			Aroclor 1260	5E-05	7E-06	3E-10	5E-05	Eye / Finger Nail / Immune System	1E+01	2E+00	NA	1E+01
			Delta-BHC	8E-07	9E-08	4E-12	9E-07	NA	NA	NA	NA	NA
			Dieldrin	1E-05	1E-06	7E-11	1E-05	Liver	1E-01	2E-02	NA	2E-01
			Heptachlor Epoxide	4E-06	5E-07	2E-11	5E-06	Liver	4E-01	4E-02	NA	4E-01
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	3E-02	NA	5E-05	3E-02
			Antimony	NA	NA	NA	NA	Longevity / Blood	7E-02	NA	NA	7E-02
			Arsenic	2E-06	1E-07	2E-10	2E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	4E-02	3E-03	1E-05	5E-02
			Cadmium	NA	NA	8E-11	8E-11	Kidney	2E-02	1E-03	2E-05	2E-02
			Chromium	1E-05	NA	5E-09	1E-05	Lung	7E-02	NA	2E-05	7E-02
			Cobalt	NA	NA	4E-10	4E-10	Thyroid / Respiratory System / Lung	7E-02	NA	3E-05	7E-02
			Copper	NA	NA	NA	NA	GI Tract	1E-01	NA	NA	1E-01
			Cyanide	NA	NA	NA	NA	NA	9E-03	NA	NA	9E-03
			Iron	NA	NA	NA	NA	GI Tract	3E-01	NA	NA	3E-01
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	1E-02	NA	3E-04	1E-02
			Mercury	NA	NA	NA	NA	Immune System / Nervous System	2E-02	NA	1E-07	2E-02
			Nickel	NA	NA	1E-10	1E-10	Body and Organ Weight / Respiratory	1E-02	NA	3E-05	1E-02
			Thallium	NA	NA	NA	NA	Skin / Hair	3E-02	NA	NA	3E-02
			Vanadium	NA	NA	3E-09	3E-09	Kidney / Respiratory System	3E+00	NA	2E-05	3E+00
			Zinc	NA	NA	NA	NA	Blood	6E-02	NA	NA	6E-02
			Chemical Total	1E-03	2E-04	1E-08	2E-03	Chemical Total	2E+01	2E+00	5E-04	2E+01
		Exposure Point Total					2E-03					2E+01
	Exposure Medium Total						2E-03					2E+01
Medium Total							2E-03					2E+01

TABLE E-2.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	**Volatile Organic Compounds**									
			1,4-Dioxane	4E-07	1E-09	2E-11	4E-07	Liver / Kidney / Respiratory	7E-04	3E-06	9E-04	2E-03
			cis-1,2-Dichloroethene	NA	NA	NA	NA	Kidney	4E-02	NA	NA	4E-02
			Trichloroethene	4E-08	8E-09	2E-09	5E-08	Heart / Immune System / Developmental / Kidney / Liver	8E-03	2E-03	2E-03	1E-02
			Vinyl Chloride	1E-04	5E-06	5E-09	1E-04	Liver	5E-02	3E-03	2E-03	5E-02
			Pesticides/Polychlorinated Biphenyls									
			Dieldrin	4E-07	3E-07	NA	7E-07	Liver	3E-03	2E-03	NA	5E-03
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	4E+00	9E-02	NA	4E+00
			Arsenic	1E-04	3E-07	NA	1E-04	Skin	2E+00	5E-03	NA	2E+00
			Cadmium	NA	NA	NA	NA	Kidney	8E-03	1E-03	NA	9E-03
			Chromium	4E-06	1E-08	NA	4E-06	None reported	2E-02	2E-03	NA	2E-02
			Cobalt	NA	NA	NA	NA	Thyroid	1E-01	1E-04	NA	1E-01
			Cyanide	NA	NA	NA	NA	None reported	1E-01	3E-04	NA	1E-01
			Iron	NA	NA	NA	NA	GI Tract	5E-01	2E-03	NA	5E-01
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	3E-02	3E-03	NA	4E-02
			Vanadium	NA	NA	NA	NA	Kidney	1E+00	3E-03	NA	1E+00
			Zinc	NA	NA	NA	NA	Blood	4E-02	7E-05	NA	4E-02
			Chemical Total	3E-04	6E-06	7E-09	3E-04	Chemical Total	8E+00	1E-01	5E-03	8E+00
		Exposure Point Total					3E-04					8E+00
	Exposure Medium Total						3E-04					8E+00
Medium Total							3E-04					8E+00

TABLE E-2.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Woodbury Creek / Hessian Run	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	6E-09	8E-06	NA	8E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1E-07	2E-04	NA	2E-04	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	1E-08	3E-05	NA	3E-05	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	5E-09	1E-05	NA	1E-05	NA	NA	NA	NA	NA
			Pentachlorophenol	3E-09	2E-06	NA	2E-06	Liver	1E-05	7E-03	NA	7E-03
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	7E-04	2E-04	NA	9E-04
			Antimony	NA	NA	NA	NA	Longevity / Blood	2E-03	3E-03	NA	5E-03
			Arsenic	2E-07	8E-08	NA	2E-07	Skin	4E-03	1E-03	NA	5E-03
			Barium	NA	NA	NA	NA	Kidney	1E-04	5E-04	NA	7E-04
			Beryllium	NA	NA	NA	NA	Intestine	5E-04	2E-02	NA	2E-02
			Cadmium	NA	NA	NA	NA	Kidney	3E-04	4E-03	NA	4E-03
			Chromium	2E-07	8E-08	NA	2E-07	None reported	1E-03	1E-02	NA	1E-02
			Cobalt	NA	NA	NA	NA	Thyroid	6E-03	6E-04	NA	6E-03
			Copper	NA	NA	NA	NA	GI Tract	7E-05	2E-05	NA	9E-05
			Cyanide	NA	NA	NA	NA	None reported	5E-04	1E-04	NA	7E-04
			Iron	NA	NA	NA	NA	GI Tract	2E-02	5E-03	NA	2E-02
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Manganese	NA	NA	NA	NA	CNS	2E-04	1E-03	NA	2E-03
			Mercury	NA	NA	NA	NA	Immune System	9E-05	3E-04	NA	4E-04
			Nickel	NA	NA	NA	NA	Body and Organ Weight	3E-04	4E-04	NA	7E-04
			Vanadium	NA	NA	NA	NA	Kidney	2E-01	6E-02	NA	3E-01
			Zinc	NA	NA	NA	NA	Blood	1E-04	2E-05	NA	2E-04
			Chemical Total	5E-07	3E-04	--	3E-04	Chemical Total	2E-01	1E-01	--	3E-01
		Exposure Point Total					3E-04					3E-01
	Exposure Medium Total						3E-04					3E-01
Medium Total							3E-04					3E-01

TABLE E-2.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Sediment	Sediment	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	8E-09	7E-09	NA	1E-08	NA	NA	NA	NA	NA
			Aroclor 1254	4E-08	4E-08	NA	8E-08	Eye / Finger Nail / Immune System	1E-02	8E-03	NA	2E-02
			Aroclor 1268	6E-09	5E-09	NA	1E-08	Eye / Finger Nail / Immune System	2E-03	1E-03	NA	3E-03
			Inorganics									
			Aluminum	NA	NA	NA	NA	Neurological	1E-02	NA	NA	1E-02
			Antimony	NA	NA	NA	NA	Longevity / Blood	8E-03	NA	NA	8E-03
			Arsenic	1E-06	4E-07	NA	2E-06	Skin	5E-02	9E-03	NA	6E-02
			Cadmium	NA	NA	NA	NA	Kidney	3E-03	7E-04	NA	4E-03
			Chromium	4E-06	NA	NA	4E-06	None reported	3E-02	NA	NA	3E-02
			Cobalt	NA	NA	NA	NA	Thyroid	4E-02	NA	NA	4E-02
			Cyanide	NA	NA		NA	None reported	7E-04	NA		7E-04
			Iron	NA	NA	NA	NA	GI Tract	3E-02	NA	NA	3E-02
			Manganese	NA	NA	NA	NA	CNS	2E-03	NA	NA	2E-03
			Thallium	NA	NA	NA	NA	Skin/Hair	2E-02	NA	NA	2E-02
			Vanadium	NA	NA	NA	NA	Kidney	1E+00	NA	NA	1E+00
			Chemical Total	6E-06	5E-07	--	6E-06	Chemical Total	1E+00	2E-02	--	1E+00
		Exposure Point Total					6E-06					1E+00
	Exposure Medium Total						6E-06					1E+00
Medium Total							6E-06					1E+00

TABLE E-2.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	3E-06	NA	NA	3E-06	NA	NA	NA	NA	NA
			Aroclor 1254	8E-06	NA	NA	8E-06	Eye / Finger Nail / Immune System	1E+00	NA	NA	1E+00
			Aroclor 1260	5E-06	NA	NA	5E-06	Eye / Finger Nail / Immune System	8E-01	NA	NA	8E-01
			Inorganics									
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	2E-05	--	--	2E-05	Chemical Total	2E+00	--	--	2E+00
		Exposure Point Total					2E-05					2E+00
	Exposure Medium Total						2E-05					2E+00
Medium Total							2E-05					2E+00
Receptor Total							2E-03					3E+01

Total Excess Cancer Risk Across All Media: 2E-03

Total Hazard Index Across All Media: 30

Blood HI Across All Media =	5
Liver HI Across All Media =	1
Kidney HI Across All Media =	5
CNS HI Across All Media =	0.10
Development HI Across All Media =	0.3
Body and Organ Weight HI Across All Media =	0.01
Respiratory HI Across All Media =	3
Lung HI Across All Media =	0.2
Eye HI Across All Media =	16
Longevity HI Across All Media =	4
Cardiovascular System HI Across All Media =	0.05
Skin HI Across All Media =	2
Intestine HI Across All Media =	0.02
Immune system HI Across All Media =	16
Heart HI Across All Media =	0.01
Thyroid HI Across All Media =	0.2
GI Tract HI Across All Media =	1
Hair HI Across All Media =	0.05
Finger Nail HI Across All Media =	16
Endocrine System HI Across All Media =	0.3
Reproductive HI Across All Media =	0.3
Neurological HI Across All Media =	0.04
Nervous System HI Across All Media =	0.02

NA = not applicable
CNS = central nervous system
GI = gastrointestinal

TABLE E-2.5a
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Dermal Contact	Cancer Risk: Inhalation	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Primary Target Organ(s)	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Dermal Contact	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	1E-06	NA	NA	1E-06	NA	NA	NA	NA	NA
			Aroclor 1254	4E-06	NA	NA	4E-06	Eye / Finger Nail / Immune System	7E-01	NA	NA	7E-01
			Aroclor 1260	3E-06	NA	NA	3E-06	Eye / Finger Nail / Immune System	5E-01	NA	NA	5E-01
			Inorganics									
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	8E-06	--	--	8E-06	Chemical Total	1E+00	--	--	1E+00
		Exposure Point Total					8E-06					1E+00
	Exposure Medium Total						8E-06					1E+00
Medium Total							8E-06					1E+00
Receptor Total							8E-06					1E+00

Total Excess Cancer Risk Across All Media: 8E-06

Total Hazard Index Across All Media: 1

Eye HI Across All Media = 1
Immune system HI Across All Media = 1
Finger Nail HI Across All Media = 1

NA = not applicable

TABLE E-2.5b
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	1E-06	NA	NA	1E-06	NA	NA	NA	NA	NA
			Aroclor 1254	4E-06	NA	NA	4E-06	Eye / Finger Nail / Immune System	1E+00	NA	NA	1E+00
			Aroclor 1260	3E-06	NA	NA	3E-06	Eye / Finger Nail / Immune System	8E-01	NA	NA	8E-01
			Inorganics									
			Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
			Chemical Total	8E-06	--	--	8E-06	Chemical Total	2E+00	--	--	2E+00
		Exposure Point Total					8E-06					2E+00
	Exposure Medium Total						8E-06					2E+00
Medium Total							8E-06					2E+00
Receptor Total							8E-06					2E+00

Total Excess Cancer Risk Across All Media: 8E-06

Total Hazard Index Across All Media: 2

Eye HI Across All Media = 2
Immune system HI Across All Media = 2
Finger Nail HI Across All Media = 2

NA = not applicable

TABLE E-3.1
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Scrapyard Area	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1260	2E-05	4E-06	1E-10	3E-05	Eye / Finger Nail / Immune System	4E+00	8E-01	NA	5E+00
			Dieldrin	2E-06	3E-07	1E-11	2E-06	Liver	2E-02	3E-03	NA	2E-02
			Inorganics									
			Chromium	4E-06	NA	2E-09	4E-06	Lung	2E-02	NA	1E-05	2E-02
			Chemical Total	3E-05	5E-06	3E-09	3E-05	Chemical Total	5E+00	8E-01	1E-04	5E+00
		Exposure Point Total					3E-05					5E+00
	Exposure Medium Total						3E-05					5E+00
Medium Total							3E-05					5E+00
Receptor Total							3E-05					5E+00

Total Excess Cancer Risk Across All Media	3E-05
Total Hazard Index Across All Media	5
Eye HI Across All Media =	5
Immune system HI Across All Media =	5
Finger Nail HI Across All Media =	5

NA = not applicable

Note:
Only chemicals above EPA's threshold values are listed in this table.

TABLE E-3.2
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent (6-18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Open Field/ Waste Disposal Area	Chemical Total	6E-07	1E-07	4E-11	7E-07	Chemical Total	1E-01	5E-03	1E-04	1E-01
		Exposure Point Total					7E-07					1E-01
	Exposure Medium Total						7E-07					1E-01
Medium Total							7E-07					1E-01
Surface Water	Surface Water	Woodbury Creek / Hessian Run	**Semi-volatile Organic Compounds**									
			Benzo(a)pyrene	1E-08	2E-05	NA	2E-05	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	1E-09	2E-06	NA	2E-06	NA	NA	NA	NA	NA
			Pentachlorophenol	2E-09	2E-06	NA	2E-06	Liver	5E-06	4E-03	NA	4E-03
			Chemical Total	2E-07	3E-05	--	3E-05	Chemical Total	8E-02	7E-02	--	2E-01
		Exposure Point Total					3E-05					2E-01
	Exposure Medium Total						3E-05					2E-01
Medium Total							3E-05					2E-01
Sediment	Sediment	Woodbury Creek / Hessian Run	**Inorganics**									
			Chromium	1E-06	NA	NA	1E-06	None reported	5E-03	NA	NA	5E-03
			Chemical Total	2E-06	5E-07	--	2E-06	Chemical Total	2E-01	1E-02	--	2E-01
		Exposure Point Total					2E-06					2E-01
	Exposure Medium Total						2E-06					2E-01
Medium Total							2E-06					2E-01
Receptor Total							3E-05					5E-01

Total Excess Cancer Risk Across All Media	3E-05	Total Hazard Index Across All Media	0.5

NA = not applicable
Note:
Only chemicals above EPA's threshold values are listed in this table.

TABLE E-3.3
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current
Receptor Population:	Resident
Receptor Age:	Adult and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Rental Home Area	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	3E-04	4E-05	4E-10	3E-04	NA	NA	NA	NA	NA
			Benzo(a)pyrene	2E-03	3E-04	2E-09	2E-03	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	3E-04	4E-05	3E-10	3E-04	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	1E-05	2E-06	2E-10	2E-05	NA	NA	NA	NA	NA
			Chrysene	3E-06	4E-07	3E-11	3E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	5E-04	8E-05	7E-10	6E-04	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	8E-05	1E-05	9E-11	9E-05	NA	NA	NA	NA	NA
			Inorganics									
			Arsenic	1E-06	8E-08	7E-11	2E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	3E-02	2E-03	5E-06	4E-02
			Chromium	8E-06	NA	2E-09	8E-06	Lung	6E-02	NA	8E-06	6E-02
			Chemical Total	3E-03	4E-04	6E-09	3E-03	Chemical Total	4E-01	2E-02	3E-04	4E-01
		Exposure Point Total					3E-03					4E-01
	Exposure Medium Total						3E-03					4E-01
Medium Total							3E-03					4E-01
Groundwater	Groundwater	Tap Water	**Volatile Organic Compounds**									
			Vinyl Chloride	1E-04	5E-06	5E-09	1E-04	Liver	5E-02	3E-03	2E-03	5E-02
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	4E+00	9E-02	NA	4E+00
			Arsenic	1E-04	3E-07	NA	1E-04	Skin	2E+00	5E-03	NA	2E+00
			Chromium	4E-06	1E-08	NA	4E-06	None reported	2E-02	2E-03	NA	2E-02
			Vanadium	NA	NA	NA	NA	Kidney	1E+00	3E-03	NA	1E+00
			Chemical Total	3E-04	6E-06	7E-09	3E-04	Chemical Total	8E+00	1E-01	5E-03	8E+00
		Exposure Point Total					3E-04					8E+00
	Exposure Medium Total						3E-04					8E+00
Medium Total							3E-04					8E+00
Receptor Total							4E-03					9E+00

Total Excess Cancer Risk Across All Media	4E-03
Total Hazard Index Across All Media	9

Blood HI Across All Media =	4
Kidney HI Across All Media =	1
Longevity HI Across All Media =	4
Skin HI Across All Media =	2

NA = not applicable
CNS = central nervous system
Note:
Only chemicals above EPA's threshold values are listed in this table

TABLE E-3.4
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Matteo Property	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	1E-04	2E-05	3E-10	2E-04	NA	NA	NA	NA	NA
			Benzo(a)pyrene	8E-04	1E-04	2E-09	1E-03	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	1E-04	2E-05	3E-10	1E-04	NA	NA	NA	NA	NA
			Benzo(k)fluoranthene	7E-06	1E-06	2E-10	8E-06	NA	NA	NA	NA	NA
			Chrysene	1E-06	2E-07	3E-11	1E-06	NA	NA	NA	NA	NA
			Dibenzo(a,h)anthracene	2E-04	2E-05	4E-10	2E-04	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	4E-05	6E-06	9E-11	4E-05	NA	NA	NA	NA	NA
			Dioxins/Furans									
			Dioxin/Furan TEQ	2E-06	8E-08	1E-11	2E-06	Liver / Reproductive / Development / Endocrine System / Respiratory / Blood	2E-01	8E-03	4E-08	3E-01
			Pesticides/Polychlorinated Biphenyls									
			4,4'-DDT	3E-06	1E-07	2E-11	3E-06	Liver	2E-01	6E-03	NA	2E-01
			Aroclor 1260	5E-05	7E-06	3E-10	5E-05	Eye / Finger Nail / Immune System	1E+01	2E+00	NA	1E+01
			Dieldrin	1E-05	1E-06	7E-11	1E-05	Liver	1E-01	2E-02	NA	2E-01
			Heptachlor Epoxide	4E-06	5E-07	2E-11	5E-06	Liver	4E-01	4E-02	NA	4E-01
			Inorganics									
			Arsenic	2E-06	1E-07	2E-10	2E-06	Developmental / Cardiovascular System / CNS / Lung / Skin	4E-02	3E-03	1E-05	5E-02
			Chromium	1E-05	NA	5E-09	1E-05	Lung	7E-02	NA	2E-05	7E-02
			Vanadium	NA	NA	3E-09	3E-09	Kidney / Respiratory System	3E+00	NA	2E-05	3E+00
			Chemical Total	1E-03	2E-04	1E-08	2E-03	Chemical Total	2E+01	2E+00	5E-04	2E+01
		Exposure Point Total					2E-03					2E+01
	Exposure Medium Total						2E-03					2E+01
Medium Total							2E-03					2E+01
Groundwater	Groundwater	Tap Water	**Volatile Organic Compounds**									
			Vinyl Chloride	1E-04	5E-06	5E-09	1E-04	Liver	5E-02	3E-03	2E-03	5E-02
			Inorganics									
			Antimony	NA	NA	NA	NA	Longevity / Blood	4E+00	9E-02	NA	4E+00
			Arsenic	1E-04	3E-07	NA	1E-04	Skin	2E+00	5E-03	NA	2E+00
			Chromium	4E-06	1E-08	NA	4E-06	None reported	2E-02	2E-03	NA	2E-02
			Vanadium	NA	NA	NA	NA	Kidney	1E+00	3E-03	NA	1E+00
			Chemical Total	3E-04	6E-06	7E-09	3E-04	Chemical Total	8E+00	1E-01	5E-03	8E+00
		Exposure Point Total					3E-04					8E+00
	Exposure Medium Total						3E-04					8E+00
Medium Total							3E-04					8E+00

TABLE E-3.4
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adults and Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Woodbury Creek / Hessian Run	**Semi-volatile Organic Compounds**									
			Benzo(a)anthracene	6E-09	8E-06	NA	8E-06	NA	NA	NA	NA	NA
			Benzo(a)pyrene	1E-07	2E-04	NA	2E-04	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	1E-08	3E-05	NA	3E-05	NA	NA	NA	NA	NA
			Indeno(1,2,3-cd)pyrene	5E-09	1E-05	NA	1E-05	NA	NA	NA	NA	NA
			Pentachlorophenol	3E-09	2E-06	NA	2E-06	Liver	1E-05	7E-03	NA	7E-03
			Chemical Total	5E-07	3E-04	--	3E-04	Chemical Total	2E-01	1E-01	--	3E-01
		Exposure Point Total					3E-04					3E-01
	Exposure Medium Total						3E-04					3E-01
Medium Total							3E-04					3E-01
Sediment	Sediment	Woodbury Creek/ Hessian Run	**Inorganics**									
			Arsenic	1E-06	4E-07	NA	2E-06	Skin	5E-02	9E-03	NA	6E-02
			Chromium	4E-06	NA	NA	4E-06	None reported	3E-02	NA	NA	3E-02
			Vanadium	NA	NA	NA	NA	Kidney	1E+00	NA	NA	1E+00
			Chemical Total	6E-06	5E-07	--	6E-06	Chemical Total	1E+00	2E-02	--	1E+00
		Exposure Point Total					6E-06					1E+00
	Exposure Medium Total						6E-06					1E+00
Medium Total							6E-06					1E+00
Whole-body Fish	Whole-body Fish	Woodbury Creek/ Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	3E-06	NA	NA	3E-06	NA	NA	NA	NA	NA
			Aroclor 1254	8E-06	NA	NA	8E-06	Eye / Finger Nail / Immune System	1E+00	NA	NA	1E+00
			Aroclor 1260	5E-06	NA	NA	5E-06	Eye / Finger Nail / Immune System	8E-01	NA	NA	8E-01
			Chemical Total	2E-05	--	--	2E-05	Chemical Total	2E+00	--	--	2E+00
		Exposure Point Total					2E-05					2E+00
	Exposure Medium Total						2E-05					2E+00
Medium Total							2E-05					2E+00
Receptor Total							2E-03					3E+01

Total Excess Cancer Risk Across All Media	2E-03
Total Hazard Index Across All Media	30

Blood HI Across All Media =	5
Liver HI Across All Media =	1
Kidney HI Across All Media =	5
Respiratory HI Across All Media =	3
Eye HI Across All Media =	16
Longevity HI Across All Media =	4
Skin HI Across All Media =	2
Immune system HI Across All Media =	16
Finger Nail HI Across All Media =	16

NA = not applicable
CNS = central nervous system
Note:
Only chemicals above EPA's threshold values are listed in this table.

CDM Smith

TABLE E-3.5a
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	1E-06	NA	NA	1E-06	NA	NA	NA	NA	NA
			Aroclor 1254	4E-06	NA	NA	4E-06	Eye / Finger Nail / Immune System	7E-01	NA	NA	7E-01
			Aroclor 1260	3E-06	NA	NA	3E-06	Eye / Finger Nail / Immune System	5E-01	NA	NA	5E-01
			Chemical Total	8E-06	--	--	8E-06	Chemical Total	1E+00	--	--	1E+00
		Exposure Point Total					8E-06					1E+00
	Exposure Medium Total						8E-06					1E+00
Medium Total							8E-06					1E+00
Receptor Total							8E-06					1E+00

Total Excess Cancer Risk Across All Media: 8E-06

Total Hazard Index Across All Media: 1

NA = not applicable

Note:
Only chemicals above EPA's threshold values are listed in this table

TABLE E-3.5b
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
Matteo & Sons, Inc. Site
Thorofare, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Angler
Receptor Age:	Child (0-6 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Whole-body Fish	Whole-body Fish	Woodbury Creek / Hessian Run	**Pesticides/Polychlorinated Biphenyls**									
			Aroclor 1248	1E-06	NA	NA	1E-06	NA	NA	NA	NA	NA
			Aroclor 1254	4E-06	NA	NA	4E-06	Eye / Finger Nail / Immune System	1E+00	NA	NA	1E+00
			Aroclor 1260	3E-06	NA	NA	3E-06	Eye / Finger Nail / Immune System	8E-01	NA	NA	8E-01
			Chemical Total	8E-06	--	--	8E-06	Chemical Total	2E+00	--	--	2E+00
		Exposure Point Total					8E-06					2E+00
	Exposure Medium Total						8E-06					2E+00
Medium Total							8E-06					2E+00
Receptor Total							8E-06					2E+00

Total Excess Cancer Risk Across All Media	8E-06
Total Hazard Index Across All Media	2
Eye HI Across All Media =	2
Immune system HI Across All Media =	2
Finger Nail HI Across All Media =	2

NA = not applicable

Note:
Only chemicals above EPA's threshold values are listed in this table.

Appendix F

Appendix F

Comparison of Reporting Limits for Non-detected Chemicals to Screening Levels

Appendix F Contents
Matteo & Sons, Inc. Site
Thorofare, New Jersey

F Comparison of Reporting Limits for Non-detected Chemicals to Screening Levels

F-1a Surface Soil - Matteo Property
F-1b Surface Soil - Willow Woods Property
F-2a Surface / Subsurface Soil - Matteo Property
F-2b Surface / Subsurface Soil - Willow Woods Property
F-3 Groundwater
F-4 Surface Water
F-5 Sediment

TABLE F-1a

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE SOIL - MATTEO PROPERTY[1]

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [2]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	µg/kg	4.9	7.6	620000	ns	No	No
79-34-5	1,1,2,2-Tetrachloroethane	µg/kg	4.9	7.6	600	c	No	No
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/kg	4.9	7.6	910000	ns	No	No
79-00-5	1,1,2-Trichloroethane	µg/kg	4.9	7.6	150	n	No	No
75-34-3	1,1-Dichloroethane	µg/kg	4.9	7.6	3600	c	No	No
87-61-6	1,2,3-Trichlorobenzene	µg/kg	4.9	7.6	6300	n	No	No
120-82-1	1,2,4-Trichlorobenzene	µg/kg	4.9	7.6	5800	n	No	No
96-12-8	1,2-Dibromo-3-Chloropropane	µg/kg	4.9	7.6	5.3	c	No	**Yes**
106-93-4	1,2-Dibromoethane	µg/kg	4.9	7.6	36	c	No	No
95-50-1	1,2-Dichlorobenzene	µg/kg	4.9	7.6	180000	n	No	No
107-06-2	1,2-Dichloroethane	µg/kg	4.9	7.6	460	c	No	No
78-87-5	1,2-Dichloropropane	µg/kg	4.9	7.6	1000	c	No	No
541-73-1	1,3-Dichlorobenzene	µg/kg	4.9	7.6	NA		No	No
106-46-7	1,4-Dichlorobenzene	µg/kg	4.9	7.6	2600	c	No	No
123-91-1	1,4-Dioxane	µg/kg	98	150	5300	c	No	No
591-78-6	2-Hexanone	µg/kg	9.8	15	20000	n	No	No
108-10-1	4-Methyl-2-Pentanone	µg/kg	9.8	15	530000	n	No	No
67-64-1	Acetone	µg/kg	9.8	15	6100000	n	No	No
71-43-2	Benzene	µg/kg	4.9	7.6	1200	c	No	No
74-97-5	Bromochloromethane	µg/kg	4.9	7.6	15000	n	No	No
75-27-4	Bromodichloromethane	µg/kg	4.9	7.6	290	c	No	No
75-25-2	Bromoform	µg/kg	4.9	7.6	19000	c	No	No
74-83-9	Bromomethane	µg/kg	4.9	7.6	680	n	No	No
75-15-0	Carbon Disulfide	µg/kg	4.9	7.6	77000	n	No	No
56-23-5	Carbon Tetrachloride	µg/kg	4.9	7.6	650	c	No	No
108-90-7	Chlorobenzene	µg/kg	4.9	7.6	28000	n	No	No
75-00-3	Chloroethane	µg/kg	4.9	7.6	1400000	n	No	No
67-66-3	Chloroform	µg/kg	4.9	7.6	320	c	No	No
74-87-3	Chloromethane	µg/kg	4.9	7.6	11000	n	No	No
156-59-2	cis-1,2-Dichloroethene	µg/kg	4.9	7.6	16000	n	No	No
110-82-7	Cyclohexane	µg/kg	4.9	7.6	120000	ns	No	No
124-48-1	Dibromochloromethane	µg/kg	4.9	7.6	750	c	No	No
75-71-8	Dichlorodifluoromethane	µg/kg	4.9	7.6	8700	n	No	No
100-41-4	Ethylbenzene	µg/kg	4.9	7.6	5800	cs	No	No
98-82-8	Isopropylbenzene	µg/kg	4.9	7.6	190000	n	No	No
179601-23-1	m,p-Xylene	µg/kg	4.9	7.6	55000	n[4]	No	No
79-20-9	Methyl Acetate	µg/kg	4.9	7.6	7800000	n	No	No
1634-04-4	Methyl Tert-Butyl Ether	µg/kg	4.9	7.6	47000	c	No	No
108-87-2	Methylcyclohexane	µg/kg	4.9	7.6	NA		No	No
75-09-2	Methylene Chloride	µg/kg	4.9	7.6	35000	n	No	No
95-47-6	o-Xylene	µg/kg	4.9	7.6	65000	n	No	No
100-42-5	Styrene	µg/kg	4.9	7.6	560000	ns	No	No
156-60-5	trans-1,2-Dichloroethene	µg/kg	4.9	7.6	160000	n	No	No
10061-02-6	trans-1,3-Dichloropropene	µg/kg	4.9	7.6	1800	c[5]	No	No
75-69-4	Trichlorofluoromethane	µg/kg	4.9	7.6	73000	n	No	No
75-01-4	Vinyl Chloride	µg/kg	4.9	7.6	59	c	No	No

TABLE F-1a

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE SOIL - MATTEO PROPERTY[1]

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [2]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Semi-volatile Organic Compounds								
95-94-3	1,2,4,5-Tetrachlorobenzene	µg/kg	190	250	2300	n	No	No
95-95-4	2,4,5-Trichlorophenol	µg/kg	190	250	630000	n	No	No
88-06-2	2,4,6-Trichlorophenol	µg/kg	190	250	6300	n	No	No
120-83-2	2,4-Dichlorophenol	µg/kg	190	250	19000	n	No	No
105-67-9	2,4-Dimethylphenol	µg/kg	190	250	130000	n	No	No
51-28-5	2,4-Dinitrophenol	µg/kg	360	490	13000	n	No	No
121-14-2	2,4-Dinitrotoluene	µg/kg	190	250	1700	c	No	No
606-20-2	2,6-Dinitrotoluene	µg/kg	190	250	360	c	No	No
91-58-7	2-Chloronaphthalene	µg/kg	190	250	480000	n	No	No
95-57-8	2-Chlorophenol	µg/kg	190	250	39000	n	No	No
95-48-7	2-Methylphenol	µg/kg	190	250	320000	n	No	No
88-74-4	2-Nitroaniline	µg/kg	360	490	63000	n	No	No
88-75-5	2-Nitrophenol	µg/kg	190	250	NA		No	No
91-94-1	3,3'-Dichlorobenzidine	µg/kg	190	250	1200	c	No	No
99-09-2	3-Nitroaniline	µg/kg	360	490	NA		No	No
534-52-1	4,6-Dinitro-2-Methylphenol	µg/kg	360	490	510	n	No	No
101-55-3	4-Bromophenyl-Phenylether	µg/kg	190	250	NA		No	No
59-50-7	4-Chloro-3-Methylphenol	µg/kg	190	250	630000	n	No	No
106-47-8	4-Chloroaniline	µg/kg	190	250	2700	c	No	No
7005-72-3	4-Chlorophenyl-Phenylether	µg/kg	190	250	NA		No	No
106-44-5	4-Methylphenol	µg/kg	190	250	630000	n	No	No
100-01-6	4-Nitroaniline	µg/kg	360	490	25000	n	No	No
100-02-7	4-Nitrophenol	µg/kg	360	490	NA		No	No
1912-24-9	Atrazine	µg/kg	190	250	2400	c	No	No
111-91-1	Bis(2-Chloroethoxy)Methane	µg/kg	190	250	19000	n	No	No
111-44-4	Bis(2-Chloroethyl) Ether	µg/kg	190	250	230	c	No	**Yes**
108-60-1	Bis-Chloroisopropyl Ether	µg/kg	190	250	4900	c	No	No
105-60-2	Caprolactam	µg/kg	190	250	3100000	n	No	No
58-90-2	Chlorophenols	µg/kg	190	250	190000	n	No	No
84-66-2	Diethylphthalate	µg/kg	190	250	5100000	n	No	No
117-84-0	Di-N-Octylphthalate	µg/kg	190	250	63000	n	No	No
87-68-3	Hexachlorobutadiene	µg/kg	190	250	1200	c	No	No
77-47-4	Hexachlorocyclopentadiene	µg/kg	190	250	180	n	**Yes**	**Yes**
67-72-1	Hexachloroethane	µg/kg	190	250	1800	c	No	No
78-59-1	Isophorone	µg/kg	190	250	570000	c	No	No
98-95-3	Nitrobenzene	µg/kg	190	250	5100	c	No	No
621-64-7	N-Nitroso-Di-N-Propylamine	µg/kg	190	250	78	c	**Yes**	**Yes**
87-86-5	Pentachlorophenol	µg/kg	360	490	1000	c	No	No

TABLE F-1a

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE SOIL - MATTEO PROPERTY[1]

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [2]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Pesticides/Polychlorinated Biphenyls								
12674-11-2	Aroclor 1016	µg/kg	35	49	410	n	No	No
11104-28-2	Aroclor 1221	µg/kg	35	49	170	c	No	No
11141-16-5	Aroclor 1232	µg/kg	35	49	170	c	No	No
53469-21-9	Aroclor 1242	µg/kg	35	49	230	c	No	No
37324-23-5	Aroclor 1262	µg/kg	35	49	120	n[5]	No	No
11100-14-4	Aroclor 1268	µg/kg	35	49	120	n[5]	No	No
33213-65-9	Endosulfan II	µg/kg	3.6	490	47000	n	No	No
1031-07-8	Endosulfan Sulfate	µg/kg	3.6	490	47000	n[6]	No	No
7421-93-4	Endrin Aldehyde	µg/kg	3.6	850	1900	n[7]	No	No
58-89-9	Gamma-BHC (Lindane)	µg/kg	1.8	250	570	c	No	No
72-43-5	Methoxychlor	µg/kg	18	2500	32000	n	No	No
8001-35-2	Toxaphene	µg/kg	180	25000	490	c	No	**Yes**

n = screening level based on noncancer effects
c = screening level based on cancer effects
s = concentration may exceed saturation concentration
NA = not available

µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
BHC = hexachlorocyclohexane

[1]This includes the scrapyard area and the open field/waste disposal area.

[2]Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3]screening value for m-xylene

[4]screening value for 1,3-dichloropropene

[5]screening value for Aroclor 1254

[6]screening value for endosulfan

[7]screening value for endrin

TABLE F-1b

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE SOIL - WILLOW WOODS PROPERTY

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	µg/kg	4.7	6.7	620000	ns	No	No
79-34-5	1,1,2,2-Tetrachloroethane	µg/kg	4.7	6.7	600	c	No	No
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/kg	4.7	6.7	910000	ns	No	No
79-00-5	1,1,2-Trichloroethane	µg/kg	4.7	6.7	150	n	No	No
75-34-3	1,1-Dichloroethane	µg/kg	4.7	6.7	3600	c	No	No
75-35-4	1,1-Dichloroethene	µg/kg	4.7	6.7	23000	n	No	No
87-61-6	1,2,3-Trichlorobenzene	µg/kg	4.7	6.7	6300	n	No	No
120-82-1	1,2,4-Trichlorobenzene	µg/kg	4.7	6.7	5800	n	No	No
96-12-8	1,2-Dibromo-3-Chloropropane	µg/kg	4.7	6.7	5.3	c	No	**Yes**
106-93-4	1,2-Dibromoethane	µg/kg	4.7	6.7	36	c	No	No
95-50-1	1,2-Dichlorobenzene	µg/kg	4.7	6.7	180000	n	No	No
107-06-2	1,2-Dichloroethane	µg/kg	4.7	6.7	460	c	No	No
78-87-5	1,2-Dichloropropane	µg/kg	4.7	6.7	1000	c	No	No
541-73-1	1,3-Dichlorobenzene	µg/kg	4.7	6.7	NA		No	No
106-46-7	1,4-Dichlorobenzene	µg/kg	4.7	6.7	2600	c	No	No
123-91-1	1,4-Dioxane	µg/kg	95	130	5300	c	No	No
78-93-3	2-Butanone	µg/kg	9.5	13	2700000	n	No	No
591-78-6	2-Hexanone	µg/kg	9.5	13	20000	n	No	No
108-10-1	4-Methyl-2-Pentanone	µg/kg	9.5	13	530000	n	No	No
71-43-2	Benzene	µg/kg	4.7	6.7	1200	c	No	No
74-97-5	Bromochloromethane	µg/kg	4.7	6.7	15000	n	No	No
75-27-4	Bromodichloromethane	µg/kg	4.7	6.7	290	c	No	No
75-25-2	Bromoform	µg/kg	4.7	6.7	19000	c	No	No
74-83-9	Bromomethane	µg/kg	4.7	6.7	680	n	No	No
75-15-0	Carbon Disulfide	µg/kg	4.7	6.7	77000	n	No	No
56-23-5	Carbon Tetrachloride	µg/kg	4.7	6.7	650	c	No	No
108-90-7	Chlorobenzene	µg/kg	4.7	6.7	28000	n	No	No
75-00-3	Chloroethane	µg/kg	4.7	6.7	1400000	n	No	No
67-66-3	Chloroform	µg/kg	4.7	6.7	320	c	No	No
74-87-3	Chloromethane	µg/kg	4.7	6.7	11000	n	No	No
156-59-2	cis-1,2-Dichloroethene	µg/kg	4.7	6.7	16000	n	No	No
10061-01-5	cis-1,3-Dichloropropene	µg/kg	4.7	6.7	1800	c[2]	No	No
110-82-7	Cyclohexane	µg/kg	4.7	6.7	120000	ns	No	No
124-48-1	Dibromochloromethane	µg/kg	4.7	6.7	750	c	No	No
75-71-8	Dichlorodifluoromethane	µg/kg	4.7	6.7	8700	n	No	No
100-41-4	Ethylbenzene	µg/kg	4.7	6.7	5800	cs	No	No
98-82-8	Isopropylbenzene	µg/kg	4.7	6.7	190000	n	No	No
179601-23-1	m,p-Xylene	µg/kg	4.7	6.7	55000	n[3]	No	No
79-20-9	Methyl Acetate	µg/kg	4.7	6.7	7800000	n	No	No
1634-04-4	Methyl Tert-Butyl Ether	µg/kg	4.7	6.7	47000	c	No	No
108-87-2	Methylcyclohexane	µg/kg	4.7	6.7	NA		No	No
75-09-2	Methylene Chloride	µg/kg	4.7	6.7	35000	n	No	No
95-47-6	o-Xylene	µg/kg	4.7	6.7	65000	n	No	No
100-42-5	Styrene	µg/kg	4.7	6.7	560000	ns	No	No
127-18-4	Tetrachloroethene	µg/kg	4.7	6.7	8100	n	No	No
108-88-3	Toluene	µg/kg	4.7	6.7	360000	ns	No	No
156-60-5	trans-1,2-Dichloroethene	µg/kg	4.7	6.7	160000	n	No	No
10061-02-6	trans-1,3-Dichloropropene	µg/kg	4.7	6.7	1800	c[2]	No	No
79-01-6	Trichloroethene	µg/kg	4.7	6.7	410	n	No	No
75-69-4	Trichlorofluoromethane	µg/kg	4.7	6.7	73000	n	No	No
75-01-4	Vinyl Chloride	µg/kg	4.7	6.7	59	c	No	No

TABLE F-1b

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE SOIL - WILLOW WOODS PROPERTY

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Semi-volatile Organic Compounds							
92-52-4	1,1'-Biphenyl	µg/kg	180	260	4700 n	No	No
95-94-3	1,2,4,5-Tetrachlorobenzene	µg/kg	180	260	2300 n	No	No
95-95-4	2,4,5-Trichlorophenol	µg/kg	180	260	630000 n	No	No
88-06-2	2,4,6-Trichlorophenol	µg/kg	180	260	6300 n	No	No
120-83-2	2,4-Dichlorophenol	µg/kg	180	260	19000 n	No	No
105-67-9	2,4-Dimethylphenol	µg/kg	180	260	130000 n	No	No
51-28-5	2,4-Dinitrophenol	µg/kg	350	500	13000 n	No	No
121-14-2	2,4-Dinitrotoluene	µg/kg	180	260	1700 c	No	No
606-20-2	2,6-Dinitrotoluene	µg/kg	180	260	360 c	No	No
91-58-7	2-Chloronaphthalene	µg/kg	180	260	480000 n	No	No
95-57-8	2-Chlorophenol	µg/kg	180	260	39000 n	No	No
91-57-6	2-Methylnaphthalene	µg/kg	180	260	24000 n	No	No
95-48-7	2-Methylphenol	µg/kg	180	260	320000 n	No	No
88-74-4	2-Nitroaniline	µg/kg	350	500	63000 n	No	No
88-75-5	2-Nitrophenol	µg/kg	180	260	NA	No	No
91-94-1	3,3'-Dichlorobenzidine	µg/kg	180	260	1200 c	No	No
99-09-2	3-Nitroaniline	µg/kg	350	500	NA	No	No
534-52-1	4,6-Dinitro-2-Methylphenol	µg/kg	350	500	510 n	No	No
101-55-3	4-Bromophenyl-Phenylether	µg/kg	180	260	NA	No	No
59-50-7	4-Chloro-3-Methylphenol	µg/kg	180	260	630000 n	No	No
106-47-8	4-Chloroaniline	µg/kg	180	260	2700 c	No	No
7005-72-3	4-Chlorophenyl-Phenylether	µg/kg	180	260	NA	No	No
106-44-5	4-Methylphenol	µg/kg	180	260	630000 n	No	No
100-01-6	4-Nitroaniline	µg/kg	350	500	25000 n	No	No
100-02-7	4-Nitrophenol	µg/kg	350	500	NA	No	No
208-96-8	Acenaphthylene	µg/kg	180	260	360000 n[4]	No	No
1912-24-9	Atrazine	µg/kg	180	260	2400 c	No	No
111-91-1	Bis(2-Chloroethoxy)Methane	µg/kg	180	260	19000 n	No	No
111-44-4	Bis(2-Chloroethyl) Ether	µg/kg	180	260	230 c	No	**Yes**
108-60-1	Bis-Chloroisopropyl Ether	µg/kg	180	260	4900 c	No	No
85-68-7	Butylbenzylphthalate	µg/kg	180	260	290000 c	No	No
105-60-2	Caprolactam	µg/kg	180	260	3100000 n	No	No
58-90-2	Chlorophenols	µg/kg	180	260	190000 n	No	No
132-64-9	Dibenzofuran	µg/kg	180	260	7300 n	No	No
84-66-2	Diethylphthalate	µg/kg	180	260	5100000 n	No	No
131-11-3	Dimethylphthalate	µg/kg	180	260	NA	No	No
117-84-0	Di-N-Octylphthalate	µg/kg	180	260	63000 n	No	No
118-74-1	Hexachlorobenzene	µg/kg	180	260	210 c	No	**Yes**
87-68-3	Hexachlorobutadiene	µg/kg	180	260	1200 c	No	No
77-47-4	Hexachlorocyclopentadiene	µg/kg	180	260	180 n	No	**Yes**
67-72-1	Hexachloroethane	µg/kg	180	260	1800 c	No	No
78-59-1	Isophorone	µg/kg	180	260	570000 c	No	No
91-20-3	Naphthalene	µg/kg	180	260	3800 c	No	No
98-95-3	Nitrobenzene	µg/kg	180	260	5100 c	No	No
621-64-7	N-Nitroso-Di-N-Propylamine	µg/kg	180	260	78 c	**Yes**	**Yes**
86-30-6	N-Nitrosodiphenylamine	µg/kg	180	260	110000 c	No	No
87-86-5	Pentachlorophenol	µg/kg	350	500	1000 c	No	No
108-95-2	Phenol	µg/kg	180	260	1900000 n	No	No

TABLE F-1b

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE SOIL - WILLOW WOODS PROPERTY

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Pesticides/Polychlorinated Biphenyls								
72-54-8	4,4'-DDD	µg/kg	3.5	5	2300	c	No	No
309-00-2	Aldrin	µg/kg	1.8	2.6	39	c	No	No
319-84-6	Alpha-BHC	µg/kg	1.8	2.6	86	c	No	No
12674-11-2	Aroclor 1016	µg/kg	35	50	410	n	No	No
11104-28-2	Aroclor 1221	µg/kg	35	50	170	c	No	No
11141-16-5	Aroclor 1232	µg/kg	35	50	170	c	No	No
53469-21-9	Aroclor 1242	µg/kg	35	50	230	c	No	No
12672-29-6	Aroclor 1248	µg/kg	35	50	230	c	No	No
11097-69-1	Aroclor 1254	µg/kg	35	50	120	n	No	No
37324-23-5	Aroclor 1262	µg/kg	35	50	120	n[5]	No	No
11100-14-4	Aroclor 1268	µg/kg	35	50	120	n[5]	No	No
319-85-7	Beta-BHC	µg/kg	1.8	2.6	300	c	No	No
319-86-8	Delta-BHC	µg/kg	1.8	2.6	300	c[6]	No	No
959-98-8	Endosulfan I	µg/kg	1.8	2.6	47000	n[7]	No	No
33213-65-9	Endosulfan II	µg/kg	3.5	5	47000	n[7]	No	No
72-20-8	Endrin	µg/kg	3.5	5	1900	n	No	No
53494-70-5	Endrin Ketone	µg/kg	3.5	5	1900	n[8]	No	No
58-89-9	Gamma-BHC (Lindane)	µg/kg	1.8	2.6	570	c	No	No
1024-57-3	Heptachlor Epoxide	µg/kg	1.8	2.6	70	c	No	No
72-43-5	Methoxychlor	µg/kg	18	26	32000	n	No	No
8001-35-2	Toxaphene	µg/kg	180	260	490	c	No	No
Inorganics								
7440-41-7	Beryllium	mg/kg	0.52	0.58	16	n	No	No
57-12-5	Cyanide	mg/kg	0.52	0.59	0.27	n	**Yes**	**Yes**
7782-49-2	Selenium	mg/kg	2.6	2.9	39	n	No	No
7440-22-4	Silver	mg/kg	0.52	0.58	39	n	No	No
7440-23-5	Sodium	mg/kg	517	584	NA		No	No
7440-28-0	Thallium	mg/kg	0.52	0.58	0.078	n	**Yes**	**Yes**

n = screening level based on noncancer effects
c = screening level based on cancer effects
s = concentration may exceed saturation concentration
NA = not available

µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
BHC = hexachlorocyclohexane
4,4'-DDD = p,p'-dichlorodiphenyldichloroethane

[1]Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[2]screening value for 1,3-dichloropropene

[3]screening value for m-xylene

[4]screening value for acenaphthene

[5]screening value for Aroclor 1254

[6]screening value for hexachlorocyclohexane, technical

[7]screening value for endosulfan

[8]screening value for endrin

TABLE F-2a

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE/SUBSURFACE SOIL - MATTEO PROPERTY[1]

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [2]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	µg/kg	4	8.2	620000	ns	No	No
79-34-5	1,1,2,2-Tetrachloroethane	µg/kg	4	8.2	600	c	No	No
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/kg	4	8.2	910000	ns	No	No
79-00-5	1,1,2-Trichloroethane	µg/kg	4	8.2	150	n	No	No
75-34-3	1,1-Dichloroethane	µg/kg	4	8.2	3600	c	No	No
87-61-6	1,2,3-Trichlorobenzene	µg/kg	4	8.2	6300	n	No	No
120-82-1	1,2,4-Trichlorobenzene	µg/kg	4	8.2	5800	n	No	No
96-12-8	1,2-Dibromo-3-Chloropropane	µg/kg	4	8.2	5.3	c	No	**Yes**
106-93-4	1,2-Dibromoethane	µg/kg	4	8.2	36	c	No	No
95-50-1	1,2-Dichlorobenzene	µg/kg	4	8.2	180000	n	No	No
107-06-2	1,2-Dichloroethane	µg/kg	4	8.2	460	c	No	No
78-87-5	1,2-Dichloropropane	µg/kg	4	8.2	1000	c	No	No
541-73-1	1,3-Dichlorobenzene	µg/kg	4	8.2	NA		No	No
106-46-7	1,4-Dichlorobenzene	µg/kg	4	8.2	2600	c	No	No
123-91-1	1,4-Dioxane	µg/kg	80	160	5300	c	No	No
591-78-6	2-Hexanone	µg/kg	8	16	20000	n	No	No
108-10-1	4-Methyl-2-Pentanone	µg/kg	8	16	530000	n	No	No
71-43-2	Benzene	µg/kg	4	8.2	1200	c	No	No
74-97-5	Bromochloromethane	µg/kg	4	8.2	15000	n	No	No
75-27-4	Bromodichloromethane	µg/kg	4	8.2	290	c	No	No
75-25-2	Bromoform	µg/kg	4	8.2	19000	c	No	No
74-83-9	Bromomethane	µg/kg	4	8.2	680	n	No	No
75-15-0	Carbon Disulfide	µg/kg	4	8.2	77000	n	No	No
56-23-5	Carbon Tetrachloride	µg/kg	4	8.2	650	c	No	No
108-90-7	Chlorobenzene	µg/kg	4	8.2	28000	n	No	No
75-00-3	Chloroethane	µg/kg	4	8.2	1400000	n	No	No
67-66-3	Chloroform	µg/kg	4	8.2	320	c	No	No
74-87-3	Chloromethane	µg/kg	4	8.2	11000	n	No	No
156-59-2	cis-1,2-Dichloroethene	µg/kg	4	8.2	16000	n	No	No
110-82-7	Cyclohexane	µg/kg	4	8.2	120000	ns	No	No
124-48-1	Dibromochloromethane	µg/kg	4	8.2	750	c	No	No
75-71-8	Dichlorodifluoromethane	µg/kg	4	8.2	8700	n	No	No
100-41-4	Ethylbenzene	µg/kg	4	8.2	5800	cs	No	No
98-82-8	Isopropylbenzene	µg/kg	4	8.2	190000	n	No	No
179601-23-1	m,p-Xylene	µg/kg	4	8.2	55000	n[3]	No	No
79-20-9	Methyl Acetate	µg/kg	4	8.2	7800000	n	No	No
1634-04-4	Methyl Tert-Butyl Ether	µg/kg	4	8.2	47000	c	No	No
108-87-2	Methylcyclohexane	µg/kg	4	8.2	NA		No	No
75-09-2	Methylene Chloride	µg/kg	4	8.2	35000	n	No	No
95-47-6	o-Xylene	µg/kg	4	8.2	65000	n	No	No
100-42-5	Styrene	µg/kg	4	8.2	560000	ns	No	No
156-60-5	trans-1,2-Dichloroethene	µg/kg	4	8.2	160000	n	No	No
10061-02-6	trans-1,3-Dichloropropene	µg/kg	4	8.2	1800	c[4]	No	No
75-69-4	Trichlorofluoromethane	µg/kg	4	8.2	73000	n	No	No
75-01-4	Vinyl Chloride	µg/kg	4	8.2	59	c	No	No

TABLE F-2a

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE/SUBSURFACE SOIL - MATTEO PROPERTY[1]

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [2]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Semi-volatile Organic Compounds							
95-94-3	1,2,4,5-Tetrachlorobenzene	µg/kg	170	4100	2300 n	No	**Yes**
95-95-4	2,4,5-Trichlorophenol	µg/kg	170	4100	630000 n	No	No
88-06-2	2,4,6-Trichlorophenol	µg/kg	170	4100	6300 n	No	No
120-83-2	2,4-Dichlorophenol	µg/kg	170	4100	19000 n	No	No
105-67-9	2,4-Dimethylphenol	µg/kg	170	4100	130000 n	No	No
51-28-5	2,4-Dinitrophenol	µg/kg	340	7900	13000 n	No	No
121-14-2	2,4-Dinitrotoluene	µg/kg	170	4100	1700 c	No	**Yes**
606-20-2	2,6-Dinitrotoluene	µg/kg	170	4100	360 c	No	**Yes**
91-58-7	2-Chloronaphthalene	µg/kg	170	4100	480000 n	No	No
95-57-8	2-Chlorophenol	µg/kg	170	4100	39000 n	No	No
95-48-7	2-Methylphenol	µg/kg	170	4100	320000 n	No	No
88-74-4	2-Nitroaniline	µg/kg	340	7900	63000 n	No	No
88-75-5	2-Nitrophenol	µg/kg	170	4100	NA	No	No
91-94-1	3,3'-Dichlorobenzidine	µg/kg	170	4100	1200 c	No	**Yes**
99-09-2	3-Nitroaniline	µg/kg	340	7900	NA	No	No
534-52-1	4,6-Dinitro-2-Methylphenol	µg/kg	340	7900	510 n	No	**Yes**
101-55-3	4-Bromophenyl-Phenylether	µg/kg	170	4100	NA	No	No
59-50-7	4-Chloro-3-Methylphenol	µg/kg	170	4100	630000 n	No	No
7005-72-3	4-Chlorophenyl-Phenylether	µg/kg	170	4100	NA	No	No
106-44-5	4-Methylphenol	µg/kg	170	4100	630000 n	No	No
100-02-7	4-Nitrophenol	µg/kg	340	7900	NA	No	No
1912-24-9	Atrazine	µg/kg	170	4100	2400 c	No	**Yes**
111-91-1	Bis(2-Chloroethoxy)Methane	µg/kg	170	4100	19000 n	No	No
111-44-4	Bis(2-Chloroethyl) Ether	µg/kg	170	4100	230 c	No	**Yes**
108-60-1	Bis-Chloroisopropyl Ether	µg/kg	170	4100	4900 c	No	No
105-60-2	Caprolactam	µg/kg	170	4100	3100000 n	No	No
117-84-0	Di-N-Octylphthalate	µg/kg	170	4100	63000 n	No	No
87-68-3	Hexachlorobutadiene	µg/kg	170	4100	1200 c	No	**Yes**
77-47-4	Hexachlorocyclopentadiene	µg/kg	170	4100	180 n	No	**Yes**
67-72-1	Hexachloroethane	µg/kg	170	4100	1800 c	No	**Yes**
78-59-1	Isophorone	µg/kg	170	4100	570000 c	No	No
98-95-3	Nitrobenzene	µg/kg	170	4100	5100 c	No	No
621-64-7	N-Nitroso-Di-N-Propylamine	µg/kg	170	4100	78 c	**Yes**	**Yes**
87-86-5	Pentachlorophenol	µg/kg	340	7900	1000 c	No	**Yes**

TABLE F-2a

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE/SUBSURFACE SOIL - MATTEO PROPERTY[1]

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [2]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Pesticides/Polychlorinated Biphenyls							
12674-11-2	Aroclor 1016	µg/kg	34	52	410 n	No	No
11104-28-2	Aroclor 1221	µg/kg	34	52	170 c	No	No
11141-16-5	Aroclor 1232	µg/kg	34	52	170 c	No	No
53469-21-9	Aroclor 1242	µg/kg	34	52	230 c	No	No
37324-23-5	Aroclor 1262	µg/kg	34	52	120 n[5]	No	No
33213-65-9	Endosulfan II	µg/kg	3.4	490	47000 n[6]	No	No
1031-07-8	Endosulfan Sulfate	µg/kg	3.4	490	47000 n[6]	No	No
8001-35-2	Toxaphene	µg/kg	170	25000	490 c	No	**Yes**

n = screening level based on noncancer effects

c = screening level based on cancer effects

s = concentration may exceed saturation concentration

NA = not available

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

[1]This includes the scrapyard area and the open field/waste disposal area.

[2]Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[3]screening value for m-xylene

[4]screening value for 1,3-dichloropropene

[5]screening value for Aroclor 1254

[6]screening value for endosulfan

TABLE F-2b

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE/SUBSURFACE SOIL - WILLOW WOODS PROPERTY

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	µg/kg	4.7	6.7	620000	ns	No	No
79-34-5	1,1,2,2-Tetrachloroethane	µg/kg	4.7	6.7	600	c	No	No
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/kg	4.7	6.7	910000	ns	No	No
79-00-5	1,1,2-Trichloroethane	µg/kg	4.7	6.7	150	n	No	No
75-34-3	1,1-Dichloroethane	µg/kg	4.7	6.7	3600	c	No	No
75-35-4	1,1-Dichloroethene	µg/kg	4.7	6.7	23000	n	No	No
87-61-6	1,2,3-Trichlorobenzene	µg/kg	4.7	6.7	6300	n	No	No
120-82-1	1,2,4-Trichlorobenzene	µg/kg	4.7	6.7	5800	n	No	No
96-12-8	1,2-Dibromo-3-Chloropropane	µg/kg	4.7	6.7	5.3	c	No	**Yes**
106-93-4	1,2-Dibromoethane	µg/kg	4.7	6.7	36	c	No	No
95-50-1	1,2-Dichlorobenzene	µg/kg	4.7	6.7	180000	n	No	No
107-06-2	1,2-Dichloroethane	µg/kg	4.7	6.7	460	c	No	No
78-87-5	1,2-Dichloropropane	µg/kg	4.7	6.7	1000	c	No	No
541-73-1	1,3-Dichlorobenzene	µg/kg	4.7	6.7	NA		No	No
106-46-7	1,4-Dichlorobenzene	µg/kg	4.7	6.7	2600	c	No	No
123-91-1	1,4-Dioxane	µg/kg	95	130	5300	c	No	No
78-93-3	2-Butanone	µg/kg	9.5	13	2700000	n	No	No
591-78-6	2-Hexanone	µg/kg	9.5	13	20000	n	No	No
108-10-1	4-Methyl-2-Pentanone	µg/kg	9.5	13	530000	n	No	No
71-43-2	Benzene	µg/kg	4.7	6.7	1200	c	No	No
74-97-5	Bromochloromethane	µg/kg	4.7	6.7	15000	n	No	No
75-27-4	Bromodichloromethane	µg/kg	4.7	6.7	290	c	No	No
75-25-2	Bromoform	µg/kg	4.7	6.7	19000	c	No	No
74-83-9	Bromomethane	µg/kg	4.7	6.7	680	n	No	No
75-15-0	Carbon Disulfide	µg/kg	4.7	6.7	77000	n	No	No
56-23-5	Carbon Tetrachloride	µg/kg	4.7	6.7	650	c	No	No
108-90-7	Chlorobenzene	µg/kg	4.7	6.7	28000	n	No	No
75-00-3	Chloroethane	µg/kg	4.7	6.7	1400000	n	No	No
67-66-3	Chloroform	µg/kg	4.7	6.7	320	c	No	No
74-87-3	Chloromethane	µg/kg	4.7	6.7	11000	n	No	No
156-59-2	cis-1,2-Dichloroethene	µg/kg	4.7	6.7	16000	n	No	No
10061-01-5	cis-1,3-Dichloropropene	µg/kg	4.7	6.7	1800	c[2]	No	No
110-82-7	Cyclohexane	µg/kg	4.7	6.7	120000	ns	No	No
124-48-1	Dibromochloromethane	µg/kg	4.7	6.7	750	c	No	No
75-71-8	Dichlorodifluoromethane	µg/kg	4.7	6.7	8700	n	No	No
100-41-4	Ethylbenzene	µg/kg	4.7	6.7	5800	cs	No	No
98-82-8	Isopropylbenzene	µg/kg	4.7	6.7	190000	n	No	No
179601-23-1	m,p-Xylene	µg/kg	4.7	6.7	55000	n[3]	No	No
79-20-9	Methyl Acetate	µg/kg	4.7	6.7	7800000	n	No	No
1634-04-4	Methyl Tert-Butyl Ether	µg/kg	4.7	6.7	47000	c	No	No
108-87-2	Methylcyclohexane	µg/kg	4.7	6.7	NA		No	No
75-09-2	Methylene Chloride	µg/kg	4.7	6.7	35000	n	No	No
95-47-6	o-Xylene	µg/kg	4.7	6.7	65000	n	No	No
100-42-5	Styrene	µg/kg	4.7	6.7	560000	ns	No	No
127-18-4	Tetrachloroethene	µg/kg	4.7	6.7	8100	n	No	No
108-88-3	Toluene	µg/kg	4.7	6.7	360000	ns	No	No
156-60-5	trans-1,2-Dichloroethene	µg/kg	4.7	6.7	160000	n	No	No
10061-02-6	trans-1,3-Dichloropropene	µg/kg	4.7	6.7	1800	c[2]	No	No
79-01-6	Trichloroethene	µg/kg	4.7	6.7	410	n	No	No
75-69-4	Trichlorofluoromethane	µg/kg	4.7	6.7	73000	n	No	No
75-01-4	Vinyl Chloride	µg/kg	4.7	6.7	59	c	No	No

TABLE F-2b

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE/SUBSURFACE SOIL - WILLOW WOODS PROPERTY

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Semi-volatile Organic Compounds								
92-52-4	1,1'-Biphenyl	µg/kg	180	260	4700	n	No	No
95-94-3	1,2,4,5-Tetrachlorobenzene	µg/kg	180	260	2300	n	No	No
95-95-4	2,4,5-Trichlorophenol	µg/kg	180	260	630000	n	No	No
88-06-2	2,4,6-Trichlorophenol	µg/kg	180	260	6300	n	No	No
120-83-2	2,4-Dichlorophenol	µg/kg	180	260	19000	n	No	No
105-67-9	2,4-Dimethylphenol	µg/kg	180	260	130000	n	No	No
51-28-5	2,4-Dinitrophenol	µg/kg	340	500	13000	n	No	No
121-14-2	2,4-Dinitrotoluene	µg/kg	180	260	1700	c	No	No
606-20-2	2,6-Dinitrotoluene	µg/kg	180	260	360	c	No	No
91-58-7	2-Chloronaphthalene	µg/kg	180	260	480000	n	No	No
95-57-8	2-Chlorophenol	µg/kg	180	260	39000	n	No	No
91-57-6	2-Methylnaphthalene	µg/kg	180	260	24000	n	No	No
95-48-7	2-Methylphenol	µg/kg	180	260	320000	n	No	No
88-74-4	2-Nitroaniline	µg/kg	340	500	63000	n	No	No
88-75-5	2-Nitrophenol	µg/kg	180	260	NA		No	No
91-94-1	3,3'-Dichlorobenzidine	µg/kg	180	260	1200	c	No	No
99-09-2	3-Nitroaniline	µg/kg	340	500	NA		No	No
534-52-1	4,6-Dinitro-2-Methylphenol	µg/kg	340	500	510	n	No	No
101-55-3	4-Bromophenyl-Phenylether	µg/kg	180	260	NA		No	No
59-50-7	4-Chloro-3-Methylphenol	µg/kg	180	260	630000	n	No	No
106-47-8	4-Chloroaniline	µg/kg	180	260	2700	c	No	No
7005-72-3	4-Chlorophenyl-Phenylether	µg/kg	180	260	NA		No	No
106-44-5	4-Methylphenol	µg/kg	180	260	630000	n	No	No
100-01-6	4-Nitroaniline	µg/kg	340	500	25000	n	No	No
100-02-7	4-Nitrophenol	µg/kg	340	500	NA		No	No
208-96-8	Acenaphthylene	µg/kg	180	260	360000	n[4]	No	No
1912-24-9	Atrazine	µg/kg	180	260	2400	c	No	No
111-91-1	Bis(2-Chloroethoxy)Methane	µg/kg	180	260	19000	n	No	No
111-44-4	Bis(2-Chloroethyl) Ether	µg/kg	180	260	230	c	No	**Yes**
108-60-1	Bis-Chloroisopropyl Ether	µg/kg	180	260	4900	c	No	No
85-68-7	Butylbenzylphthalate	µg/kg	180	260	290000	c	No	No
105-60-2	Caprolactam	µg/kg	180	260	3100000	n	No	No
58-90-2	Chlorophenols	µg/kg	180	260	190000	n	No	No
132-64-9	Dibenzofuran	µg/kg	180	260	7300	n	No	No
84-66-2	Diethylphthalate	µg/kg	180	260	5100000	n	No	No
131-11-3	Dimethylphthalate	µg/kg	180	260	NA		No	No
117-84-0	Di-N-Octylphthalate	µg/kg	180	260	63000	n	No	No
118-74-1	Hexachlorobenzene	µg/kg	180	260	210	c	No	**Yes**
87-68-3	Hexachlorobutadiene	µg/kg	180	260	1200	c	No	No
77-47-4	Hexachlorocyclopentadiene	µg/kg	180	260	180	n	No	**Yes**
67-72-1	Hexachloroethane	µg/kg	180	260	1800	c	No	No
78-59-1	Isophorone	µg/kg	180	260	570000	c	No	No
91-20-3	Naphthalene	µg/kg	180	260	3800	c	No	No
98-95-3	Nitrobenzene	µg/kg	180	260	5100	c	No	No
621-64-7	N-Nitroso-Di-N-Propylamine	µg/kg	180	260	78	c	**Yes**	**Yes**
86-30-6	N-Nitrosodiphenylamine	µg/kg	180	260	110000	c	No	No
87-86-5	Pentachlorophenol	µg/kg	340	500	1000	c	No	No
108-95-2	Phenol	µg/kg	180	260	1900000	n	No	No

TABLE F-2b

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE/SUBSURFACE SOIL - WILLOW WOODS PROPERTY

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Pesticides/Polychlorinated Biphenyls							
72-54-8	4,4'-DDD	µg/kg	3.5	5	2300 c	No	No
309-00-2	Aldrin	µg/kg	1.8	2.6	39 c	No	No
319-84-6	Alpha-BHC	µg/kg	1.8	2.6	86 c	No	No
12674-11-2	Aroclor 1016	µg/kg	34	50	410 n	No	No
11104-28-2	Aroclor 1221	µg/kg	34	50	170 c	No	No
11141-16-5	Aroclor 1232	µg/kg	34	50	170 c	No	No
53469-21-9	Aroclor 1242	µg/kg	34	50	230 c	No	No
12672-29-6	Aroclor 1248	µg/kg	34	50	230 c	No	No
11097-69-1	Aroclor 1254	µg/kg	34	50	120 n	No	No
37324-23-5	Aroclor 1262	µg/kg	34	50	120 n[5]	No	No
11100-14-4	Aroclor 1268	µg/kg	34	50	120 n[5]	No	No
319-85-7	Beta-BHC	µg/kg	1.8	2.6	300 c	No	No
319-86-8	Delta-BHC	µg/kg	1.8	2.6	300 c[6]	No	No
959-98-8	Endosulfan I	µg/kg	1.8	2.6	47000 n[7]	No	No
33213-65-9	Endosulfan II	µg/kg	3.5	5	47000 n[7]	No	No
72-20-8	Endrin	µg/kg	3.5	5	1900 n	No	No
53494-70-5	Endrin Ketone	µg/kg	3.5	5	1900 n[8]	No	No
58-89-9	Gamma-BHC (Lindane)	µg/kg	1.8	2.6	570 c	No	No
1024-57-3	Heptachlor Epoxide	µg/kg	1.8	2.6	70 c	No	No
72-43-5	Methoxychlor	µg/kg	18	26	32000 n	No	No
8001-35-2	Toxaphene	µg/kg	180	260	490 c	No	No
Inorganics							
57-12-5	Cyanide	mg/kg	0.52	0.61	0.27 n	**Yes**	**Yes**
7782-49-2	Selenium	mg/kg	2.6	3	39 n	No	No
7440-22-4	Silver	mg/kg	0.52	0.59	39 n	No	No
7440-23-5	Sodium	mg/kg	517	594	NA	No	No
7440-28-0	Thallium	mg/kg	0.52	0.59	0.078 n	**Yes**	**Yes**

n = screening level based on noncancer effects
c = screening level based on cancer effects
s = concentration may exceed saturation concentration
NA = not available

µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
BHC = hexachlorocyclohexane

[1]Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[2]screening value for 1,3-dichloropropene

[3]screening value for m-xylene

[4]screening value for acenaphthene

[5]screening value for Aroclor 1254

[6]screening value for hexachlorocyclohexane, technical

[7]screening value for endosulfan

[8]screening value for endrin

TABLE F-3

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

GROUNDWATER

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	µg/L	0.5	0.5	800 n	No	No
79-34-5	1,1,2,2-Tetrachloroethane	µg/L	0.5	0.5	0.076 c	**Yes**	**Yes**
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	0.5	0.5	5500 n	No	No
79-00-5	1,1,2-Trichloroethane	µg/L	0.5	0.5	0.041 n	**Yes**	**Yes**
75-34-3	1,1-Dichloroethane	µg/L	0.5	0.5	2.7 c	No	No
87-61-6	1,2,3-Trichlorobenzene	µg/L	0.5	0.5	0.7 n	No	No
120-82-1	1,2,4-Trichlorobenzene	µg/L	0.5	0.5	0.4 n	**Yes**	**Yes**
96-12-8	1,2-Dibromo-3-Chloropropane	µg/L	0.05	0.05	0.00033 c	**Yes**	**Yes**
106-93-4	1,2-Dibromoethane	µg/L	0.05	0.05	0.0075 c	**Yes**	**Yes**
95-50-1	1,2-Dichlorobenzene	µg/L	0.5	0.5	30 n	No	No
107-06-2	1,2-Dichloroethane	µg/l	0.5	0.5	0.17 c	**Yes**	**Yes**
78-87-5	1,2-Dichloropropane	µg/L	0.5	0.5	0.44 c	**Yes**	**Yes**
541-73-1	1,3-Dichlorobenzene	µg/L	0.5	0.5	NA	No	No
106-46-7	1,4-Dichlorobenzene	µg/l	0.5	0.5	0.48 c	**Yes**	**Yes**
78-93-3	2-Butanone	µg/L	5	5	560 n	No	No
591-78-6	2-Hexanone	µg/L	5	5	3.8 n	**Yes**	**Yes**
108-10-1	4-Methyl-2-Pentanone	µg/L	5	5	120 n	No	No
67-64-1	Acetone	µg/L	5	5	1400 n	No	No
71-43-2	Benzene	µg/L	0.5	0.5	0.45 c	**Yes**	**Yes**
74-97-5	Bromochloromethane	µg/L	0.5	0.5	8.3 n	No	No
75-27-4	Bromodichloromethane	µg/L	0.5	0.5	0.13 c	**Yes**	**Yes**
75-25-2	Bromoform	µg/L	0.5	0.5	3.3 c	No	No
74-83-9	Bromomethane	µg/L	0.5	0.5	0.75 n	No	No
56-23-5	Carbon Tetrachloride	µg/L	0.5	0.5	0.45 c	**Yes**	**Yes**
75-00-3	Chloroethane	µg/L	0.5	0.5	2100 n	No	No
67-66-3	Chloroform	µg/L	0.5	0.5	0.22 c	**Yes**	**Yes**
74-87-3	Chloromethane	µg/L	0.5	0.5	19 n	No	No
10061-01-5	cis-1,3-Dichloropropene	µg/L	0.5	0.5	0.47 c[2]	**Yes**	**Yes**
110-82-7	Cyclohexane	µg/L	0.5	0.5	1300 n	No	No
124-48-1	Dibromochloromethane	µg/L	0.5	0.5	0.17 c	**Yes**	**Yes**
75-71-8	Dichlorodifluoromethane	µg/L	0.5	0.5	20 n	No	No
100-41-4	Ethylbenzene	µg/L	0.5	0.5	1.5 c	No	No
98-82-8	Isopropylbenzene	µg/L	0.5	0.5	45 n	No	No
179601-23-1	m,p-Xylene	µg/L	0.5	0.5	19 n[3]	No	No
79-20-9	Methyl Acetate	µg/L	0.5	0.5	2000 n	No	No
108-87-2	Methylcyclohexane	µg/L	0.5	0.5	NA	No	No
75-09-2	Methylene Chloride	µg/L	0.5	0.5	11.4 n	No	No
95-47-6	o-Xylene	µg/L	0.5	0.5	19 n	No	No
100-42-5	Styrene	µg/L	0.5	0.5	120 n	No	No
108-88-3	Toluene	µg/L	0.5	0.77	110 n	No	No
156-60-5	trans-1,2-Dichloroethene	µg/l	0.5	0.5	36 n	No	No
10061-02-6	trans-1,3-Dichloropropene	µg/L	0.5	0.5	0.47 c[2]	**Yes**	**Yes**
75-69-4	Trichlorofluoromethane	µg/L	0.5	0.5	110 n	No	No

TABLE F-3

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

GROUNDWATER

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Semi-volatile Organic Compounds							
92-52-4	1,1'-Biphenyl	µg/L	5	50	0.083 n	**Yes**	**Yes**
95-94-3	1,2,4,5-Tetrachlorobenzene	µg/L	5	50	0.17 n	**Yes**	**Yes**
95-95-4	2,4,5-Trichlorophenol	µg/L	5	50	120 n	No	No
88-06-2	2,4,6-Trichlorophenol	µg/L	5	50	1.2 n	**Yes**	**Yes**
120-83-2	2,4-Dichlorophenol	µg/L	5	50	4.6 n	**Yes**	**Yes**
105-67-9	2,4-Dimethylphenol	µg/L	5	50	36 n	No	**Yes**
51-28-5	2,4-Dinitrophenol	µg/L	10	100	3.9 n	**Yes**	**Yes**
121-14-2	2,4-Dinitrotoluene	µg/L	5	50	0.24 c	**Yes**	**Yes**
606-20-2	2,6-Dinitrotoluene	µg/L	5	50	0.048 c	**Yes**	**Yes**
91-58-7	2-Chloronaphthalene	µg/L	5	50	75 n	No	No
95-57-8	2-Chlorophenol	µg/L	5	50	9.1 n	No	**Yes**
91-57-6	2-Methylnaphthalene	µg/L	0.1	0.1	3.6 n	No	No
95-48-7	2-Methylphenol	µg/L	5	50	93 n	No	No
88-74-4	2-Nitroaniline	µg/L	10	100	19 n	No	**Yes**
91-94-1	3,3'-Dichlorobenzidine	µg/L	5	50	0.12 c	**Yes**	**Yes**
99-09-2	3-Nitroaniline	µg/L	10	100	NA	No	No
534-52-1	4,6-Dinitro-2-Methylphenol	µg/l	10	100	0.15 n	**Yes**	**Yes**
101-55-3	4-Bromophenyl-Phenylether	µg/L	5	50	NA	No	No
59-50-7	4-Chloro-3-Methylphenol	µg/L	5	50	140 n	No	No
106-47-8	4-Chloroaniline	µg/L	5	50	0.36 c	**Yes**	**Yes**
7005-72-3	4-Chlorophenyl-Phenylether	µg/L	5	50	NA	No	No
106-44-5	4-Methylphenol	µg/L	5	50	190 n	No	No
100-01-6	4-Nitroaniline	µg/L	10	100	3.8 c	**Yes**	**Yes**
100-02-7	4-Nitrophenol	µg/L	10	100	NA	No	No
208-96-8	Acenaphthylene	µg/L	0.1	50	53 n[4]	No	No
98-86-2	Acetophenone	µg/L	5	50	190 n	No	No
1912-24-9	Atrazine	µg/L	5	50	0.3 c	**Yes**	**Yes**
100-52-7	Benzaldehyde	µg/L	5	50	190 n	No	No
56-55-3	Benzo(a)anthracene	µg/L	0.1	0.1	0.012 c	**Yes**	**Yes**
205-99-2	Benzo(b)fluoranthene	µg/L	0.1	0.1	0.034 c	**Yes**	**Yes**
191-24-2	Benzo(g,h,i)perylene	µg/L	0.1	0.1	12 n[5]	No	No
207-08-9	Benzo(k)fluoranthene	µg/L	0.1	0.1	0.34 c	No	No
111-91-1	Bis(2-Chloroethoxy)Methane	µg/L	5	50	5.9 n	No	**Yes**
111-44-4	Bis(2-Chloroethyl) Ether	µg/L	5	50	0.014 c	**Yes**	**Yes**
108-60-1	Bis-Chloroisopropyl Ether	µg/L	5	50	0.36 c	**Yes**	**Yes**
85-68-7	Butylbenzylphthalate	µg/L	5	50	16 c	No	**Yes**
86-74-8	Carbazole	µg/L	5	50	NA	No	No
58-90-2	Chlorophenols	µg/L	5	50	24 n	No	**Yes**
218-01-9	Chrysene	µg/L	0.1	0.1	3.4 c	No	No
53-70-3	Dibenzo(a,h)anthracene	µg/L	0.1	0.1	0.0034 c	**Yes**	**Yes**
132-64-9	Dibenzofuran	µg/L	5	50	0.79 n	**Yes**	**Yes**
84-66-2	Diethylphthalate	µg/L	5	50	1500 n	No	No
131-11-3	Dimethylphthalate	µg/L	5	50	NA	No	No
84-74-2	Di-N-Butylphthalate	µg/L	5	50	90 n	No	No
117-84-0	Di-N-Octylphthalate	µg/L	5	50	20 n	No	**Yes**
86-73-7	Fluorene	µg/L	0.1	50	29 n	No	**Yes**
118-74-1	Hexachlorobenzene	µg/L	5	50	0.0098 c	**Yes**	**Yes**
87-68-3	Hexachlorobutadiene	µg/L	5	50	0.14 c	**Yes**	**Yes**
77-47-4	Hexachlorocyclopentadiene	µg/L	5	50	0.041 n	**Yes**	**Yes**
67-72-1	Hexachloroethane	µg/L	5	50	0.33 c	**Yes**	**Yes**
193-39-5	Indeno(1,2,3-cd)pyrene	µg/L	0.1	0.1	0.034 c	**Yes**	**Yes**
78-59-1	Isophorone	µg/L	5	50	78 c	No	No
91-20-3	Naphthalene	µg/L	0.1	0.1	0.17 c	No	No
98-95-3	Nitrobenzene	µg/L	5	50	0.14 c	**Yes**	**Yes**
621-64-7	N-Nitroso-Di-N-Propylamine	µg/L	5	50	0.011 c	**Yes**	**Yes**
86-30-6	N-Nitrosodiphenylamine	µg/L	5	50	12 c	No	**Yes**

TABLE F-3

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

GROUNDWATER

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Pesticides/Polychlorinated Biphenyls							
309-00-2	Aldrin	µg/L	0.045	0.05	0.00092 c	**Yes**	**Yes**
12674-11-2	Aroclor 1016	µg/L	0.091	0.1	0.14 n	No	No
11104-28-2	Aroclor 1221	µg/L	0.091	0.1	0.0046 c	**Yes**	**Yes**
11141-16-5	Aroclor 1232	µg/L	0.091	0.1	0.0046 c	**Yes**	**Yes**
53469-21-9	Aroclor 1242	µg/L	0.091	0.1	0.0078 c	**Yes**	**Yes**
12672-29-6	Aroclor 1248	µg/L	0.091	0.1	0.0078 c	**Yes**	**Yes**
11097-69-1	Aroclor 1254	µg/L	0.091	0.1	0.0078 c	**Yes**	**Yes**
11096-82-5	Aroclor 1260	µg/L	0.091	0.1	0.0078 c	**Yes**	**Yes**
37324-23-5	Aroclor 1262	µg/L	0.091	0.1	0.0078 c[6]	**Yes**	**Yes**
11100-14-4	Aroclor 1268	µg/L	0.091	0.1	0.0078 c[6]	**Yes**	**Yes**
319-85-7	Beta-BHC	µg/L	0.045	0.05	0.025 c	**Yes**	**Yes**
319-86-8	Delta-BHC	µg/L	0.045	0.05	0.025 c[7]	**Yes**	**Yes**
959-98-8	Endosulfan I	µg/L	0.045	0.05	10 n[8]	No	No
1031-07-8	Endosulfan Sulfate	µg/L	0.091	0.1	10 n[8]	No	No
72-20-8	Endrin	µg/L	0.091	0.1	0.23 n	No	No
7421-93-4	Endrin Aldehyde	µg/L	0.091	0.1	0.23 n[9]	No	No
53494-70-5	Endrin Ketone	µg/L	0.091	0.1	0.23 n[9]	No	No
58-89-9	Gamma-BHC (Lindane)	µg/L	0.045	0.05	0.041 c	**Yes**	**Yes**
76-44-8	Heptachlor	µg/L	0.045	0.05	0.0014 c	**Yes**	**Yes**
1024-57-3	Heptachlor Epoxide	µg/L	0.045	0.05	0.0014 c	**Yes**	**Yes**
8001-35-2	Toxaphene	µg/L	4.5	5	0.015 c	**Yes**	**Yes**
Inorganics							
7440-22-4	Silver	µg/L	1	1	9.4 n	No	No
7440-28-0	Thallium	µg/L	0.5	0.5	0.02 n	**Yes**	**Yes**

n = screening level based on noncancer effects
c = screening level based on cancer effects
s = concentration may exceed saturation concentration
NA = not available

µg/L = micrograms per liter
BHC = hexachlorocyclohexane

[1]Screened against Regional Screening Levels, June 2015, for tap water, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[2]screening value for 1,3-dichloropropene

[3]screening value for m-xylene

[4]screening value for acenaphthene

[5]screening value for pyrene

[6]screening value for Aroclor 1254

[7]screening value for hexachlorocyclohexane, technical

[8]screening value for endosulfan

[9]screening value for endrin

TABLE F-4

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE WATER

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	µg/L	0.5	0.5	800 n	No	No
79-34-5	1,1,2,2-Tetrachloroethane	µg/L	0.5	0.5	0.076 c	**Yes**	**Yes**
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	0.5	0.5	5500 n	No	No
79-00-5	1,1,2-Trichloroethane	µg/L	0.5	0.5	0.041 n	**Yes**	**Yes**
75-34-3	1,1-Dichloroethane	µg/L	0.5	0.5	2.7 c	No	No
75-35-4	1,1-Dichloroethene	µg/L	0.5	0.5	28 n	No	No
87-61-6	1,2,3-Trichlorobenzene	µg/L	0.5	0.5	0.7 n	No	No
120-82-1	1,2,4-Trichlorobenzene	µg/L	0.5	0.5	0.4 n	**Yes**	**Yes**
96-12-8	1,2-Dibromo-3-Chloropropane	µg/L	0.5	0.5	0.00033 c	**Yes**	**Yes**
106-93-4	1,2-Dibromoethane	µg/L	0.5	0.5	0.0075 c	**Yes**	**Yes**
95-50-1	1,2-Dichlorobenzene	µg/L	0.5	0.5	30 n	No	No
107-06-2	1,2-Dichloroethane	µg/L	0.05	0.05	0.17 c	No	No
78-87-5	1,2-Dichloropropane	µg/L	0.5	0.5	0.44 c	**Yes**	**Yes**
541-73-1	1,3-Dichlorobenzene	µg/L	0.5	0.5	NA	No	No
542-75-6	1,3-Dichloropropylene	µg/L	0.05	0.05	0.47 c	No	No
106-46-7	1,4-Dichlorobenzene	µg/L	0.5	0.5	0.48 c	**Yes**	**Yes**
78-93-3	2-Butanone	µg/L	5	5	560 n	No	No
591-78-6	2-Hexanone	µg/L	5	5	3.8 n	**Yes**	**Yes**
108-10-1	4-Methyl-2-Pentanone	µg/L	5	5	120 n	No	No
67-64-1	Acetone	µg/L	5	5	1400 n	No	No
71-43-2	Benzene	µg/L	0.05	0.05	0.45 c	No	No
74-97-5	Bromochloromethane	µg/L	0.5	0.5	8.3 n	No	No
75-27-4	Bromodichloromethane	µg/L	0.5	0.5	0.13 c	**Yes**	**Yes**
75-25-2	Bromoform	µg/L	0.5	0.5	3.3 c	No	No
74-83-9	Bromomethane	µg/L	0.5	0.5	0.75 n	No	No
75-15-0	Carbon Disulfide	µg/L	0.5	0.5	81 n	No	No
56-23-5	Carbon Tetrachloride	µg/L	0.05	0.05	0.45 c	No	No
108-90-7	Chlorobenzene	µg/L	0.5	0.5	7.8 n	No	No
75-00-3	Chloroethane	µg/L	0.5	0.5	2100 n	No	No
67-66-3	Chloroform	µg/L	0.5	0.5	0.22 c	**Yes**	**Yes**
74-87-3	Chloromethane	µg/L	0.5	0.5	19 n	No	No
156-59-2	cis-1,2-Dichloroethene	µg/L	0.5	0.5	3.6 n	No	No
10061-01-5	cis-1,3-Dichloropropene	µg/L	0.5	0.5	0.47 c[2]	**Yes**	**Yes**
110-82-7	Cyclohexane	µg/L	0.5	0.5	1300 n	No	No
124-48-1	Dibromochloromethane	µg/L	0.05	0.05	0.17 c	No	No
75-71-8	Dichlorodifluoromethane	µg/L	0.5	0.5	20 n	No	No
100-41-4	Ethylbenzene	µg/L	0.5	0.5	1.5 c	No	No
98-82-8	Isopropylbenzene	µg/L	0.5	0.5	45 n	No	No
179601-23-1	m,p-Xylene	µg/L	0.5	0.5	19 n[3]	No	No
79-20-9	Methyl Acetate	µg/L	0.5	0.5	2000 n	No	No
1634-04-4	Methyl Tert-Butyl Ether	µg/L	0.5	0.5	14 c	No	No
108-87-2	Methylcyclohexane	µg/L	0.5	0.5	NA	No	No
75-09-2	Methylene Chloride	µg/L	0.5	0.5	11.4 n	No	No
95-47-6	o-Xylene	µg/L	0.5	0.5	19 n	No	No
100-42-5	Styrene	µg/L	0.5	0.5	120 n	No	No
127-18-4	Tetrachloroethene	µg/L	0.05	0.05	4.1 n	No	No
108-88-3	Toluene	µg/L	0.5	0.5	110 n	No	No
156-60-5	trans-1,2-Dichloroethene	µg/L	0.5	0.5	36 n	No	No
10061-02-6	trans-1,3-Dichloropropene	µg/L	0.5	0.5	0.47 c[2]	**Yes**	**Yes**
79-01-6	Trichloroethene	µg/L	0.5	0.5	0.28 n	**Yes**	**Yes**
75-69-4	Trichlorofluoromethane	µg/L	0.5	0.5	110 n	No	No
75-01-4	Vinyl Chloride	µg/L	0.5	0.5	0.019 c	**Yes**	**Yes**

TABLE F-4

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE WATER

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Semi-volatile Organic Compounds							
92-52-4	1,1'-Biphenyl	µg/L	5	5	0.083 n	**Yes**	**Yes**
95-94-3	1,2,4,5-Tetrachlorobenzene	µg/L	0.05	0.05	0.17 n	No	No
95-95-4	2,4,5-Trichlorophenol	µg/L	5	5	120 n	No	No
88-06-2	2,4,6-Trichlorophenol	µg/L	0.05	0.05	1.2 n	No	No
120-83-2	2,4-Dichlorophenol	µg/L	5	5	4.6 n	**Yes**	**Yes**
105-67-9	2,4-Dimethylpheno	µg/L	5	5	36 n	No	No
51-28-5	2,4-Dinitropheno	µg/L	10	10	3.9 n	**Yes**	**Yes**
121-14-2	2,4-Dinitrotoluene	µg/L	0.05	0.05	0.24 c	No	No
606-20-2	2,6-Dinitrotoluene	µg/L	5	5	0.048 c	**Yes**	**Yes**
91-58-7	2-Chloronaphthalene	µg/L	5	5	75 n	No	No
95-57-8	2-Chlorophenol	µg/L	5	5	9.1 n	No	No
91-57-6	2-Methylnaphthalene	µg/L	5	5	3.6 n	**Yes**	**Yes**
95-48-7	2-Methylphenol	µg/L	5	5	93 n	No	No
88-74-4	2-Nitroaniline	µg/L	10	10	19 n	No	No
88-75-5	2-Nitrophenol	µg/L	5	5	NA	No	No
91-94-1	3,3'-Dichlorobenzidine	µg/L	0.05	0.05	0.12 c	No	No
99-09-2	3-Nitroaniline	µg/L	10	10	NA	No	No
534-52-1	4,6-Dinitro-2-Methylphenol	µg/L	10	10	0.15 n	**Yes**	**Yes**
101-55-3	4-Bromophenyl-Phenylether	µg/L	5	5	NA	No	No
59-50-7	4-Chloro-3-Methylphenol	µg/L	5	5	140 n	No	No
106-47-8	4-Chloroaniline	µg/L	5	5	0.36 c	**Yes**	**Yes**
7005-72-3	4-Chlorophenyl-Phenylether	µg/L	5	5	NA	No	No
106-44-5	4-Methylphenol	µg/L	5	5	190 n	No	No
100-01-6	4-Nitroaniline	µg/L	10	10	3.8 c	**Yes**	**Yes**
100-02-7	4-Nitrophenol	µg/L	10	10	NA	No	No
83-32-9	Acenaphthene	µg/L	5	5	53 n	No	No
208-96-8	Acenaphthylene	µg/L	5	5	53 n[4]	No	No
98-86-2	Acetophenone	µg/L	5	5	190 n	No	No
120-12-7	Anthracene	µg/L	5	5	180 n	No	No
1912-24-9	Atrazine	µg/L	5	5	0.3 c	**Yes**	**Yes**
100-52-7	Benzaldehyde	µg/L	5	5	190 n	No	No
191-24-2	Benzo(g,h,i)perylene	µg/L	5	5	12 n[5]	No	No
111-91-1	Bis(2-Chloroethoxy)Methane	µg/L	5	5	5.9 n	No	No
111-44-4	Bis(2-Chloroethyl) Ether	µg/L	0.05	0.05	0.014 c	**Yes**	**Yes**
108-60-1	Bis-Chloroisopropyl Ether	µg/L	5	5	0.36 c	**Yes**	**Yes**
85-68-7	Butylbenzylphthalate	µg/L	5	5	16 c	No	No
105-60-2	Caprolactam	µg/L	5	5	990 n	No	No
86-74-8	Carbazole	µg/L	5	5	NA	No	No
58-90-2	Chlorophenols	µg/L	5	5	24 n	No	No
53-70-3	Dibenzo(a,h)anthracene	µg/L	0.05	0.05	0.0034 c	**Yes**	**Yes**
132-64-9	Dibenzofuran	µg/L	5	5	0.79 n	**Yes**	**Yes**
84-66-2	Diethylphthalate	µg/L	5	5	1500 n	No	No
131-11-3	Dimethylphthalate	µg/L	5	5	NA	No	No
84-74-2	Di-N-Butylphthalate	µg/L	5	5	90 n	No	No
117-84-0	Di-N-Octylphthalate	µg/L	5	5	20 n	No	No
206-44-0	Fluoranthene	µg/L	5	5	80 n	No	No
86-73-7	Fluorene	µg/L	5	5	29 n	No	No
118-74-1	Hexachlorobenzene	µg/L	0.05	0.05	0.0098 c	**Yes**	**Yes**
87-68-3	Hexachlorobutadiene	µg/L	0.05	0.05	0.14 c	No	No
77-47-4	Hexachlorocyclopentadiene	µg/L	5	5	0.041 n	**Yes**	**Yes**
67-72-1	Hexachloroethane	µg/L	0.05	0.05	0.33 c	No	No
78-59-1	Isophorone	µg/L	5	5	78 c	No	No
91-20-3	Naphthalene	µg/L	5	5	0.17 c	**Yes**	**Yes**
98-95-3	Nitrobenzene	µg/L	5	5	0.14 c	**Yes**	**Yes**
621-64-7	N-Nitroso-Di-N-Propylamine	µg/L	0.05	0.05	0.011 c	**Yes**	**Yes**
86-30-6	N-Nitrosodiphenylamine	µg/L	0.05	0.05	12 c	No	No
85-01-8	Phenanthrene	µg/L	5	5	180 n[6]	No	No
108-95-2	Phenol	µg/L	5	5	580 n	No	No
129-00-0	Pyrene	µg/L	5	5	12 n	No	No

TABLE F-4

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SURFACE WATER

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]	RL > SL	
			Minimum	Maximum		Minimum	Maximum
Pesticides/Polychlorinated Biphenyls							
72-55-9	4,4'-DDE	µg/L	0.1	0.1	0.046 c	**Yes**	**Yes**
50-29-3	4,4'-DDT	µg/L	0.1	0.1	0.23 c	No	No
309-00-2	Aldrin	µg/L	0.05	0.05	0.00092 c	**Yes**	**Yes**
319-84-6	Alpha-BHC	µg/L	0.05	0.05	0.0071 c	**Yes**	**Yes**
5103-71-9	Alpha-Chlordane	µg/L	0.05	0.05	0.045 c[7]	**Yes**	**Yes**
12674-11-2	Aroclor 1016	µg/L	0.2	0.2	0.14 n	**Yes**	**Yes**
11104-28-2	Aroclor 1221	µg/L	0.2	0.2	0.0046 c	**Yes**	**Yes**
11141-16-5	Aroclor 1232	µg/L	0.2	0.2	0.0046 c	**Yes**	**Yes**
53469-21-9	Aroclor 1242	µg/L	0.2	0.2	0.0078 c	**Yes**	**Yes**
12672-29-6	Aroclor 1248	µg/L	0.2	0.2	0.0078 c	**Yes**	**Yes**
11097-69-1	Aroclor 1254	µg/L	0.2	0.2	0.0078 c	**Yes**	**Yes**
11096-82-5	Aroclor 1260	µg/L	0.2	0.2	0.0078 c	**Yes**	**Yes**
37324-23-5	Aroclor 1262	µg/L	0.2	0.2	0.0078 c[8]	**Yes**	**Yes**
11100-14-4	Aroclor 1268	µg/L	0.2	0.2	0.0078 c[8]	**Yes**	**Yes**
319-85-7	Beta-BHC	µg/L	0.05	0.05	0.025 c	**Yes**	**Yes**
319-86-8	Delta-BHC	µg/L	0.05	0.05	0.025 c[9]	**Yes**	**Yes**
60-57-1	Dieldrin	µg/L	0.1	0.1	0.0017 c	**Yes**	**Yes**
959-98-8	Endosulfan I	µg/L	0.05	0.05	10 n[10]	No	No
33213-65-9	Endosulfan II	µg/L	0.1	0.1	10 n[10]	No	No
1031-07-8	Endosulfan Sulfate	µg/L	0.1	0.1	10 n[10]	No	No
72-20-8	Endrin	µg/L	0.1	0.1	0.23 n	No	No
7421-93-4	Endrin Aldehyde	µg/L	0.1	0.1	0.23 n[11]	No	No
53494-70-5	Endrin Ketone	µg/L	0.1	0.1	0.23 n[11]	No	No
58-89-9	Gamma-BHC (Lindane)	µg/L	0.05	0.05	0.041 c	**Yes**	**Yes**
76-44-8	Heptachlor	µg/L	0.05	0.05	0.0014 c	**Yes**	**Yes**
1024-57-3	Heptachlor Epoxide	µg/L	0.05	0.05	0.0014 c	**Yes**	**Yes**
72-43-5	Methoxychlor	µg/L	0.5	0.5	3.7 n	No	No
8001-35-2	Toxaphene	µg/L	5	5	0.015 c	**Yes**	**Yes**

n = screening level based on noncancer effects

c = screening level based on cancer effects

NA = not available

µg/L = micrograms per liter

BHC = hexachlorocyclohexane

[1]Screened against Regional Screening Levels, June 2015, for tap water, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[2]screening value for 1,3-dichloropropene

[3]screening value for m-xylene

[4]screening value for acenaphthene

[5]screening value for pyrene

[6]screening value for anthracene

[7]screening value for chlordane

[8]screening value for Aroclor 1254

[9]screening value for hexachlorocyclohexane, technical

[10]screening value for endosulfan

[11]screening value for endrin

TABLE F-5

COMPARISON OF REPORTING LIMITS FOR NON-DETECTED CHEMICALS TO SCREENING LEVELS

SEDIMENT

Matteo & Sons, Inc. Site

Thorofare, New Jersey

CAS No.	Chemical	Unit	Reporting Limit (RL)		Screening Level (SL) (n/c) [1]		RL > SL	
			Minimum	Maximum			Minimum	Maximum
Polychlorinated Biphenyls								
12674-11-2	Aroclor 1016	µg/kg	1.8	7	410	n	No	No
11104-28-2	Aroclor 1221	µg/kg	1.8	7	170	c	No	No
11141-16-5	Aroclor 1232	µg/kg	1.8	7	170	c	No	No
53469-21-9	Aroclor 1242	µg/kg	1.8	7	230	c	No	No
11096-82-5	Aroclor 1260	µg/kg	1.8	7	240	c	No	No
37324-23-5	Aroclor 1262	µg/kg	1.8	7	120	n[2]	No	No

n = screening level based on noncancer effects
c = screening level based on cancer effects

µg/kg = micrograms per kilogram

[1]Screened against Regional Screening Levels, June 2015, for residential soil, adjusted to a cancer risk of 1 in 1,000,000 and hazard quotient of 0.1. http://www.epa.gov/region09/waste/sfund/prg/index.html

[2]screening value for Aroclor 1254